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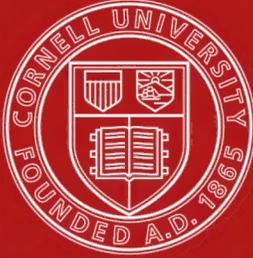


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TALLQUIST'S HEMOGLOBIN SCALE

THE
PREVENTION AND TREATMENT
OF
DISEASES
OF THE
DOMESTIC ANIMALS
INCLUDING
ETIOLOGY AND SYMPTOMS

BY
KENELM WINSLOW, M.D., M.D.V., B.A.S. (Harv.)

Formerly Instructor in Zoölogy, Bussey Institute, and Assistant
Professor of Therapeutics, Veterinary School of Harvard
University. Author of "Veterinary Materia
Medica and Therapeutics," etc., etc.



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PREFACE.

The endeavor has been made in this book to present in a conveniently arranged form the modern treatment of the more common diseases of the domestic animals. This attempt is only an extension of what has already been done in a brief summary in the writer's "Veterinary Materia Medica and Therapeutics." The author's familiarity with recent progress in human, as well as veterinary practice, has enabled him to apply the latest additions to therapeutic knowledge in human medicine to analogous conditions obtaining in veterinary practice. Thus the introduction of bismuth paste for the cure of sinus' by Beck in human surgery will prove of success if applied to veterinary surgery—as it is indeed already beginning to do.

In the use of drugs the aim has been to make the directions as specific as possible, so that the dose and preparation are given in detail although, for the sake of brevity, not commonly in the conventional form of prescriptions. Etiology has been given especial attention, since it is the basis of preventive medicine.

Prevention or treatment being the practical aim and end of medicine, a properly written book on the subject should prove of great practical value to the veterinary practitioner. Several such books have recently appeared in human medicine and have met with marked success.

It is the hope of both writer and publisher that the same happy result will follow the present attempt in its application to veterinary practice.

KENELM WINSLOW.

DISEASES OF THE DOMESTIC ANIMALS.

Abortion (Accidental and Contagious)—Slipping—Slinking.

(A) ACCIDENTAL.—Calf abortion, strictly speaking, is the expulsion of the fetus before it is viable, at $7\frac{1}{2}$ months old, but the name is often used to mean expulsion before full term.

Symptoms of Threatened Abortion.—In the first three months of pregnancy, the appearance of a bloody, watery or mucous discharge from the vagina. In the later months, uneasiness, swelling, heat and tenderness about the udder; secretion of milk; and straining as if in labor.

Causes of Accidental Abortion.—1. Mechanical injuries due to blows, falls; improper floors, as those too slippery, or sloping backward too much; deep gutters; railway journeys; pregnant animals riding the non-pregnant in heat.

2. General diseases. Premature breeding; plethora; anemia and malnutrition through interference with the fetal circulation. Anemia may be caused by improper feeding, and lack of mineral matter in the food may induce pica, seen often in pregnant cows. Anemia is also due to excessive lactation, intestinal parasites, hemorrhage and unhealthy surroundings.

3. Special Diseases. Chronic disorders of digestion leading to the formation of gas in the rumen and pressure on the womb. Also diarrhea and straining. Disease of the urinary organs, as renal calculus in cattle (from lack of sufficient water), reflexly

causing irritation of the uterus; stone in the bladder or cystitis causing constant straining; disease of the heart, as fatty heart, leading to disturbances of the fetal circulation and death of the fetus.

4. Improper feeding, especially with ergotized, smutty or rusty fodder. Also sudden change from dry to succulent diet, inducing flatulence in cattle; deprivation of water, leading to indigestion; constipation and straining; ice water; putrid water; frozen food.

5. Diseases of the genital organs and of the fetus and membranes. Tuberculosis of the ovaries and uterus. Interference with the fetal circulation and mechanical obstruction in the umbilical cord, etc.

6. Poisons, as powerful cathartics and diuretics, and those taken accidentally or with the food, as ergot.

7. Nervous shocks, as fright; and noisome odors, as from slaughterhouse or proximity to animals with retained afterbirth.

(B) EPIZOOTIC OR CONTAGIOUS ABORTION.—*Causes.*—This form of abortion is frequent among cows and is capable of being communicated to sows, mares, ewes, goats, rabbits, guinea pigs. When it once infects a barn it is difficult to eradicate. The disease is either communicated by a special bacillus which enters the vagina and womb and inhabits the space between the fetal membranes of uterine walls, or apparently by several forms of bacilli—according to various observers. In this country several forms of the colon group have been described as the cause. The organism is found in the uterine discharge and is conveyed to cows by the bull or by floors, litter, walls, posts, tails or tongues soiled with vaginal discharge from infected animals. Cows in advanced pregnancy carry their young to full term, even though exposed to the infection. Of animals aborting, some may remain sterile, some may abort persistently, while others, after aborting two or three times, may recover and go through normal pregnancies.

Prevention of Accidental Abortion.—This embraces avoid-

ance of the predisposing causes already mentioned. (a) Abstinence from improper floors and gutters, and railway journeys for pregnant animals. Confining pregnant cows so that they cannot mix with those in heat. (b) Anemia and malnutrition is corrected by feeding grains and by the use of iron and general liberal diet. (c) Special disorders are combated. An abundance of water before cows will prevent calculus, together with feeding roots, ensilage, etc. Warm water for drinking and avoidance of sudden changes in diet. If ergot is prevalent the grass or grain must be cut before they go to seed, or the hay may be fed after the seed has been removed by threshing. Ergotized or smutty fodder may be fed to some extent if the animals at the same time receive plenty of succulent food, as ensilage and roots, and water. The growth of ergot and smut may be prevented greatly by soaking the seed in a saturated solution of copper sulphate or bluestone.

The substitution of hoed crops for several years in place of ergotized or smutty grains or corn (turnips, beets, potatoes) together with drainage, will rid the ground of the pest.

Treatment of Threatened Accidental Abortion.—If the water bags have not presented or the waters escaped, give two ounces of laudanum and keep the animal absolutely quiet in stall. Repeat in three or four hours.

Treatment of Contagious Abortion.—This is chiefly preventive. Cows aborting, or threatened with abortion, should be removed to a separate barn or, if this is impossible, to a separate part of the barn. When single cases of abortion occur without any sufficient cause apparent, it is often impossible to know whether the case is accidental or contagious and it should be treated as contagious.

The fetus and membranes should be burned. The premises occupied by the sick animal should be disinfected as follows: Remove all bedding and dirt possible and spray all available parts of barn with 3 % formalin or 5 % carbolic acid solution. Apply white-

wash containing 1 lb. chloride of lime to 3 gallons of whitewash. Scatter quicklime on floor and gutters.

The cow yard should be scraped clean and sprinkled with 10 % solution of iron sulphate. Apply the same to fences about yard and walls of stable, before whitewashing.

The animal which has aborted should receive daily an intra-uterine injection of two gallons of warm water containing 2 % of compound cresol solution (lysol) until the vaginal discharge stops. The external parts about the vagina, including the hips and tail, should be washed thoroughly with soap and water and then with the same cresol solution twice daily, and this latter should also be done on all exposed pregnant animals in the herd, being careful that neither the same cloth, nor solution, nor bucket, nor attendant are used for the sick and the well animals.

Carbolic acid, in doses of two drams of a 3 per cent solution, given subcutaneously in the side of the neck, once in ten days, is both preventive in exposed animals and curative in cows which have aborted, and deserves trial.

A bull which has served a cow suffering from the effects of epizoötic abortion should not cover healthy animals. The bull on the premises in which there is epizoötic abortion should have the hair cut short about the sheath of the penis and surrounding parts and have the sheath well flushed with water containing 2 % of compound cresol solution before and after serving a cow.

Cows should not go to the bull until ten or twelve weeks after aborting, or until all discharge from the vagina has ceased.

It is advisable that the stable be frequently disinfected while abortion is prevalent, as the bacteria may live 14 months in the vagina and 7 months in the stable.

Abscess.

Symptoms.—A circumscribed collection of pus surrounded by

a well defined wall. There are two forms—acute and chronic. The acute results from traumatism and infection. The infectious variety is especially common in glands, as of the parotid and submaxillary of horses in influenza and strangles. It occurs as tender, hot, more or less hard swellings under or behind the jaw in the latter diseases.

Treatment.—The treatment of acute abscess consists in the removal of hair from the part and in the use of tincture of iodine painted very freely on the swelling in its early stages and the injection—especially if a gland is the seat—of 10 minims of 2 % solution of carbolic acid into the swelling. These measures may abort the abscess. When the progress of the abscess appears to be certain, it should be hastened by hot, frequently changed, flax-seed poultices, or by the application of a fly blister—in the case of indurated glands of the neck in the horse. When the swelling begins to soften and suppuration is evident, the abscess may be opened by the knife or actual cautery. The latter is excellent in being aseptic and comparatively bloodless and painless, when the white hot iron is used, and much of the tissue—which would slowly slough—may be at once destroyed by the cautery.

The after care consists in washing the cavity, once or more daily, with hydrogen dioxide and injecting 5 % iodoform in warmed vaseline, or peruvian balsam at a later stage, to stimulate granulation. It is well to keep up the poultices for a day or two after opening of the abscess.

Chronic or cold abscess is commonly either tuberculous or results from repeated traumatism, as in the case of shoulder abscess or shoe-boil in the horse, from the irritation of an ill-fitting collar or from that of the shoe calks in lying down. The swelling is usually large, without inflammatory signs, as heat and tenderness, except in recent cases (as in shoe-boil or capped elbow). The inflammation starts in connective tissue and results in the formation of many pockets, and the abscess is usually very thick-walled and cure is chiefly by the knife or cautery, with the removal of all the indur-

ated tissue. The open wound resulting is covered with a dressing powder—as equal parts tannic acid, iodoform, boric acid and charcoal—and cleansed with hydrogen dioxide. Carbolic acid in glycerine (1 to 16), or peruvian balsam, may be used later to stimulate granulation.

Accessory Sinus of the Nose and Guttural Pouches, Disease of Inflammation of the Maxillary and Frontal Sinuses in the Horse.

Symptoms.—The various accessory sinuses may be affected, but usually the superior maxillary and frontal. Extension of nasal catarrh, carious teeth, trauma, glanders, strangles, and new growth may induce sinus disease with catarrh, obstruction and empyema of the sinus. One-sided nasal discharge, flowing in gushes with the head down; and dulness and swelling over the sinus externally, with one-sided enlargements of the submaxillary lymph nodes, are seen. This simulates catarrh of the guttural pouches, but in the latter there is difficulty in swallowing, noisy, obstructed breathing, and swelling in the parotid region.

Treatment.—The treatment of both conditions is surgical—trephining, drainage and irrigation of the maxillary sinus, and hyovertebrotomy for disease of the guttural pouches.

Acne.

Symptoms.—Acne is due to clogging of the sebaceous glands and hair follicles with inspissated sebum, and also to infection with bacteria, leading to inflammation about the follicle. In pustular acne, staphylococci are present. The pustular form is seen in horses, dogs and sheep. In horses, as painful, hard pustules appearing under the saddle or other harness, from which tallow-like sebaceous matter followed by a drop or two of pus may be squeezed; in dogs, it is caused by pressure of a muzzle, or appears on the trunk and extremities and may lead to considerable infection and large abscesses; in sheep, acne is observed after shearing—on the body and

inside of the thighs—and is perhaps due to irritation and infection of the skin by the process.

Treatment.—In acute acne with much tenderness, heat and swelling, hot fomentations containing borax (3 ii-O i) are indicated.

Acne may perhaps be prevented by avoiding rough and irritating harness and by keeping the skin clean under the harness through the use of sulphur soap; and the lesions can sometimes be aborted by touching them with pure carbolic acid—that is, the papular may be prevented from becoming the pustular form. Sulphur in various forms is remedial. Pustules should be incised, sebum and pus squeezed out, and the after-treatment conducted by the application of dry sulphur or sulphur ointment to the lesions. In chronic cases, Fowler's solution (H., ʒ ss; D., ℥ iii-v twice daily in drinking water) may prove beneficial.

A boil is but a more severe form of acne (phlegmonous folliculitis), and the reader is referred to p. 32 for its treatment.

Actinomycosis—Big Jaw—Lumpy Jaw—Wooden Tongue.*

This disease is due to a streptothrix (*S. actinomyces bovis*) or ray fungus, so called because colonies assume rosette or radiate forms. The disease is not directly communicable from animal to animal or from animal to man. It is inoculated into the mucous membrane of the mouth in most cases by means of sharp particles of foodstuff (as awns of barley, spears of oats, thorns of cactus and dried grasses), on which the fungus appears to naturally exist. Conditions in the mouth favoring inflammation or injury of the mucous membrane, as decayed teeth and shedding of the milk teeth, also aid in furnishing a more favorable field for the entrance of the fungus. Most cases occur in young cattle at dentition; 89 % in the last half of the year when hay and grain are fed. Usually

* The author desires to acknowledge his indebtedness to Circular No. 99, U. S. Bureau of Animal Industry, on Actinomycosis.

the result of the invasion of the fungus is the production of a chronic inflammation. The fungi are surrounded by a mass of round cells and there is proliferation of connective tissue. The granulation tissue thus formed (infective granuloma) either breaks down into puriform matter, or connective tissue formation predominates and a hard, fibrous tumor or calcification results. The tumors thus produced vary in consistency and size and affect the jaws, parotid glands, tongue, pharynx and larynx, and soft parts about the head. In certain countries special forms are more common: In England, "wooden tongue"; in Denmark, disease of the soft parts of the head; in Prussia, disease of the lips.

Invasion of the upper and lower maxillary bones is one of the most serious and common forms in this country. The bones become much thickened and porous and the invasion may begin in the marrow or periosteum, or in soft parts about these bones. Finally a fungus-like growth breaks through the skin or into the mouth. In "wooden tongue" the growth in this organ renders it hard, painfully swollen and stiff so that its action is greatly impeded and it protrudes from the mouth and there is an excessive flow of saliva.

Actinomycosis of the pharynx appears as broad-based or polypoid tumors in the mouth, originating from involvement of submucous glands.

In the soft parts of the head, tumors, from the size of a nut to an egg, may develop and break through the skin as reddish, fungous-like patches covered with a thin slough, or may discharge creamy pus from an abscess cavity, and later the cavity becomes filled with a fungous growth.

Actinomycosis may suggest tuberculous lesions, but if the growth is cut into the characteristic sulphur-colored granules may be seen with the naked eye or by a magnifying glass, as they are about 1-50 of an inch in diameter. These are the fungi and are imbedded in cellular masses in a meshwork of connective tissue.

They may be removed by a needle and examined under the microscope. The sulphur grains consist of threads and coccoid bodies and show a radiate arrangement when squeezed under a cover glass. The older forms are more yellow and are clubbed. The threads divide and branch. The fungus stains well by the usual stains and Gram's method.

There may be involvement of various parts of the body more rarely, as the lungs (in which various forms may be met, as pneumonia, softening and abscess); brain; liver; spleen; muscular tissue; scrotum; udder; vagina; spermatic cord of recently castrated animals; and skin.

Usually, unless the internal organs are affected, the local growth about the head distresses and injures the patient by interfering with chewing, swallowing and breathing. In the jaws, the disease interferes with their motion and causes destruction of the teeth; in the soft parts about the mouth the tumor projects into that cavity; in the tongue, deglutition is impeded; and in the pharynx tumors may obstruct breathing. The disease is but rarely self-limited through calcification or encysting of the fungus growth.

Prevention.—Until our knowledge is more specific as to the actual presence of the fungi on any particular foodstuff it is impossible to prevent the inoculation of animals from such. While the disease is not directly transmitted from the diseased to the well, it is not wise that diseased animals should be permitted to go about and spread broadcast the fungi in discharges from the growths.

As actinomycosis is also communicated to man by straw, grasses and grains, the holding of such in the mouth is most certainly to be avoided.

Treatment.—Surgical extirpation is most successful in curing the disease, but this is not often possible owing to the seat of the trouble and for reasons of economy. The curettement of fistulæ and accessible foci and packing with iodoform gauze is also remedial. The most generally applicable treatment is that by potassium

iodide. This is almost a specific; from 53 to 75 % of cases are cured by its use according to different authorities. Two to three drams are given daily in drench and continued until coryza, lachrymation, bronchorrhea and anorexia ensue (iodism), when the drug is given in daily doses of one dram for a period of three to six weeks. The drug is expensive, however. Some animals who do not show iodism are not curable by the iodide. If there is no improvement within four or five weeks of treatment with the iodide, it is useless to persist in it. The drug should not be given to milch cows nor to pregnant animals, as it is eliminated in the milk and may induce abortion. Packing fistulous tracts with pure powdered copper sulphate is efficient. A one per cent. solution of the iodide may also be injected into the tissues and Lugol's solution or tinc. of iodine may be used externally on the lesion. The injection of tuberculin has also been shown to lead to great improvement.

Alopecia—Baldness.

This occurs in horses, sheep, dogs and other animals. Several forms may be differentiated. That appearing as the result of general debility or symptomatic alopecia; that which is inherited, or congenital; as a form of eczema with much dandruff or scaling, alopecia pityrodes; and the form in which isolated patches of baldness appear, alopecia areata.

Treatment.—The treatment consists in combating debility and anemia by good feeding, and the use of iron, arsenic and vegetable bitters in the symptomatic form with general loss of hair. Local stimulation of the skin with a variety of remedies is useful. Thus ℞: Tincturæ cantharidis, ℥ i; linimenti saponis, ad ℥ viii, may be employed externally. Pilocarpine hydrochlorate, ℥ ss; vaseline, ℥ ss; and lanolin, ad ℥ ii, makes a serviceable application in limited areas of baldness. The application of strong water of ammonia; of chrysarobin (gr. xx-xxx to the ounce of ointment); and many other substances are remedial, but in symptomatic baldness the hair often returns naturally in a few weeks.

In the baldness following scaling of the skin, thorough and frequent grooming is most useful with local inunction of sulphur ointment daily. After some time, oil of cade may be added in the proportion of one dram to the ounce of sulphur ointment.

In alopecia areata there are circumscribed round spots of baldness which resemble those of ringworm but there are no broken hairs, scales, crusts or fungus. It is common in dogs and horses. Treatment is conducted with the daily use of an ointment of extract of pilocarpus, ℥ i; sulphur ointment to make ℥ i; or the chrysarobin ointment, noted above, may be employed as frequently as may be without producing too much skin irritation. Friedberger advises one of the following: Creolin in alcohol (1-10 to 20); tincture of iodine and alcohol, equal parts; or peruvian balsam and alcohol (1-10).

Amaurosis.

Amaurosis is that form of total blindness occurring without any apparent ocular lesion visible to the naked eye. There may be a lesion discoverable, however, by ophthalmoscopic examination of the fundus. Amblyopia is often used synonymously with amaurosis but strictly refers to weakened or impaired vision (and not total blindness) due to functional disease of the visual apparatus.

The etiology of amaurosis (including amblyopia) embraces the following conditions: Disease of the choroid, retina, optic nerve or brain. Many general disorders produce disturbance of these parts and amaurosis, as apoplexy, parturient apoplexy, renal disease, diabetes mellitus, lead poisoning, convulsions, cerebral tumor and concussion, and hydatids.

Amaurosis may be caused by blindness in the other eye (sympathetic form). Functional disturbances of the visual apparatus, which are more apt to result in amblyopia, are induced by debility, severe anemia and hemorrhage, gastric disorder, impacted rumen, pregnancy and lactation, large doses of quinine, exposure to the glare of the sun and excessive copulation.

Symptoms.—In the horse amaurosis is shown by a “glass eye” —a glassy, staring eye in which the pupil does not react to light. There is blindness, generally in both eyes, without any visible lesions in the eye. The animal is apt to step high. On pretending to strike the animal, the eyelid does not wink, unless wind made by the movement is perceived by the patient.

Treatment.—It will be apparent from the foregoing that the treatment must depend upon the causation. When causative factors, inducing only functional disorder of the visual apparatus, may be removed, then recovery may be expected. In amaurosis dependent upon debility, hemorrhage, trauma and quinine poisoning, the use of strychnine under the skin—or by mouth—and the application of a fly blister the size of the palm (which should be rubbed into the skin behind the ear) are indicated. Also in atrophy of the optic nerve strychnine is beneficial. It should be injected about the temple, in doses of one grain for the horse, twice daily. When this is not feasible, one dram doses of powdered nux vomica may be given on the food thrice daily.

Anemia (Pernicious Anemia—Hydremia).

Anemia is a bodily state in which there is reduction of the total amount of blood or of its constituent parts, especially the red corpuscles and hemoglobin. It attacks all domestic animals.

Anemia may be divided into two kinds: (*a*) secondary or symptomatic, and (*b*) primary, idiopathic or pernicious. Ordinary anemia belongs to the first division and is symptomatic of many disorders, as hemorrhage; insufficient food; exposure to cold; badly ventilated quarters; acute and chronic diseases accompanied by exhausting discharges, as in diarrhea and chronic suppuration; chronic nephritis; prolonged lactation; pregnancy; malignant disease; toxic conditions as in fever, indigestion and metal poisoning; and intestinal parasites—especially the *Distoma hepaticum*, and *Stronglyti*—as *S. contortus* of sheep, *S. tetracanthus* of foals, *Dochmius tri-*

gonocephalus of dogs and its congener of cats. Prolonged over-exertion, obesity and in-breeding appear to be etiological factors. Anemia is common in sucklings and young animals and is then said to be congenital.

Symptoms.—Pallor of the mucous membranes, weakness and sweating on exertion, palpitation, and rapidity of the heart, heart murmurs and venous hum in the jugulars, anorexia and digestive disturbances are the chief symptoms. Sometimes the mucous membranes in the horse are of a coppery color and the nasal membrane of a slate hue.

PERNICIOUS ANEMIA is a rare and often fatal form arising from unknown causes. Weakness is slowly but persistently progressive and, in addition to the ordinary symptoms of anemia, there may be a yellowish hue of the mucous membranes, intermittent fever, diarrhea, visible pulsating vessels, dropsy and perhaps emaciation. In the exact diagnosis of anemia the signs and symptoms are not sufficient, but the blood should be examined. In ordinary, secondary anemia the hemoglobin is proportionately deficient, as shown by the color in comparing a drop of fresh blood on white filter paper with Tallquist's color scale. The red corpuscles are to a less extent diminished. Tallquist's Scale will be found as the frontispiece of the book. This was made for use in human practice but applies almost equally well to most domestic animals. If the hemoglobin of any selected specimen of blood shows a color equal to that, or higher than that, marked 80 per cent., the probability of anemia existing is slight.

This test is the easiest of any reliable method for determining anemia and the appearance of the mucous membranes may be misleading.

To perform the test one should draw a drop of blood by a prick with a surgical needle or scalpel from the lip or other vascular part, and saturate a piece of clean, white filter paper with it.

The blood on the filter paper should be compared by daylight

with the various colors on the scale when it is fresh, but after a few minutes for the moist gloss to disappear, or after pressing the stain against a piece of blotting paper. In pernicious anemia, the red corpuscles are much reduced (generally below 1,000,000 per cu. m. m.) and usually forms, as megalocytes (large corpuscles), microcytes (small corpuscles), poikilocytes (irregularly shaped corpuscles), and nucleated corpuscles are found. The total hemoglobin is low (10 to 50 per cent.), as shown by the Tallquist color scales.

ANEMIA IN SHEEP (HYDREMIA).—This condition is often enzoötic in flocks from exposure to wet and cold, improper feeding and poor care. Edema of dependent parts, ascites, great weakness, diarrhea, and slow exhaustion and death frequently follow.

Treatment.—The ordinary form of anemia being secondary, it is incumbent upon us to find and remove the cause, if possible. It is probable that autointoxication from indigestion is one of the most common causes of anemia. For this reason it is well to supply salt liberally to increase gastric secretion, or to give diluted hydrochloric acid; also to keep the bowels loose with laxatives—as salts on the food or bran mashes for horses. The diet is of great importance in supplying iron and available proteids. Thus, for the large animals, the grains, with a pint to a quart of oil meal daily, and milk—to the extent of two or three gallons daily—with a proper amount of coarse fodder are indicated; while for dogs, milk, meat juice, bovine (3 i in milk thrice daily) with meat are particularly useful. When the appetite is poor, the bitters are of service, as fluidextract of nux vomica on the tongue (H., 3 i; D., ʒ i), which also stimulates peristalsis. Care of the skin by careful grooming and, in the case of horses, clipping in the spring and fall, when the animals are “changing their coats,” are of service in averting and benefiting anemia. Well-ventilated quarters and rest conduce to blood formation. The feeding of finely ground bone meal to young anemic pigs is of value in supplying calcium phosphate.

Special diet, however, sometimes brings on anemia and dropsy (hydreemia), as in the case of cattle and horses fed on sugar-beet pulp.

The two remedies of most value in anemia are iron and arsenic. The former stimulates hemoglobin formation and indirectly the building of red corpuscles, while arsenic appears to promote more especially the formation of red corpuscles. To large patients, tincture of ferric chloride (H. & C., § i-ii) may be given on the food or placed undiluted on the tongue three times daily and improves digestion and stimulates activity of the kidneys by its contained nitrous ether and alcohol. Ferrous sulphate is a good form for horses, and one dram is frequently prescribed with two drams each of sodium bicarbonate and powdered nux vomica on the feed thrice daily. The sodium bicarbonate lessens the astringency of the iron salt.

Saccharated ferrous carbonate may be given to animals, if the other iron salts are not taken voluntarily; or reduced iron, which has little taste (of either H., § i-ii; C., § ii-iv; sheep and swine, gr. xx-xxx; D., gr. i-v).

To dogs, pills of ferrous carbonate may be administered in the form of Bland's pills (each gr. v), or tablets containing one or two grains of reduced iron may be given. When there is indigestion and flatulence it is advisable to give an aromatic and bitter with iron, as powdered nux vomica, § i; powdered ginger, § iv; reduced iron, § i; arsenous acid, gr. v—in a single dose (powder), to be given twice daily on the food for a horse. For sheep, 20 grains of ferrous sulphate, or reduced iron, may be given on grain, with a dram each of salt, ginger and gentian.

Arsenic may often be combined to advantage with iron, as above, in powder, or Fowler's solution may be added to tincture of ferric chloride without incompatibility. In the pernicious form of anemia, arsenic is of much more value than iron and should be given in slowly increasing doses so that as much as 2 ounces of

solution of arsenous acid (U.S.P.) twice daily may be given cattle and horses, unless catarrh and edema about the eyes and indigestion are induced. The dose at first should be about $\frac{1}{2}$ ounce of Fowler's solution, or solution of arsenous acid—twice daily—and increased to the above and, after a week or two, diminished again. Either solution is readily taken on the food.

Progressively severe forms of anemia tending to become fatal are sometimes classed as pernicious anemia—as those due to intestinal parasites—but we have considered only that form due to unknown causes as pernicious. In pernicious anemia, diluted hydrochloric acid (H. & C., 3 i-ii) is commonly indicated, as atrophy of the gastric mucous membrane often occurs; it may be combined to advantage with solution of arsenous acid and given in drench, well diluted, after meals. In anemia following disease and hemorrhage, the use of alcohol and bitters to stimulate appetite and digestion is advisable for a week or so before beginning with iron.

In the anemia of rickets in young animals the syrup of ferrous iodide (puppies, 10 to 15 minims) is the best preparation.

In all secondary anemias—and these are the common anemias—the chief desideratum is the discovery and removal so far as possible of the cause. The causal diseases are noted above and the reader is referred to the special headings of these disorders under which their treatment may be found.

INFECTIOUS ANEMIA (Pernicious Anemia, Swamp Fever, Typhoid Fever of Horses, Malaria of Horses*). This is an infectious disease attacking horses, asses and mules and characterized by a progressive, pernicious anemia with remittent fever, weakness, emaciation, polyphagia, and polyuria. It is prevalent in Minnesota, Kansas, Nebraska, Colorado, Wyoming, Montana, North Dakota, Texas and Manitoba.

This disease appears to be enzoötic in certain localities for

* The writer is indebted to John R. Mohler, Amer. Vet. Review, Nov. 1908, and circular 138 U. S. Dep't Agric. for matter pertaining to infectious anemia.

years. It first arises more commonly in summer and early autumn. The disease can be communicated from sick to healthy animals by inoculation of the blood and is due to an unknown but filterable virus. The disorder is not, however, communicated from the sick to the well by proximity. What the infecting organism is, by what channels it enters the body, and by what media it is communicated, are all unknown.

The disease begins suddenly or insidiously and occurs in acute, subacute and chronic forms. An intermittent type is also described, but as intermissions are characteristic of all forms, we omit this. The subacute or chronic forms may at any time become acute and no hard and fast line can be drawn to separate this text-book classification.

The acute form appears insidiously or suddenly. The following symptoms are characteristic: continuous or remittent fever (104° – 107° F.), soft, compressible pulse (60–90), with, however, visible apex beat and palpation on exertion. A systolic murmur at the apex and jugular pulse are often present. Dyspnea on exertion, rapid respiration and great weakness, especially of the hind legs, are seen and the animal has a staggering gait and may fall on turning. Among other symptoms are polyuria, enlarged lymph nodes, edema of dependent parts, pale or yellowish conjunctivae with injected veins and having an oily appearance. Epistaxis and passage of feces streaked with blood are frequent. The disease is usually fatal in five to seven days. Marked blood changes are uncommon in the acute form, but increase of lymphocytes is the rule. In the subacute form the disease is prolonged for weeks or months. The chief peculiarity is the marked remissions during which the temperature is not much elevated and the animal has a voracious appetite and gains in flesh and appears to be recovering or even well. At other times the condition is much as in the acute form with high fever, dyspnea, sweating and weakness. The blood changes become characteristic with the duration of the disease. The red cells are diminished and

may become as low as 1,000,000 per c.m.m.*; hemoglobin by Tallquist's test is always diminished and averages 10 to 85 per cent. in all cases. Lymphocytosis exists, the lymphocytes constituting 40 to 60 per cent. of the white cells, and there is corresponding leucopenia of the polynuclear leucocytes. Megalocytes, microcytes, poikilocytes and occasional erythroblasts are found. The remissions are much longer and marked than in the acute form, but fifty per cent. or more cases are fatal.

The chronic form of infectious anemia with occasional attacks of slight fever, weakness, emaciation, etc., may be hard to separate from other secondary anemias, but the special changes in the blood noted and the occurrence of lymphocytosis will aid the diagnosis. If secondary to intestinal parasites, there will be eosinophilia. The post mortem reveals numerous petechiae on the surface of the large bowels and visceral organs, free bloody fluid in the cavities and engorgement of the spleen and alteration in the bone marrow.

Prognosis.—Reports show that the mortality is 75 per cent. and over, but this may be cut down to 20 per cent., it is said, by treatment.

Treatment.—In the acute form the temperature is lowered by applications of cold water with a hose and by rectal injections.† Animals must be kept at complete rest in the stall and not even removed to supply them with water. Shade is imperative. Fowler's solution should be given in two to three ounce doses daily and continued for two weeks after the subsidence of fever unless symptoms of poisoning ensue. Alcoholic stimulants may be given thrice daily to advantage along with the arsenic. In the chronic form the treatment is much the same;—the arsenic is continued for from four to six weeks and cold ablutions are employed for fever. Segregation of the sick and disinfection of the premises are indicated (p. 282).

Anthrax—Charbon.

Anthrax occurs as an enzoötic, epizoötic or sporadic disease,

* Normally 7,000,000.

† Quinine, 40 gr., acetanilid, ℥ii, with pulv. nux vomica, gr. xxx given four times daily is effective in reducing temperature (Mohler).

due to the *B. anthracis*, which thrives in rich, moist, inundated soils contaminated by the discharges or bodies of anthrax patients, and in warm seasons (September and June) or climates. The anthrax bacillus is a spore-bearing organism and while multiplying by division in the blood, outside of the body the bacilli germinate by spores which live for years, even after drying. The bacilli, especially the spores, gain entrance into animals directly from the infected soils in food and water by the digestive tract; also by the skin through abrasions, the use of infected cleaning utensils, bites of infected insects, and by the lungs through inhalation of infected dust. Cattle, sheep and horses are the chief sufferers; less commonly, goats, pigs, cats, hogs and dogs.

Man is affected with the same forms of disease as cattle, but more often with a local inoculation (malignant pustule or carbuncle). Handlers of hides, hair, wool, tanners, butchers and attendants of sick animals are subject to anthrax, as carriers, wool sorters, mattress-makers.

Symptoms.—These are characterized by rapid fatality (80 to 90 per cent.) due chiefly to the effects of hemorrhagic effusions in the internal organs; to edema and local infection of the skin; and to loss of oxygen (asphyxia, cyanosis) through the enormous growth of the bacilli. Usually numbers of animals are attacked about the same time. The symptoms are often insufficient to afford a positive diagnosis, which is confirmed by autopsy; by inoculation of a sheep, guinea-pig or rabbit under the skin with blood from the liver of a suspected animal; and by finding the specific bacilli in the blood.

The symptoms may be classified into groups, any one of which may predominate singly, or in combination in individual cases. Thus the (1) apoplectic, (2) cerebral, (3) abdominal and (4) thoracic, are recognized as internal forms; while externally (5) carbuncles and edema occur. In addition, a form of carbuncle—as papules and vesicles—appears on the tongue, palate, cheeks, pharynx and larynx.

(1) The apoplectic form is seen in cattle and sheep and causes death almost immediately. The animal staggers and falls, perhaps with spasms and hemorrhage from the various cavities of the body, or is found dead. As commonly seen in horses and cattle the disease lasts from a few hours to a week and there may be intervals of great apparent improvement. High fever and rapid pulse with great weakness amounting almost to paraplegia, occur.

(2) In the cerebral form, there is congestion of the mucous membranes; lachrymation; mania with rushing and thrashing about and running against objects; or stupor, convulsions, insensibility and falling.

(3) In the abdominal form, colic, especially in horses, with tympanites, dysentery and edematous swellings of dependent parts occur, and sometimes prolapse of the rectum.

(4) In the thoracic form, dyspnea is predominant—with hurried abdominal breathing and often bloody discharge from the nostrils—and, in the horse, a hard board-like swelling of the throat and neck with protrusion of the nose; and vesicles and papules in the mouth, dysphagia, salivation and suffocation are observed.

(5) The lesions on the skin may appear with, or independently of, the other symptoms. The carbuncles are circumscribed swellings in the skin—as large as a walnut perhaps—at first hot and tender and, later, cold and insensitive and often gangrenous, with extension to the neighboring lymphatics. Edema occurs as extensive, insensitive, doughy, diffuse, cold swellings. From quarter ill, the swellings of anthrax differ in not crepitating from gas-formation. Carbuncle is not quite so fatal a form as the other varieties of anthrax.

Anthrax occurs in horses when they eat the herbage down close on infected pastures. The bacilli or spores may infect through water, food, inhalation of dust, or through the skin, by abrasion of lips or tongue, or by friction of harness.

Symptoms in Horses.—The temperature is 104°–105° F. The

pulse and breathing are rapid. There are stupor, weakness, chills colic and vertigo. Hot, painful swellings appear on the skin which become cold and painless. It is fatal in most cases in two to four days. The post mortem appearances are the same as in cattle. Rigor mortis quickly passes and decomposition rapidly occurs. Bodies bloat and bloody fluid escapes from the nose, mouth and anus.

Hemorrhages are general in the viscera and the spleen is enlarged some two to three times and soft. Dark, tarry blood is found in the cavities of the peritoneum, pericardium and pleurae. Swellings are seen on the skin and *B. anthracis* occurs in the blood. The mortality varies from 70 to 90 per cent.

Diagnosis.—Texas fever and black leg are most apt to confuse in cattle. In Texas fever the blood is not black and tarry, but thin; the disease is of longer duration; there is bloody urine and fever ticks on the animal. In black leg the swellings are on the shoulder and thigh, not on sides; the swellings crepitate; the blood is not dark nor spleen enlarged.

Treatment.—Prevention is of chief importance. Pasteur made two vaccines. Number one, the weaker, is made by growing bacilli in a current of air at 109° F. for twenty-four hours; number two is prepared in the same manner during twelve days. The weaker, number one, is injected into healthy animals in summer or fall and followed in ten days by the injection of number two. Sick animals may infect a pasture for ten years, but vaccination will permit of pasturage on infected land. Vaccines contain weakened bacilli, but they may regain their original virulence and should not be used in anthrax-free regions, or by the laity.

The method of inoculation requires minute directions, which may be obtained from manufacturers of the vaccines. Less than one per cent. of animals die from vaccination and the mortality has been reduced to about one half of one per cent. in cattle in countries where anthrax is frequent.

Animals should be kept away from pastures which have been

occupied by those suffering from anthrax and from low-lying areas under suspicion; they may be stall-fed. Marshy, infected areas should be drained, and animals should be prevented from drinking any water arising from doubtful sources.

The disposal of discharges and carcasses of animals dead from anthrax is of vital importance. The disease in man is chiefly gotten from the hair, wool and hides and their products, while flesh will communicate anthrax to man and animals if eaten. The discharges, as feces, blood, etc., are teeming with bacilli and bodies should therefore be buried with their hides and hair on and unopened—to avoid discharges—and to the depth of seven feet, as earth-worms have been shown to bring spores to the surface from dead and buried bodies. The graves should be removed from highways and pastures and surrounded by fence. Destruction of carcasses by burning is the best method of disposal, and also of all infected objects. The greatest thoroughness in cleansing, disinfection and whitewashing premises should be observed, remembering that infected dust is a fruitful source of anthrax in man and animals.

Medical treatment is undesirable in animals, because unsuccessful and since attendants can so readily acquire the disease through the slightest skin abrasion, and keeping patients alive may extend the infection. It is well for attendants to wear thick rubber gloves. The use of salts and calomel by the mouth, together with very large doses of antiseptics—as carbolic acid and creolin—internally, have yielded some apparent recoveries in animals. In anthrax carbuncles, immediate incision and application of powdered corrosive sublimate, or the actual cautery, has proven of value in human medicine. In animals this treatment is inadvisable, as it spreads infection. Also the injection of 5 per cent. carbolic solution frequently and in many places about the periphery of carbuncles has cured a series of twenty-eight cases in human practice. Carbolic acid appears to be of most value and to be borne with great safety in enormous doses in anthrax in the human. The injection of

serum of animals immunized with Pasteur's attenuated cultures and also with attenuated cultures themselves has proven curative in man.

Arthritis, Acute Infectious—Acute Articular Rheumatism.

It will be necessary to discriminate between various affections which are classed under the head of acute articular rheumatism, and also to define the latter in order to treat the subject properly. In man and animals there is supposed to be a specific disease caused by a specific organism and having specific clinical features which we recognize as acute articular rheumatism. The fact that several different germs may cause the disease is not improbable. If this is so, then the disease should receive different names according to its etiological organism, as may come to pass. It is now known that many conditions simulating acute articular rheumatism are caused by various specific infections—as in man, by gonorrhoea and scarlet fever; and these are called gonorrhoeal or scarlatinal arthritis accordingly. So again in animals, the commonest form of so-called acute articular rheumatism of cows is due to parturient sepsis and follows in a few weeks or months some septic state due to abortion or parturition. This should be called a parturient septic arthritis. Then among new-born animals, there is an acute suppurative arthritis due to infection of the umbilical cord and occurring soon after birth. In young animals an acute non-suppurative arthritis arises also from other infections, as from enteritis, pneumonia, and from exposure to the infection of epizootic abortion. Rickets is thought to predispose to the latter condition.

True acute articular rheumatism is comparatively rare, when these various specific forms of septic arthritis are eliminated. True articular rheumatism we distinguish by its not being due to any other specific infection, by its not being a suppurative arthritis, and by the following positive characteristics:—It is a febrile disease coming on suddenly and attacking several large joints, either

simultaneously or more frequently in turn. In addition to the hot, tender and swollen joints, there are apt to be complications—as pleuritis, pneumonia, endocarditis, peritonitis and sometimes laryngitis. A subacute and chronic course oftens follows, with continued lameness and deformity of the joints, atrophy of the muscles, and loss of condition. Acute articular rheumatism affects cattle, dogs, horses, pigs and goats.

Treatment.—Salicylic acid in some form relieves the pain and fever, and alkalis are thought to prevent endocarditis. Sodium salicylate may be given in ounce doses to the larger animals in solution thrice daily with an equal amount of potassium or sodium bicarbonate. To dogs, the sodium salicylate may be administered in tablets or capsules (gr. x to xl thrice daily). Or in the following prescription: ℞ Sodii salicylatis, potassii bicarbonatis, aa ℥v; aquæ gaultheriæ, ad ℥viii; sig. 1 to 3 teaspoonfuls thrice daily in water. When the salicylates cause anorexia, nausea or vomiting in dogs, salol and phenacetin may be prescribed in capsule, of each gr. v-x thrice daily, or aspirin in doses of 10 grs. given in the same manner, is an excellent substitute.

Local treatment consists in the application of methyl salicylate to the joints and covering them with absorbent cotton and bandage, or in the use of cloths soaked in a hot saturated solution of epsom salts and covered with waterproof protective and bandage. In the later subacute and chronic stages, a combination of equal parts of sodium salicylate and iodide is beneficial, given in solution thrice daily (large patients, of each ℥ss; dogs, gr. x of each in solution or capsule). Iodine ointment rubbed into the joints and blistering or firing are useful in the chronic form. Rest, warmth, and liquid diet are indicated at the beginning; milk for dogs and gruels or mashes for large animals. In the later stages, codliver oil, iron, arsenic, bitters and good feeding.

ACUTE SUPPURATIVE ARTHRITIS OF THE NEW-BORN.—This is a very fatal disorder of foals and calves when arising, as it

generally does, from infection of the umbilical cord (75 to 90 per cent. mortality). Heat, tenderness and swelling suddenly appear in certain joints—within a few weeks of birth—accompanied by fever, thirst and loss of appetite. Abscess formation in the joints and pyemia, endocarditis, pneumonia, pleurisy and enteritis often ensue.

Treatment.—The treatment is chiefly prophylactic. This consists in cleanliness as to stable—clean bedding and removal of urine and manure—but particularly as to the umbilical cord. This should be ligated with boiled string about two inches from the belly. The stump should be trimmed with boiled scissors, washed with 2 per cent. lysol, or other antiseptic solution, covered with absorbent cotton and oil silk held in place by a bandage about the body. The stump will separate in five days or more, and 10 per cent. boric ointment may be kept upon the umbilicus while it is raw. In place of such elaborate care, thorough washing of the umbilical cord and cicatrix daily, the use of boric ointment, or even of tar, will usually suffice. In the treatment of the disease itself, attention must still be directed toward cleansing of the navel with antiseptic solutions and application of antiseptic ointments or powders. Aspiration of pus from the joints and supporting treatment of milk, alcohol, eggs, etc., are also indicated. In some cases the joints do not suppurate and the animal improves. In such cases the treatment recommended for acute articular rheumatism may be undertaken, but it is rarely economically advisable, as recovery is apt to be very slow and incomplete.

PARTURIENT SEPTIC ARTHRITIS OF COWS.—This follows, within a few weeks or months, sepsis due to abortion or parturition. Enlargement and tenderness of one or more of the joints—especially the stifle—with difficulty in rising and lameness, occur. A chronic deformity and disability of the joint ensues, with ankylosis and wasting of the muscles. In the beginning, treatment as advised for acute articular rheumatism should be employed. Aseptic aspiration of the joints followed by firing and blistering are indicated

in the chronic form. If destruction and disability of the joints are marked, the patient had best be killed for meat or fattened for the same purpose. If any symptoms of metritis or septic condition of the birth-canal remains, antiseptic douches and treatment recommended under Metritis (p. 169) should be given.

Arthritis, Traumatic. See **Open Joints** (p. 277).

Ascites.

Ascites, or a collection of free fluid in the peritoneal cavity, is merely a symptom of various conditions: of chronic peritonitis, chronic pericarditis, gestation, of cardiac, renal, lung or liver disease, or pressure on the portal vein from any source, with congestion of the portal system and exudation. It is secondary to exhaustive diseases (hydremia), as uncinariasis in dogs and liver rot in sheep, and anemia in old animals. There is a gradually enlarging, pendulous belly, fluctuation on palpation, dulness in the dependent part of the belly, a wave felt on one side of the belly on striking the opposite side, movable dulness (as the position of the belly shifts) on percussion, edema of the sheath (male) and limbs, weakness, and general failure of condition. Examination per vagina and rectum rules out distended bladder, pregnancy and intra-abdominal growths (ovarian cysts) to some extent. Obesity, and a stomach distended with fluid, must be eliminated.

Treatment.—If it is impossible to determine the cause the condition is treated symptomatically. Restrict fluids. To dogs, give compound jalap powder (5ss-i) in capsules three times daily to produce catharsis and diuresis. Puncture the belly (dogs) a little posterior to the navel (after emptying the bladder) with a trocar under aseptic precautions, if there is dyspnea.

Young dogs are sometimes cured by thus removing the fluid. Bandaging the belly should be done immediately the fluid is withdrawn, to prevent filling of the abdominal veins and shock. In the

horse, cathartics and diuretics—Epsom salts (ʒiv) in very little water in the morning and the following as a diuretic: ℞ fluidextract of digitalis, ʒss; oil of juniper, ʒi; spirit of nitrous ether; ʒii in one-half pint of water thrice daily.

Cattle may be punctured on the right side midway between the navel and loose skin in front of the stifle. If gestation is the associated cause, and the ascites is slight, recovery will occur with good care and feeding. To cattle a tonic powder consisting of equal parts ferri carb., potass. nitrat., and pulv. gentian. may be given in tablespoonful doses t. i. d. on the food—together with one-half pound of sodium sulph., and ʒi each of molasses and ginger, night and morning. Too much catharsis, however, may aggravate the anemia.

Food containing the most nourishment in concentrated form is always advisable, as grains for the larger animals and cooked meat for dogs.

In cases with marked cachexia, slaughter will be best.

Balanitis in the Ox.

This is common from retained smegma, urine and sediment crystallizing from fermentation of the same. Inflammation with the formation of pus and occlusion of sheath by phimosis follow. Distention of the bladder and obstruction of the bowels succeed the blocking of the urinary meatus. Examination of the sheath and per rectum should therefore always be made in complete constipation or urinary retention.

Treatment.—This is surgical. In complete retention perineal section must be done or otherwise the sheath is to be freely incised below and backward in the median line and the sheath thoroughly cleansed with the finger or spoon and 1–5,000 corrosive solution injected forcibly into the sac with a syringe. The daily application of a one per cent. zinc sulphate solution thereafter is indicated.

INJURY TO THE SHEATH AND PENIS OF THE BULL AND OX.—

This is an inflammation of the scrotum and sheath from pressure of the sling in which oxen rest when shod. General symptoms, as fever, loss of rumination and appetite, occur. The animal stands with legs wide apart and urine dribbling from the sheath, which is tremendously swollen and may undergo gangrene and bleb formation.

Treatment.—Prevention is secured by keeping the slings forward of the sheath. A large wet compress of absorbent cotton soaked in a saturated solution of boric acid and covered with rubber cloth and held in place by harness over the patient's loins should be used. Multiple incisions and evacuation of abscess' may be required, together with general surgical cleanliness.

Bites (Snake).

The treatment of snake bite consists in preventing absorption of the poison and in (locally and generally) neutralizing and destroying its toxic effects. To prevent absorption, a ligature should immediately be put about a limb above the bite. The Bier treatment may be employed for thirty-six hours, see p. 278. Instant free excision or actual cautery of the bitten area are also desirable. The subcutaneous injection of chlorinated lime in solution in boiled water, about the bite in several places, is effective in neutralizing the snake poison. 15 grains may be dissolved in 2 ounces of water and this amount may be safely used, even in medium sized dogs. Potassium permanganate in the same strength is used in the same way, but is less valuable.

Internally the best remedy is Calmette's antivenomous serum, obtained from immunized animals, and is effective against the bites of all kinds of snakes and scorpions. It is injected deep in the muscle and is sold in doses of 10 c. c., which is the human dose, but can be used in veterinary medicine, somewhat in proportion to the weight of the animal, although this amount will do no harm to small patients.

Snake poison causes disintegration of the red corpuscles (hemolysis) and structural changes in the medulla with depression of respiration and circulation. To obviate this, large doses of strychnine, together with atropine, may be given. As much as one-sixth grain of strychnine may be administered subcutaneously to a medium-sized dog and repeated till slight muscular stiffness of jaw or neck appear, as the drug is borne wonderfully.

Alcohol should never be given in large amounts, but small and frequent doses quiet the nervous system and, in concentration, stimulate the heart.

Bites of Rabid Animals.

The virus of rabies (as is tetanus) is conveyed by the nerves to the spinal cord and not by the lymph and vascular channels. Therefore absorption is comparatively slow and cauterization is advisable, even as late as twenty-four hours after the bite. The actual cautery, free excision, or cauterization with fuming nitric or other strong mineral acid, should be done in case the human is bitten.

Treatment of the human at one of the Pasteur institutes is then always to be advised as soon as the animal inflicting the bite has been proved rabid by observation, inoculation of rabbits from the medulla of the suspected animal or by pathologic examination (see Rabies). Attenuated virus for treatment is now sent from Pasteur institutes to physicians. Treatment of rabid animals, or of sound animals bitten by rabid patients, is undesirable.

Bites and Stings of Insects.

The free application of aromatic spirit of ammonia to the bite is most useful. Formic acid in the stings of bees, wasps, and ants is the chief poison and is neutralized by alkalis. So that in the absence of aromatic spirit of ammonia, ammonia water or solutions of saleratus (baking soda) may be used. After the neutralization

of the poison the application of moist clay, or antiphlogistine, or cold water dressing, is desirable.

Black Leg—Black Quarter—Quarter Evil of Cattle.

Black leg attacks calves from the age of three months to two years. Animals become inoculated through the skin by means of the specific bacteria (*B. chauvoei*) in abrasions produced by thorns, briars, barb wire, spines, etc. For this reason thin-skinned, grade or pure-bred animals are those chiefly affected. The disease attacks animals at different times according to the locality, and the season at which the disease may be expected is well known by the cattlemen in any region. Lack of exercise predisposes, so that in the spring and fall, when feed is good, the disorder is apt to be more prevalent.

Symptoms.—The characteristic swellings may appear in any part of the body except on the tail or below the knee or hock. The regions of the thigh and shoulder are commonly attacked; also the neck, chest, flank and rump. The swellings rapidly increase in number and may coalesce. They give a crackling sensation on pressure and are cool and without tenderness in the center. If opened in the center there is no pain and a frothy discharge of bloody serum exudes. The temperature is high (107° F.), respiration rapid (140), rumination ceases, and the animal lies down and suffers from trembling or convulsions and has cold extremities. Black leg commonly ends fatally within twelve to thirty-six hours.

Autopsy shows that the subcutaneous tissue of the tumors is distended with gas and that there is a black area of gangrene in the centre of the swelling; hence the name black leg, owing to the color seen on removing the skin. The muscle in the tumor area has the appearance of lung, so filled is it with small gas infiltrations, and exudes a serous, bloody fluid when cut. Black leg may be distinguished from anthrax in that the spleen is not enlarged nor is the blood thick and tarry as in anthrax.

Malignant edema may closely simulate it but is associated with

wounds, and if virus from the affected area is injected into rabbits these animals will succumb to malignant edema but not to black leg.

Hemorrhagic septicemia also resembles black leg, but the former attacks cattle of all ages and affects the throat, neck and dewlap, while the swellings do not contain gas and are associated with hemorrhages throughout the body.

Treatment.—Curative treatment is of little service and by the use of incisions an exit for the escape of myriads of bacilli is afforded. The spores remain virulent in the soil for some years. The dead bodies should be burned or buried six feet deep in quicklime, and the surfaces contaminated with infection should be thoroughly disinfected. The burning of pastures in winter will destroy the infection. After a case has occurred removal of the herd to new pastures may hinder the spread of the disease. Prevention is very successfully secured by inoculation of calves from four months to two years with virus attenuated by heat. This is made by pounding up some affected muscle in a mortar with water and straining the pulp through cloth. If dried at 35° C. the bacilli remain virulent for two years. Then when desired for use the dried virus is mixed with two parts of water and dried in thin layers on glass for seven hours at 90° to 94° C., when it occurs as a brown powder; gm. .01 is a dose for a calf. Vaccination is usually done after the calf is six months old, but if younger calves are subject to the disease, it may be done at an earlier age and a second vaccination performed in the second year. After the age of six months only one vaccination is required to protect during life. Immunity begins in ten to twelve days after vaccination.

Vaccination is done by mixing the powder in water in a mortar, filtering it and injecting it with a hypodermic syringe in the side of the neck in front of the shoulder. The vaccine is given away by the Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, Washington D. C., to stock owners, and it and directions for using the same may be procured by writing to this ad-

dress. The loss from vaccination is about one-half of 1 per cent., while that from black leg is about 10 per cent. of deaths from all other diseases in calves. No operation should be performed before or until two weeks after vaccination—as spaying, branding, castrating or dehorning.

Vaccination is done two to three weeks before the prevalent black leg season begins. Pregnant animals must not be vaccinated within one month of parturition.

Boils—Furuncles.

A boil is an acute circumscribed inflammation about a skin gland or hair follicle. It is caused by the entrance of pus-forming cocci from (usually) without, due to pressure, friction and scratching, and so occurs in chafing—as by harness—and in skin diseases, as eczema and mange. Conditions of debility associated with anemia appear to favor the occurrence and continuance of boils. Boils may be aborted by shaving the hair from them and touching them with pure carbolic acid or painting them with 20 per cent. solution of silver nitrate, or with tincture of iodine, or repeated coats of collodion. Also by the injection of a few drops of 2 per cent. carbolic acid solution. If abortion of the boil is unsuccessful, a toothpick dipped in carbolic acid may be thrust into the central opening or, if this is not easy, the boil may be punctured with a scalpel dipped in pure carbolic. Afterward an ointment containing carbolic acid—as carbolized vaseline—or pure iodoform may be employed to dress the remaining ulcer.

Cauterizing it with silver nitrate stick and dressing with peruvian balsam and creolin (1-10, Friedberger) is also remedial. Poultices are not advisable, as they favor the occurrence of a crop of boils by spreading the infection.

Many internal remedies have been recommended, as calcium sulphide (D., gr. $\frac{1}{4}$ - $\frac{1}{2}$; H., gr. xx-xxx three times daily), sodium sulphite (H., $\frac{3}{4}$ ss-i; D., gr. xv-xx three daily), and ordinary

yeast—a whole of one of Fleishman's yeast cakes in pills daily for a dog; but their usefulness is somewhat doubtful. Iron and bitters are of advantage in anemia. Care must be taken to prevent chafing of the skin by dirty objects and especially so to avoid rubbing pus into the skin to start up a new crop of boils.

Bots in Horses.

Bots are the larvæ of the common horse fly (*Gastus equi*) and of several allied species. The eggs are laid on the hair of the horse's body by the fly in summer and are licked off by the horse and the resulting larvæ find lodgment in the stomach and pharynx by burrowing into the mucosa. The larvæ rarely do harm in these locations, but sometimes wander into the brain, peritoneum, etc., with fatal results. A positive diagnosis of bots can not be made unless the larvæ can be found in the feces in which they naturally escape in the spring of the year. Colic may be produced by bots.

Treatment.—The treatment consists in the use of carbon disulphide in capsules; ℥ii at hour intervals for three doses, followed in twelve hours by a pint of linseed oil.

Broken or Wounded Knees in The Horse.

A horse may stumble and wound his knees from many causes; bad shoeing, carelessness on the part of the rider or driver, megrims, speedy cut, etc., are among them. A lasting blemish detracts from the value of the horse on account of the suspicion attaching to its causation. For this reason great care should be used in the treatment.

Treatment.—When there is merely an abrasion of the skin, the animal should have its head tied up for a few days, to prevent the patient from lying down, and a compress wet continually with white lotion may be applied (℞ Plumbi acetatis, ℥iii; zinci sulphatis ℥iii; aquæ, Oi. M. Sig. Apply externally after shaking).

When the skin is cut, clip off all the hair and sterilize the part by painting the wound and surrounding skin with tincture of iodine.

Irrigate the wound most thoroughly with corrosive sublimate (1 to 1,000), or lysol (2 per cent.) solution if it contains foreign bodies (otherwise do not irrigate), suture the wound with boiled silk or silkworm gut and cover with iodoform gauze. The limb must be then splintered from the forearm to fetlock with three padded wooden splints, and the splints fastened about the limb by adhesive plaster, or by straps of webbing, and the whole covered with a bandage.

If signs of infection and suppuration ensue (as increase in temperature and swelling), the dressing and stitches must be removed and the wound thoroughly irrigated as above, and a wet antiseptic dressing should be applied for a few days (sterile gauze wet with 2 per cent. lysol solution and covered with rubber or oil silk, bandage and splints). As the inflammation subsides and swelling and acute symptoms abate, then Peruvian balsam and a dressing of dry sterile gauze are indicated.

If the sheath of the extensor tendon is opened, the tendon exposed, or the joint penetrated, place the animal in slings and apply wet antiseptic dressings and splints, as above, until the more acute condition passes, when the wound may be treated with frequent irrigation of lysol or corrosive solution, drained, and dressed with dry iodoform gauze, bandage and splints.

Opening of the carpo-metacarpal articulation renders recovery more probable than if other divisions of the knee-joint are penetrated.

Otherwise, when the tendon is much lacerated, or the joint opened, or when there is fracture of one of the bones entering into the joint, there is little probability of securing a useful and supple joint, and slaughter may be indicated. In severe cases of broken knee, the Bier treatment should be tried (p. 278).

Broken Wind (Asthma, Emphysema).

Broken Wind in veterinary parlance is used in rather a loose

way to include chronic dyspnea in horses, dogs, cattle and other animals arising from various causes. In this sense it is merely a symptom of chronic heart lesions, emphysema and chronic bronchitis, obstructive lesions in the upper air passages, paralysis of the left recurrent laryngeal nerve, chronic renal disease, etc. It is often confused with asthma, but this term should be limited to a distinct functional nervous disorder (neurosis) appearing in severe attacks of intense dyspnea—often when the patient is asleep or at rest—with prolonged, labored, wheezy expiration, small pulse and cold extremities. When suffocation seems imminent the fit passes away, often with cough. In the intervals respiration is apt to be somewhat difficult and wheezy. Such is true of bronchial asthma and this is rarely seen in the larger animals, but occasionally in dogs. True asthma is due either to spasm or sudden swelling and congestion of the bronchioles—very likely to both. It is induced by irritation of a medullary center through afferent impulses conveyed from the bronchi (irritation by dust, etc.), from the stomach and intestines (indigestion), from the nose (dust, smoke, irritation and obstruction by polypi, hypertrophic conditions, etc.), ear and genital organs. Persistent asthmatic attacks lead to distension of the pulmonary alveoli and emphysema, with disturbance of circulation in the lungs, and therefore chronic bronchitis. In the horse, overexertion after a time not infrequently causes emphysema and emphysema commonly occurs in the horse in broken wind. It is difficult to know, then, whether broken wind in the horse is caused by emphysema or is of a neurotic origin from indigestion, or both. Broken wind is, however, often induced in horses by overloading of the digestive organs with poor, coarse hay, and the dust of hay (as in man) may also incite it through irritation of the nasal or bronchial mucous membrane. This form of broken wind is therefore akin to asthma and due to irritation of the vagus endings in the stomach. Dyspnea is more frequent in these cases after eating

and horses suffer from flatulence, pot-belly, ill condition and rough staring coat.

Treatment.—Treatment of horses in these latter cases should be largely dietetic. Give water in moderation between meals and never before hard or fast work, while the food should be concentrated and laxative. Mashings of bran or oats, on which are placed 3 to 4 ounces of carron oil, together with a small amount of moistened hay, form a suitable ration. By this means we give an easily digestible diet, avoid flatulence and pressure on the diaphragm, and, by limiting water, lessen the vascular contents and load on the heart.

Arsenic (acidum arsenosum, gr. v; or liquor acidi arsenosi, ℥i; thrice daily on the food for a long period) is of most value and improves the condition of the nervous system and blood. Iron is also indicated with anemia (℥i-ii of the reduced iron, or ferrous sulphate), and bitters (nux vomica, gentian), if the appetite is poor.

In the horse, broken wind from any cause is commonly evidenced by persistent, rapid breathing after speedy or violent work, together with difficulty in breathing, as shown by a prolonged and double expiratory movement. Sometimes there may be râles in the chest, significant of true asthma or bronchitis, and sometimes increased resonance or percussion from emphysema, and sometimes no abnormal signs whatever. Treatment must be based on the etiology and when the broken wind is not a symptom of some of the lesions noted above, the treatment recommended for the form due to indigestion should be tried. The same treatment applies in emphysema. If the heart is at fault, as shown by cardiac murmurs, etc., treatment should be given directed to that source (see p. 106), as a mixture of tincture of digitalis and strophanthus, of each 2 drams, with spirit of nitroglycerin, ℥xx, given three times daily.

If chronic bronchitis predominates, remedies advised for that

trouble (p. 39) should be given. Other lesions should likewise be attacked according to their nature.

True bronchial asthma of dogs, occurring in definite attacks as a neurosis, described above, must receive treatment which shall have three objects: (1) To remove attack; (2) to allay the severity of the attack; (3) to prevent or lessen the severity of the attacks. Prophylaxis must be directed to the causes already mentioned. During the attack, relief is secured by a variety of drugs, as inhalation of chloroform or amyl nitrite (℥iii-v), injection of morphine sulphate (gr. $\frac{1}{4}$ - $\frac{1}{3}$), with atropine sulphate (gr. 1-150-gr. 1-100), or the use of chloral hydrate (gr. x-xv) with sodium bromide in twice this amount in solution, for dogs. For horses, any one of the same agents is indicated, or spirit of chloroform, ℥i, in ℥ii of whiskey.

Following an attack treatment should be directed toward cure of the trouble. The iodides and belladonna are the two most useful drugs. Thus, to dogs, potassium iodide (gr. x) may be given in solution with tincture of belladonna (℥x) thrice daily. Horses will receive 2 drams of the iodide with 1 dram of fluid extract of belladonna. The addition of potassium bromide (gr. x to xv) to the iodide mixture is sometimes serviceable in dogs. Inhalations are of value.

During an attack the fumes of burning stramonium leaves and saltpetre may avert the seizure. Inhalations as recommended for bronchitis (see p. 38) are also of great value. Tonics, especially to the nervous system, as arsenic, may be of worth, and fats or oil in conditions of inanition. Dust is to be avoided and a digestible and concentrated diet with moderate exercise are desirable.

Bronchitis.

This affection is common in horses; less so in dogs and cattle. It is characterized by cough; more or less fever (sometimes absent),

and acceleration of the pulse and breathing. Examination of the chest shows sibillant and rhonchus râles, followed by moist sounds. Absence of dulness on percussion and blowing breathing on auscultation distinguish it from pneumonia. Prevention is accomplished as in coryza (see p. 65).

Bronchitis usually follows coryza by extension and is due to the same causes; also to poor ventilation, as during transportation of animals, and to irritants in air, as dust and smoke. It is symptomatic of many special infections, as influenza, distemper, etc., and may arise from ingesta of vomitus being drawn into the trachea.

Treatment.—The treatment consists generally in attention to hygiene, and in shortening the attack and relieving symptoms. It is possible that a full dose of opium may abort the disorder (H., pulvis opii ʒi; D., liquid Dover's powder ℥x) when given at the onset, if, at the same time, the equine patient is covered with a hot blanket, rubber sheet and dry blanket, and the limbs are rubbed with mustard paste and bandaged. The retention of a wet pack about the chest and bandaging of the limbs, as above, is useful throughout the attack. The food should be laxative (H., bran mashes, roots, grass) and the bowels moved by oil or enema, and there must be plenty of fresh air, which is aided by the use of a box-stall. In the first stage, secretion should be promoted; give inhalations of sodium bicarbonate (ʒ ss to the pint of boiling water or lime water) three times daily. At this time, if there is much fever, the following prescription may be employed:

R	Horse	Dog
Tincturae aconitae	ʒiii	℥xxx
Spiritus aetheris nitrosi	ʒvi	ʒi
Potassii citratis	ʒiii	ʒi
Liq. ammonii acetatis ad	ʒxii	ʒii

M.

Sig. 4 tablespoonfuls to horse; 1 teaspoonful for dog, thrice daily.

In the dog, syrup of ipecac, ℥ x-xx, may be given every three hours in a teaspoonful of syrup of squill; or ammonium chloride (D., gr. v; H., ℥ii) dissolved in chloroform water (H., ℥i; D., ℥i), to increase secretion.

When secretion is excessive in the dog, leading to dyspnea and suffocation, it is well to give a tablespoonful of syrup of ipecac to cause emesis. In the horse, inhalations containing $\frac{1}{2}$ dram of turpentine to the pint of water, are serviceable in thinning and lessening secretion. With excessive or viscid secretion, terpin hydrate (D., gr. ii) may be given in capsules and combined with codeine (D., gr. $\frac{1}{8}$ to $\frac{1}{2}$) if cough is annoying. Cough is also allayed by chloral hydrate (D., gr. v) in solution, which is less objectionable than opium preparations. If cough is persistent and the lungs do not clear, it is well to prescribe sodium iodide (H., ℥i, very expensive; D., gr. x) in solution thrice daily.

In the horse, drugs (expectorants) do not influence the bronchial secretions as much as is desirable and inhalations and external application of hot, wet packs, frequently changed in severe cases, are more useful.

Tincture of belladonna (D., ℥ v-x; H., ℥ss) and nux vomica (D., tincture, ℥ x-xx; H., fluid extract, ℥i) are also valuable agents in excessive secretion and may be combined to advantage.

CHRONIC BRONCHITIS.—This disease may occur in all animals, following the acute form, but is also a frequent accompaniment of chronic lung disorders (emphysema, asthma, chronic pneumonia, pleuritic adhesions, tuberculosis) and of chronic heart and kidney lesions. With emphysema and asthma it is one of the factors in “broken wind” of horses.

Symptoms.—Cough, with the presence of dry or moist râles in the chest and difficult and hurried breathing, are the chief signs and symptoms.

Treatment.—Treatment depends upon the symptoms and cause. In a general way many of the same measures are useful which were

recommended in acute bronchitis. When secretion is viscid and scanty, and cough is dry, inhalations containing sodium bicarbonate are indicated; with much secretion, turpentine inhalations are in order. To increase secretion, the ammonium compounds or sodium iodide are serviceable. For the horse, a ball containing 2 drams each of ammonium carbonate and chloride and 1 dram of powdered nux vomica may be given twice daily. Also sodium bicarbonate and chloride (of each an ounce) on the feed thrice daily will tend to increase bronchial secretion.

To diminish secretion, oil of turpentine should be given (H., ℥iv in a pint of milk; D., emulsion of oil of turpentine, U. S. P., ℥i thrice daily). Creosote (H., ℥i) may be also administered in milk; to dogs in capsule (℥ii-v), and is often very efficient in chronic bronchitis.

When there is evidence of heart weakness, stimulants, as strychnine and digitalis, are required. The fluidextracts of digitalis and nux vomica (of each, 1 dram) may be dropped on the tongue thrice daily, in the case of horses.

In young and debilitated patients the use of oil or fat in some form is desirable, as cream, olive oil, or cod-liver oil.

Cold and damp is especially unfavorable, and therefore the housing should be dry, warm, and well ventilated.

VERMINOUS BRONCHITIS (HOOSE HUSK).—This affection is seen frequently in lambs and calves and is due to *Strongylus filaria* (lambs) and *S. micrurus* in calves. The parasites gain entrance in the water and food and are found in wet pastures and wet seasons. The disease is often enzoötic and can be prevented only by the avoidance of wet pastures in spring and by the destruction (by burning) of lungs infested with strongyli.

Symptoms.—The symptoms are those of chronic bronchitis, with coughing, choking, slobbering, dyspnea and weakness, with coughing up of worms.

Treatment.—The treatment is not very satisfactory and there-

fore many remedies have been used by the mouth, by inhalation, by the nostrils and intratracheally, with more or less success. Thus to lambs, 10 minims of diluted hydrocyanic acid twice daily; or oil of turpentine (℥i), or creosote (℥ x), or equal parts of tincture of camphor and oil of turpentine, in milk or gruel, may be given once daily; or a mixture of creosote, ℥ii; benzine, ℥i; water, 2 quarts, may be given once daily in teaspoonful doses for a week (Moussu). These remedies may kill the parasites by elimination in the lungs. Lambs are said to be cured by inhalation of the fumes of equal parts of tar, sulphur and turpentine from a kettle over a fire in an air-tight-house, during twenty-five minutes for three treatments.

One of the simplest and most satisfactory methods consists in pouring 2 drams of ether and oil of turpentine (either alone or in combination) in each nostril of a calf, with the head upturned, for one or more treatments (Read).

Intratracheal injection of oil of turpentine, ℥ii; carbolic acid, ℥ xx, and chloroform, ℥ss, has also proved of value in calves (Penhale).

Generous feeding with iron and bitters (gentian) are essential. Slaughter of severe cases is often advisable.

Burns and Scalds.

Burns are commonly divided into three classes:—1st degree, when superficial and erythematous; 2nd degree, with vesiculation and blebs; 3rd degree, with deep destruction of the skin and underlying parts.

In burns of the first degree the application of carron oil (equal parts of lime water and raw linseed oil) or, in place of this, flour, starch or saleratus thickly sprinkled over the surface, will protect the skin and afford relief. In burns of the 2nd degree a one per cent. solution of picric acid in water is the best dressing. Sterile gauze is soaked in this solution and laid over the burn and covered

with a thick dressing of absorbent cotton and bandage. After three days the absorbent cotton is removed, the gauze moistened with picric acid solution and removed, and a fresh application of gauze soaked in picric acid solution and absorbent cotton is made. This latter dressing may be left for a week. The vesicles should be pricked before the use of the above remedy. Among other agents of value in burns are vaseline containing ten per cent. boric acid, or carron oil containing 1 dram of phenol to the pint, spread on sterile gauze. The boric vaseline is absolutely harmless, while the carbolic acid, if licked off, might cause poisoning.

Burns of the third degree are treated like any similar wounds. To promote sloughing, wet dressing of saturated aqueous solutions of boric acid may be continuously applied, being covered with some waterproof protective, as oil silk, and kept in place by bandaging. Dead tissue should be removed by the scissors or knife. Granulations are stimulated by applications of equal parts of castor oil and Peruvian balsam, and by stick lunar caustic. The severe burns are so slow of recovery and so often result in contractures and deformity, that the cost of treatment may be too great.

Shock is marked in severe burns. Warmth, stimulation with alcohol and strychnine, and the use of opium, are then indicated.

In burns produced by the mineral acids, chalk or saleratus are the antidotes; while in those caused by the caustic alkalies, as lime, vinegar may be applied. In burns of the eye the hourly instillation of boric acid in camphor water (gr. x to ʒi), and the instillation of albolene several times daily, while the patient is kept in the dark, are remedial.

Bursitis, Acute and Chronic (Hygroma or Hygrops)—Capped Hock, Elbow and Knees—Poll Evil—Navicular Disease, etc.

Bursitis is an inflammation of the serous or synovial sacs, or bursae, lying beneath the skin or under tendons or ligaments at exposed points. The acute form is commonly due to pressure,

blows or kicks, and is a hot, tender, circumscribed swelling, usually fluctuating, and often coming on in a night. Its location corresponds to the seat of a bursa. The content is serum or blood. A dry inflammation, with crepitation of the swelling, may exist. Septic bursitis with suppuration arises from injury, often with abrasion and puncture of the bursa, and is accompanied by marked tenderness and swelling and perhaps fever. It does not tend to subside and aseptic aspiration with a hypodermic syringe may solve the diagnosis. Finally, tuberculous bursitis occurs in cattle, commonly of the subcutaneous bursa over the knee. It may reach great size and consist largely of fibrous tissue. Caseous matter, floating, fibrous bodies, and gelatinous matter are also seen in these.

Chronic bursitis (hygroma, hygrops) is common and is due to frequent attacks of the acute form and constant irritation and pressure. Fluctuating or semi-solid, painless, circumscribed swellings with indurated walls are seen at bursal sites.

The common sites of bursitis are as follows: At the point of the elbow (capped elbow), at the point of the hock (capped hock), between the ligamentum nuchae and atlas (in puppies), between the ligamentum nuchae and 2nd cervical vertebra (poll evil), on either side of the withers (terminating often in fistulous withers). Also over the tuberosities of the ischia, external angle of ilium, the trochanter, the stifle, fetlock, metacarpus, and knee. One of the most important forms is bursitis podotrochlearis, or inflammation of the bursa between the perforans tendon and under surface of the navicular bone in the fore feet. This eventuates in navicular disease, *i. e.*, in erosion of the navicular cartilage, in rarefying osteitis, laceration of the tendon and even fracture of the bone accompanied by incurable lameness and contracted feet.

Prevention.—The avoidance of injury to bursæ will prevent the occurrence of bursitis. In the case of shoe ball or capped elbow the horse must be prevented from lying with the heel of the shoe upon this part. This may be accomplished by affording a roomy

or box stall, by providing shoes with short heels, by placing a boot about the hoof or large stuffed ring above the foot about the limb. Capped hock is caused by the animal striking the hock in kicking and also by lack of bedding. Padding the stall or hobbling the hind limbs together may prevent further damage. So also an abundance of bedding may prevent capped knees, but often the animal has the habit of pawing the bedding away. A tight over-drawn check and low ceilings cause pressure and blows upon the poll and cause poll evil. Unfortunately, bursitis usually has already occurred before steps are taken to forestall it.

Treatment.—In the acute stage of serous bursitis the treatment is the same in whatever site it may be found. Rest of the part and the application of heat by fomentations, or, better, continuously by the use of wet antiseptic dressings (two per cent. creolin), covered with rubber or waterproof material and bandage, when possible. Cold is equally efficient, as by the employment of continuous irrigation, or ice poultices—difficult to keep in place in veterinary practice. Astringent preparations, as white lotion (lead acetate and zinc sulphate, each ℥iii to ℥i) on gauze kept continuously wet with the same, are also of value. The application of high heeled shoes on the hind limb is of benefit in capped hock. Pressure by bandage is of service, when it can be applied, as in capped knee. For the same reason, collodion may be painted on the shaved part. After the acute stage has departed counter-irritants are in order. The ointment of red mercuric iodide (1 to 8) or Churchill's tincture of iodine may be applied every other day till the part becomes a little sore. The action of the following preparation is highly commended: Norway tar and green soap, each 4.5 parts; and tannic acid, 1 part; the mixture being stirred and painted on the swelling daily until recovery occurs, without regard to the desquamation of the skin it causes.

In suppurating bursitis the sac should be opened at the earliest possible moment, to prevent extension of the infection and burrow-

ing of pus, the formation of pockets and destruction of neighboring parts, as happens in poll evil, fistulous withers, and puncture of the bursa in the hoof under the perforans tendon. The skin should be shaven, made aseptic, and incised freely at a dependent part. Then light curettage, packing with aseptic gauze soaked in hydrogen dioxide, and the application of an aseptic dressing wet with two per cent. creolin solution should be kept constantly over the wound, where possible. Frequent irrigations with two per cent. creolin are also indicated.

In most cases chronic bursitis or hygroma gives rise to a painless cystic or chiefly fibrous tumor which does not cause lameness and is objectionable only in being a blemish. However, on account of its size or because it is continually subject to acute exacerbations and becomes infected and sloughing, or because of its unsightly appearance, one may be called upon to treat it. There is some danger, however, in operative interference and it should not be attempted unless it can be done in the most cleanly manner. When a bursa connects with a joint or is deep, as in the bursa under the perforans at the point of the hock, there is much greater danger. Firing and blistering are not of service. Aspiration of the bursa and injection of an aseptic irritant, or incision, curettage, packing and drainage, are the best measures in cystic chronic bursitis, and excision of the whole mass in indurated chronic bursitis, where the fibrous tumor is chiefly due to peribursitis through constant proliferation of connective tissue.

In aspiration the strictest aseptic precautions must be observed. The animal is cast, the part shaved for a large area, scrubbed thoroughly with green soap and water and Harrington's solution (see *Wounds*, p. 273), or painted with tincture of iodine. The boiled needle of a hypodermic syringe is then plunged into the sac. This is permitted to remain while aspiration is done. Aspiration is conducted with a Potain or Dieulafoy aspirator. Now 95 per cent carbolic acid (μ_x to μ_{xxx}) or tincture of iodine (3i) are injected

into the sac by means of a hypodermic syringe connected with the needle which has been previously inserted. The sac must be manipulated so that the injection will come in contact with all parts of it. Collodion is employed to seal the puncture of the aspirator needle. Considerable local inflammation will follow and is relieved by the use of a wet dressing (2 per cent. creolin) kept constantly on the part. Absolute rest for some time must be enforced. If this treatment prove unsuccessful, or in any case, incision of the cyst, thorough curettage, packing of the cavity with aseptic gauze soaked in hydrogen dioxide, and the external application of a dressing wet with 2 per cent. creolin solution may be done. The wet dressing should be employed during the healing process. The actual cautery may be used to open and destroy the wall of the cyst, but is not to be preferred to knife and curette. Complete excision of the mass with the bursa is the only remedy for a greatly indurated bursal mass. First intention is, however, very hard to secure. (See also Tenosynovitis, p. 244.)

When the fibrous enlargement has a distinct pedicle then elastic ligature may be employed, as in shoe ball in some cases. If the ligature has a tendency to slip it may be held in place by a transfixion pin or suture. Excision is, however, more rapid and precise.

Navicular disease is treated by the application of cold swabs kept constantly wet about the coronet of the affected foot or feet, by the use of poultices, or by causing the animal to stand in warm water. Later, blister of the coronet and the use of shoes thick at the heels and thin at the toe and the employment of rubber pads may relieve the lameness. Neurectomy above the fetlock is the last resort.

Tuberculous bursitis can not be cured except by complete excision, but this is rarely worth while in cattle.

Inflammation of bursae under the flexor brachii in the bicipital groove; and at the external tuberosity of the humerus

under the infraspinatus; and at the convexity of the trochanter under the large gluteus, are considered under *Tenosynovitis*.

Calculus.

(See *Urinary Retention*, p. 261.)

Canker of the Ear in the Dog.

I. INTERNAL CANKER, OTORRHEA, OTITIS EXTERNA DIFFUSA.—The diffuse form of inflammation of the external auditory canal is exhibited by a purulent or bloody discharge from the ear and swelling of the canal. The inflammation may extend to the internal ear (otitis media) and in that case the symptoms are more marked. Ordinarily the dog will rub his ears and head with his paws, or shake the head frequently, and, with involvement of the internal ear, the pain is intense (with fever), and the animal howls and often develops delirium, coma, ending in death. It is usually impossible to inspect the drum on account of swelling of the canal, and therefore it may be difficult to differentiate positively inflammation of the external from that of the internal ear.

Otitis externa is caused by trauma; by dirt lodging in the ear and causing infection through contained fungi and bacteria; by foreign bodies and by water; and it occurs as a sequel to distemper, in the course of catarrhal affections, and as an extension of skin diseases. Lack of exercise and overfeeding predispose.

Treatment.—At the onset it is well to give a brisk purge, as 3 compound cathartic pills for good-sized animals. If there is much pain and swelling of the canal, deep scarifications, after local anesthesia with 10 per cent. cocaine solution, will relieve most quickly. The scarifications are made to the periosteum parallel to the long axis of the canal. Frequent irrigation of the canal with hot, saturated, boric acid solution, by means of a fountain syringe elevated but slightly above the patient, is the simplest and one of the most effective forms of treatment. It is well to wipe out the water with absorbent cotton on a probe, dust a mixture of boric acid and

zinc oxide (equal parts) into the ear, and pack loosely with absorbent cotton after each irrigation. Three per cent. phenol, or 1 to 8,000 corrosive sublimate solution, may be used in place of the boric acid. The diet should be restricted. In mild cases the injection of 50 per cent. aqueous solution of ichthyol is sometimes curative. In the later stages the use of astringent solutions is advisable, as a 2 to 4 per cent. solution of silver nitrate, lead acetate or cupric sulphate once daily. The canal should be wiped dry and the boric acid and zinc oxide powder blown in. With a tendency to chronicity one should touch the surface of the canal with stick lunar caustic, after local anesthesia with powdered cocaine. In severe cases the inflammation may lead to caries of the bony canal, when curettement is indicated under general anesthesia. A pill of iron and arsenic (modified Blaud's pill, each gr. v) often assists recovery, when given three times daily for two or three weeks.

2. EXTERNAL CANKER.—This has no pathological connection whatever with internal canker, but is mentioned on account of its similarity of name. It is an abrasion, ulcer, or fissure on the tip of the external ear caused by trauma or shaking the ears in long-eared dogs.

Treatment.—The use of a netted cap over the dog's head, bathing the wound in antiseptic solution, and cauterizing it with lunar caustic, or the cutting away of the diseased surface and suture of fissures with fine silver wire, constitute the proper treatment. Cropping the ears is the radical method of cure, if other means fail.

Canker of Feet in Horses.

This condition is probably due to some special organism—possibly one of the fungi. It is characterized by soft, spongy swelling of the frog with fetid, cheesy secretion—going on to destruction of the frog and sole of the foot and the production of fungoid growths.

Treatment.—Treatment consists in casting the animal and removing by the knife or actual cautery all of the diseased horn from the sole of the foot, so as to fully expose the soft parts beneath. Then the exposed tissue is dressed with one or more of the following agents: Salicylic acid; stick silver nitrate; equal parts of alum, or tannic acid, and iodoform; formaldehyde (10 per cent.); creolin, or iodine ointment (5 per cent.); zinc, copper and iron sulphates, of each equal parts, vaseline enough to make a paste, and creolin to make 5 per cent. Then the foot is protected with tow, shoe and leather or iron sole, and dressed daily with one of the agents noted above for a week or more. After that time the dressings may be done less often and applications of tar are made, or calomel. When it is necessary to remove all the sole of the foot, hemorrhage may be prevented by tight bandage about the fetlock, after the animal is up.

If the disease has invaded the sensitive laminae, treatment is hopeless. If the canker spots appear during treatment they must be cut away. In some cases it is well to work the patient after the first few days of treatment.

Cerebral Anemia—Anemia of the Brain.

This is always a secondary disorder due to weakness of the heart (as in ordinary fainting), loss of blood, general anemia, compression of brain from dropsy of ventricles, etc., fright, sudden withdrawal of fluid from chest or belly, or of gas from bowels in tympanites, causing rapid flow of blood to these parts. The common symptoms are sudden unconsciousness with almost or quite imperceptible pulse, dilated pupils, and sometimes twitching of muscles and vomiting.

Treatment.—The head should be kept low and ether (H., ℥ss; D., ℥xxx, undiluted) or aquae ammoniae (H., ℥ii; D., ℥xv, undiluted) should be injected into the muscular tissue to cause rapid stimulation. At the same time strychnine (H., gr. ii; D.,

gr. 1/100 to gr. 1/30) should be given subcutaneously, and repeated every few hours with digitalis, if necessary. Tonics, as iron and arsenic, may be required in anemia, together with generous feeding.

Active delirium and stupor are also thought to result from chronic anemia of the brain with alteration of the composition of the blood, as in chronic nephritis and tuberculosis, but here treatment would not be worth while.

Cerebral Hyperemia and Cerebral Hemorrhage or Apoplexy.

These conditions are considered together as the treatment is quite similar for both. Hyperemia is caused by overexertion and excitement, heat, tympanites, toxins (legumes and rye grass in horses), brain lesions, infections (distemper in dogs), and obstructions of the jugulars by harness, and may occur in all animals. Maniacal excitement with purposeless kicking and biting, injected mucous membranes about the head, contracted pupils and full frequent pulse without fever, usher in the condition, and, if it persists, are followed by stupor, unsteady gait and falling, with unconsciousness. In cerebral hemorrhage, or apoplexy, there are unconsciousness, with hemiplegia or monoplegia, and inability to swallow. It occurs rarely in all the domestic animals and may follow traumatism (meningeal hemorrhage), atheroma, and as a result of infections, toxins and parasites in the brain.

Treatment.—The head should be raised in the unconscious patient and an ice-bag retained over the poll. Bleeding should then be done (H., 4–8 quarts), unless the pulse is small and weak. The limbs should be rubbed with mustard and water and bandaged. Croton oil (℥xxx in a little olive oil may be dropped on the tongue for the large animals; ℥ii for small patients) is an effective purge in conditions where swallowing is difficult. Quiet, darkened quarters are best for the patient. In case swallowing is possible, a laxative diet of green fodder and gruels and mashes is

most suitable for the larger patients. This treatment is indicated for either cerebral hemorrhage or congestion. Recovery from the former is slow and often incomplete, with persisting paresis, so that treatment is rarely advisable. Frequent change of position of the patient is necessary in unconsciousness, and catheterization and enemata. To facilitate resolution of hemorrhage, sodium iodide (H., ℥ss; D., gr. x, thrice daily) and strychnine (H., gr. 1 in solution on tongue; D., gr. 1/100 to gr. 1/30 in pill three times a day) may be given after the first two weeks. Massage and faradism to the muscles also aid recovery in paralyses.

Cholera.

See *Fowl Cholera* (p. 100).

Chorea.

This is a nervous disorder characterized by irregular involuntary movements of voluntary muscles, usually ceasing during sleep. It attacks more often the young, and has been seen in horses, cattle, pigs, cats and dogs, being most frequent in the latter. It is associated often with endocarditis and arthritis, but whether these are primary or secondary diseases is unknown.

Chorea is thought to be due to a special infection, but this is uncertain. Reflex causes, as the presence of intestinal worms, are said to predispose. Anemia often accompanies chorea, and chorea frequently follows canine distemper. Stringhalt in horses is classed with chorea by some.

The severity of chorea varies from twitching of certain groups of muscles to constant motion of the whole body. Usually there is jerking of some part of the body, as the head and neck, with twitching of the facial muscles and jaw, or of the fore or hind legs. The movements occur when the patient is at rest, and even when lying down, but not usually during sleep.

Treatment.—Rest and attention to hygiene are most important.

The animal should have plenty of fresh air and the food should contain much fat. Dogs should receive milk and considerable cream with oatmeal or bread, and also strong broths, with meat once daily. Iron is also essential in most cases. One pill of ferrous carbonate (each gr. v), or Blaud's pill, should be given thrice daily to dogs. Fowler's solution of arsenic appears to have a most beneficial action in chorea. It may be given in the drinking water to dogs or put on the feed for horses (liquor potassii arsenitis, H., ℥ss; D., ℥ii-v three times daily). Sometimes it is well to gradually increase each dose for dogs 1 minim until as much as 30 minims are given daily. Puffiness of the eyes, colic and diarrhea signify that no more arsenic will be tolerated. After giving arsenic three weeks it is well to omit the drug for a day or two. When the movements are severe some nervous sedative must be used. To dogs may be administered chloral, gr. v, with sodium bromide, gr. xx to xxx, thrice daily, and 5 drops of laudanum may be added if necessary to procure rest and sleep. For the horse, ℥ss each of chloral and sodium bromide, with ℥i of fluidextract of belladonna, may be prescribed in solution twice daily.

When arthritis precedes or is associated with chorea, sodium salicylate is indicated (H., ℥ii-iv; D., gr. x-xv). The wet pack will sometimes afford relief from chorea, *i. e.*, the application of a blanket wrung out in warm water and covered by a rubber sheet and dry blanket. Any source of peripheral irritation—worms, indigestion, etc.—must be removed.

Coenurosis—Sturdy—Gid—Turn-Sick—Staggers.

This disease attacks sheep between the ages of 3 and 18 months and, less frequently, cattle up to the 4th or 5th year. It is due to the encysting in the brain of the embryo (*Coenurus cerebralis*) of the tape worm of dogs (*Taenia coenurus*). The dogs, in their turn, get tape worm from eating brains of cattle or sheep containing the tapeworm embryo. Dogs pass the eggs or embryos in their

feces and these enter sheep or cattle at pasture and migrate from the digestive tract to the brain in about a week, where they form cysts in a month or two. Dampness favors the vitality of the ova, so that spring and fall are the seasons when animals at pasture are usually attacked. Sturdy is apt to be enzoötic, but there is not any nasal discharge or sneezing as in false sturdy due to *Oestrus ovis*.

Symptoms.—There are two phases. 1. When parasites first enter the brain, young animals appear dull and stand immovable for hours; they become blind and exhibit contracted or dilated, and unequal pupils, with squinting. The gait is unsteady and the animal may be unable to walk. The conjunctivæ are congested and the sheep may circle around (not so common as in 2nd stage), have fits and stagger and die in stupor. Many recover and the majority are not attacked but go on to the 2nd phase 3 to 6 months later. Now the animal shows stupor, blindness and runs against objects and exhibits the peculiar feature of the disease which consists in moving in circles and spirals or rolling on the ground or staggering and falling. There are usually one or two cysts, and sometimes more, in the brain at this time.

Treatment.—Tapping the cysts with trephine or trocar is most effective, but exact localization of the cysts is usually impossible. Localization of the cysts by means of the peculiar movements is described in text books, but this is extremely difficult and impossible with several cysts. Rarely a softened or dull area occupied by the cyst may be discovered on percussing the skull. Prophylaxis is most important. This will entirely prevent the occurrence of coenurosis.

Dogs kept upon farms where the disease is prevalent should never be given sheep's or cattle's brains to eat, and twice a year should be starved 24 hours and then receive treatment for tape worm, as powdered areca nut (2 gr. to the lb. live-weight), with oleo-resin of aspidium (℥xv) in capsules, followed by a dose of

castor oil or 2 to 3 compound cathartic pills. The whole treatment should be repeated in two days and the feces should be mixed with quicklime or burned. Sheep may be sent to the butcher in the early stage, but their brains should be boiled or burned. Lambs or yearlings should not be pastured in infested regions.

Colic in the Horse.

Colic signifies acute pain in the belly and may be due to many causes, functional and organic.

Symptoms.—Pawing, stamping, lying down and rolling and rising again, looking at flanks, groaning and sweating. Intervals of freedom from pain often. Frequent unsuccessful attempts to urinate. Belly tense and distended in flanks; peristaltic sounds often diminished or absent. Pulse and breathing rapid in paroxysms. It must be distinguished from hemoglobinuria (paralysis of hind quarters and dark urine); from cystitis (characteristic changes in urine); from enteritis and peritonitis (in which fever is prominent), and from various other conditions which will be noted under treatment.

General Treatment.—This depends to some extent upon the cause, but there are certain general indications for treatment common to the different kinds of colic. The patient should be put into a box stall with plenty of bedding. Walking exercise may be beneficial in mild cases of spasmodic colic, but in no others. Relief of pain and spasm is secured by morphine under the skin (gr. ii to v) with atropine (gr. i). When this treatment is not convenient, various antispasmodics and anodynes may be given in drench in 1 pint of water, as laudanum, ℥ii; ether, ℥i; chloroform, ℥ii. In place of chloroform, the spirit of chloroform may be used (℥i). In mild cases opium may be dispensed with and the following given: Aromatic spirit of ammonia, and ether, each ℥ii; spirit of chloroform, ℥i; or chloral (℥i) in a pint of linseed oil. In flatulent colic, oil of turpentine (℥ss), carbolic acid (ʒx) may be

given with ℥i each of ether and spirit of chloroform and ʒ pint of linseed oil. Morphine and atropine under the skin are the most certain and rapid remedies.

A cathartic is generally needed at the earliest possible moment. The kind of cathartic depends to some extent upon the kind of colic (see below). Ordinarily a physic ball or a pint of linseed oil are used. When opium is not required the action of the cathartic is apt to be more certain. In severe colic, barium chloride is often most efficient (see below). Enemata of warm soap suds with manual cleaning of the rectum assist the action of cathartics and should always be used. The skin of the whole trunk should be rubbed briskly with straw and, after this, hot turpentine stupes should be applied.

Special treatment is indicated for different kinds of colic.

Spasmodic colic is the most common form, caused by the ingestion of cold water by horses when hot or fatigued, by exposure to cold in the same condition, by improper food, sudden changes in diet or exhaustion. The pain is apt to be remittent with intervals of freedom from colic. Loud peristaltic murmurs are often heard. Sometimes in mild cases the attack may be relieved by the use of alcohol (whisky, ℥iv in a pint of hot water) and external heat and warm enemata. Otherwise give morphine or colic drench as recommended above. A physic in the shape of an aloes ball or pint of linseed oil is also indicated.

Flatulent colic follows the ingestion of food given to fermentation, as green clover, rank grass, raw potatoes, etc., and occurs in wind suckers. In addition to the use of intestinal antiseptics (see above) and antispasmodics, the one essential consists in puncturing the bowel at the earliest moment that the tympanites is seen to be progressing. The point of election is in the right flank, equidistant from the posterior border of the last rib, from the tip of the lumbar vertebrae, and from the external angle of the ilium. The left flank may be selected, if it is the seat of greater distension, or

uppermost with the patient recumbent. Careful asepsis must be observed, with clipping of the hair, painting the skin with tincture of iodine, and boiling of instruments. The skin is incised with a knife, the puncture made with a trocar and canula and the wound sealed with collodion. Barium chloride may be given intravenously in a dose of gr. xv. in 1 pint of water, or ℥i may be given by mouth, and these doses repeated in one hour if necessary. One ounce of ether given in one quart of cold water per rectum, and the use of cold cloths externally (if the premises are warm) serve to stimulate peristalsis and aid the escape of gas. Four ounces of inspissated oxgall in one pint of water the writer has found a most efficient enema.

In colic from overloading of the stomach we have the history to guide us. Also eructation of gas, retching, vomiting, distension of the stomach and difficult respiration, so that the horse sometimes assumes the "dog sitting position." The use of the stomach tube (see p. 289) is often a life saving measure in removing gas and ingesta and preventing rupture of the stomach and diaphragm. Barium chloride may be tried by vein (gm. i) or mouth (℥i), and repeated in one hour.

Colic due to thrombus obstruction of the anterior mesenteric artery and embolus of its branches is rarely diagnosed except post mortem and is suspected when the onset is sudden and without apparent cause. We should unload the bowels by the use of linseed oil (O*i*), or salts (1 lb.), or calomel (℥i-ii). Drastic cathartics are generally contraindicated, but barium chloride may be employed in severe cases with the understanding that twist of the bowels may be caused by violent peristalsis. Massage of the belly, walking exercise, and enemata, are also indicated.

Colic with constipation (or ileus) arises from various sources, as through paralysis of a portion of the gut produced by local peritonitis or sources of reflex irritation in the belly; and is due to mechanical obstruction of the bowels situated within or without

their lumen. In mechanical obstruction peristalsis persists; in paralytic, it ceases. Symptoms of shock and often fever are present in these cases. In almost all of them cathartics form the worst possible treatment.

Colic may be produced by various forms of obstruction of the bowels. Thus impaction of the colon or rectum is caused by indigestible food and may be recognized by examination per rectum and by the tendency of the animal to press the hind quarters against the wall and by straining. The colic is apt to be mild and persistent. Powerful cathartics are generally out of place and our endeavors should be directed toward improving the tone of the bowel, liquefying the feces and removal of the same per rectum, while stimulating peristalsis through rectal injections. Linseed oil (Oi) may be alternated with Glauber's salts (lb. ss-i), and strychnine (gr. i-ii) with atropine (gr. ss) in solution may be dropped on the tongue thrice daily. In addition to manual removal of the feces and soap suds enemata, dried oxgall (℥iv in 1 pint of water) or salts (lb. ii, with glycerin, ℥viii; in saturated solution), may be injected high into the rectum. It may be necessary to empty the rectum several times daily by hand. Barium chloride may be used if other methods fail.

Colic is caused sometimes by enteroliths. A diagnosis can only be made if the stone is felt per rectum and surgical removal is required. Colic due to sand, as shown by passage of the same, may yield to a physic ball. Volulus, or incarceration of the bowels in hernia, may be detected in some cases by rectum or by examining the abdominal rings. These also only yield to surgical treatment. Invagination is often shown first by diarrhea, with passage of mucus and blood, and can rarely be detected per rectum. The course is chronic. Elevation of the hind quarters and the use of enormous warm water enemata and purgatives—as an aloes ball or barium chloride—may be successful, although the latter may aggravate the condition. Intussusception or invagination has been cured in human medicine by the injection of air (through a cath-

eter) into the rectum by means of a bicycle pump. This would be just as applicable in veterinary practice. The procedure should be conducted slowly and carefully and, after the lower gut has been well distended, time may accomplish a reduction of the invagination.

- Passage of a necrotic portion of the bowel is pathognomonic, but the proposed treatment at such a time would be out of the question.

Colic caused by new-growths of the bowel or stricture may be diagnosed by rectal exploration. There is little to be done except to empty the rectum by enema or manually twice daily.

Colic due to worms is of a mild character, is apt to recur, to alternate with other digestive disorders, and to attack young animals. It is produced by obstruction of the bowels and irritation of the intestinal mucous membrane. Round, tape, and thread worms; the larvæ of *Gastrophilus equi* and *hemorrhoidalis*, and several others, may induce colic. The discovery of worms or their larvae in the feces is the only positive evidence of their presence. The treatment is that recommended for worms under the heading of that name.

Colic due to torsion of the colon. This is discovered by rectal examination. To relieve, puncture the bowel to allow escape of gas and then roll the animal. If the colon is twisted to the right, roll to the right; if to the left, roll the animal to the left.

Conjunctivitis in All Animals.

Conjunctivitis may be conveniently classified as Acute Catarrhal, and Purulent and Chronic; while less frequently are seen Membranous, Follicular, Granular and Phlyctenular forms.

In acute catarrhal conjunctivitis the lids are somewhat swollen and there is a muco-purulent discharge. Congestion of the mucous membrane of the lids and eyeball is present, the color being brick-red. On the eyeball the vessels are tortuous, superficial and movable, forming a coarse, irregular network in all directions, and not confined to the corneal border. It is of special importance not to

confuse conjunctivitis with inflammation of the cornea, or deeper parts of the eye, as inflammation of the iris or ciliary body (cyclitis) or glaucoma. In these conditions the congestion is chiefly in the sclera about the cornea, and not general; lachrimation is more prominent than a mucous or purulent discharge; photophobia is marked; the pupil often fails to react readily to light; the color of the pericorneal congested area is pink rather than the general brick-red injection of superficial vessels seen in conjunctivitis. In these more serious affections the superficial vessels of the ocular conjunctivæ are not especially enlarged and sight is apt to be impaired. In conjunctivitis both eyes are usually attacked, though often one is affected before the other. The absence of foreign bodies in the eye must be determined.

The treatment of acute catarrh of the conjunctiva consists in the use of the following prescription :

℞

Zinci Sulphatis	gr. ss
Acidi Borici	gr. xii
Aquae Dest.	ʒi

M.

Sig. Drop in the eye thrice daily.

At night it is well to rub on the lids boric acid ointment. The disease is likely to be self-limited to a period of 10 days, or longer, but may become chronic.

Pink Eye is an epizootic, contagious form of acute conjunctivitis and in human practice has been shown to be caused by the Week's bacillus or pneumococcus more commonly. The chronic form of conjunctivitis may be due to bad hygiene, dust, irritant gases, rhinitis, ectropion, etc. The treatment consists in removal of the cause and the use of the zinc and boric acid solution.

Purulent conjunctivitis is almost always due to gonococcus infection in man, but while this may occur in animals from contact with the human patient, yet in animals is also due to other

germs and is seen in the new-born, and under bad hygienic surroundings. It is contagious and there is much danger of ulceration of the cornea and loss of the eye. Bacteriological examination of the discharge will decide the specific infection. Great care should be observed to prevent the sound eye from being infected with discharge; also in protecting the eyes of the attendants by glasses, and in cleansing one's hands after treating the eyes. Washing the eyes hourly with saturated boric acid solution by means of a dropper, and the application of a freshly made 50 per cent. solution of argyrol by dropper thrice daily are indicated. If the cornea is affected, as shown by haziness of this structure and photophobia, it is wise to drop atropine solution into the eye (gr. iv to ʒi) twice daily. If a 50 per cent. argyrol solution is dropped in the eye at the onset the attack may be aborted. With corneal involvement the patient should be isolated in a dark place.

In membranous conjunctivitis, as distinguished from true diphtheria of the conjunctiva of the lids, the membrane can be forcibly detached by a swab. The only absolute diagnosis can be made by examination of the discharge. True diphtheria does sometimes occur in animals, as shown by the presence of the Klebs-Loeffler bacillus. Membranous conjunctivitis may be due to streptococcus infection and may occur in the course of an ordinary catarrhal or purulent conjunctivitis. It does not tend to invade the bulbar conjunctiva and the discharge is slight and watery and the lids much swollen. It ends in a severe catarrhal or purulent form usually. It is caused by irritant applications to the eye and in poorly nourished subjects.

The treatment of membranous conjunctivitis consists in the frequent use of boric acid solution (3 per cent.), or corrosive sublimate (1-10,000) irrigations, and atropine (gr. i-ʒi) when there is photophobia. When the membranous condition ceases and is superseded by a catarrhal state, then the remedies advised for that trouble (boric acid and zinc sulphate) are indicated. Protargol (3 per

cent.) is also of benefit. In the membranous form due to the Klebs-Loeffler bacillus, nothing is so valuable as diphtheria antitoxin.

Granular conjunctivitis (granular lids, trachoma) begins as an acute muco-purulent form with swelling of the lids, and often considerable photophobia, but tends to become chronic with implication of the cornea, photophobia, blepharospasm, and lachrimation. Upon the everted lids may be seen enlarged papillae on the upper lids, or sago-like bodies on the lower lids, with thickening of the submucous tissue. As a result of this condition we have atrophy and entropion; and on account of the roughness of the lids, ulceration and opacity of the cornea and pannus, or the development of a fan-like growth of blood-vessels on the upper half of the cornea. Granular conjunctivitis is thought to be due to a specific germ and is contagious.

To treat this condition requires much time and patience. Apply to the everted lids once daily a 40 per cent. solution of protargol and drop into the eye a 10 per cent solution of the same thrice daily. With marked photophobia one should employ a solution of atropine two or more times daily (gr.ii-iv to $\frac{3}{4}$ i). If this treatment does not succeed, then the crystal of cupric sulphate, or 2 per cent. silver nitrate solution, should be applied every other day to the everted lid. Knapp's roller forceps are valuable in expressing the contents from enlarged follicles. The lids are well cocainized and everted and the forceps are made to grasp the everted lids or folds of conjunctiva and are drawn over them.

Entropion may be treated by removing the lashes, but surgical treatment is the only remedy (see *Entropion*) in severe cases. When pannus is marked the use of powdered jequirity bean, in three per cent. solution in water, prepared by maceration for three hours at ordinary temperature, may be curative. This is to be painted on the everted lids two or three times at one treatment and then the animal should be kept in the dark and treated as for acute conjunctivitis. Great inflammation is produced and there is some

danger of severe corneal involvement. The inflammation lasts about two weeks and cold applications should be made frequently to the eyes during this time.

Follicular conjunctivitis may occur as distinct from the granular form, as shown by the absence of pannus, thickening of the lids and entropion in the former. Enlarged follicles appear on the conjunctival surface of the lids with slight mucous discharge. The treatment is the same as for the acute catarrhal form.

Phlyctenular conjunctivitis is characterized by yellowish-red elevations, or phlyctenules, about the margin of the cornea or on the cornea, sometimes as large as a split pea, and surrounded by a zone of congestion. The phlyctenule tends to ulcerate and is attended with photophobia and lachrimation. If on the cornea, a keratitis with opacity may result. The disease is not contagious. One eye only is often affected. A solution of boric acid (3 per cent.) should be dropped in the eye three times daily and, with corneal invasion and photophobia, atropine also (gr. i-iv to ℥i). Once daily ointment of yellow oxide of mercury (1 per cent.) should be inserted between the upper and lower lid, in amount as great as a split pea. Attention to the general health is important; a tonic powder containing nux vomica, copperas and quinine may be given the horse. The bowels should be kept open.

Constipation in Dogs.

Constipation in dogs is caused by a diet containing too great a quantity of soft food, as much bread or porridge; or too dry food, as bones. Insufficient exercise, old age and various diseases predispose. Frequent, distressing and unsuccessful attempts at defecation, passage of small balls, loss of appetite, tense belly and inflamed and swollen anus, are often observed. A tender, fecal tumor may be felt in the belly and accumulation of dried feces by the finger in the rectum.

Treatment.—Two to three compound cathartic pills or one to

two ounces of castor oil should be given and, if there are dry, hard, impacted feces in the lower bowel, the use of injections of sweet oil (§viii) and followed by warm water should be persisted in. Often, with dried fecal masses, the only successful measure consists in external massage and the mechanical removal of dry and bony masses from the rectum with finger or blunt curette. The animal should be starved until well rid of his trouble or fed on food giving rise to little residue in the digestive tract, as broth, lean cooked meat with salt, and milk. To avoid future constipation, exercise and the occasional use of liver and dog biscuit are useful with a mixed diet. When a tendency to chronic constipation exists, $\frac{1}{2}$ to 1 teaspoonful of the aromatic fluidextract of cascara sagrada, or a pill containing the solid extract of rhamnus purshiana (gr. ii-iv), with extract of hyoscyamus (gr. $\frac{1}{4}$), may be given once daily.

Convulsions—Epilepsy—Eclampsia.

Epilepsy and eclampsia (or convulsions) are not synonymous, but they will be considered here because the treatment of both is similar. Epilepsy is a chronic nervous disease characterized by periodic attacks of unconsciousness with tonic and clonic spasms. It is rare, but affects all domestic animals and more often dogs. Eclampsia (or convulsions) is usually symptomatic of some irritation of the nervous system, central or peripheral. We distinguish convulsions or eclampsia from epilepsy in that, while the symptoms are alike in both, eclampsia is transient or occasional, but epilepsy is periodic, chronic and usually incurable.

Symptoms.—In an attack of epilepsy the animal stands still, stares, trembles, cries (dogs and pigs), staggers and falls unconscious with rigidity, followed by convulsive movements of the whole body. There is frothing at the mouth; the eyeballs are fixed, rolling or squinting. Breathing is noisy or labored and the pulse is slow and hard. Attacks last a few minutes to half an hour and

end abruptly in recovery, or in a heavy sleep with complete relaxation. Attacks recur at variable intervals, the patient being well in the intervals. Epilepsy is sometimes partial with spasms of groups of muscles only, as of the eyeball, face or fore limbs, and the animal may not fall. Thus, in horses, staring, shaking of the head and to and fro movements of the ears may be seen. Megrimms differs from epilepsy in occurring during exercise and without convulsions.

Convulsions or eclampsia are seen more often in puppies or young pigs. A special form affects bitches from a few days to a month after parturition. They fall to the ground absolutely rigid, go into convulsions, but apparently retain consciousness. A convulsion (or eclampsia) is similar to a single attack of epilepsy in its symptoms.

Treatment.—This depends upon the causation and whether the attack is eclampsia or epilepsy. Epilepsy is often idiopathic, but may be due to actual disease of the brain or to peripheral reflex irritation. Thus local lesions in the brain, as abscess, exostoses, tubercle, parasitic cysts, thickened dura, fracture with depression of the bone and hemorrhage, are causes. Also parasites in the frontal sinus or ear, foreign bodies in the ears or stomach, burns and wounds (as stump of horn in cow), sharp, rough teeth in horses, may be etiologic factors. In the young the inhibitory centres are undeveloped, and overloaded stomach, acute disease (toxins, as in canine distemper), rickets, indigestion (autointoxication), abnormal teething and intestinal worms appear to be most often responsible for convulsions.

In the treatment of epilepsy or convulsions one should, then, try to find some source of reflex irritation and remove it. In the attacks of convulsions sedatives to the motor centres should be employed. In epilepsy treatment of the attack is of little value, but sedatives are given in the intervals for long periods. Bromides are the most useful sedatives. Sodium bromide (H., \mathfrak{z} ss; D., gr. x-xv thrice daily) or mixtures of the various bromides of potas-

sium, sodium, ammonium, calcium and lithium, equaling together the above dose of sodium bromide, are sometimes more effective. The bromide salt is placed on the feed of horses, and given in solution to dogs. Tincture of belladonna (H., ℥ss ; D., ℥ii), or chloral (H., ℥i ; D. gr. v), or laudanum (H., ℥i ; D., ℥v-x) are also often added to the bromides if they are ineffectual in preventing the attacks. Epilepsy is, however, rarely cured.

In the treatment of a convulsion in puppies it is well for the owner to hold the animal head downward with the eyes covered (cerebral anemia), or to immerse the animal in a warm bath and for the veterinarian to administer chloroform by inhalation, while the attack lasts. Then an emetic (ipecac, gr. xxx; or mustard, ℥i-ii) and an enema should be given, and, if worms are suspected, a vermicide. Inflamed gums in teething call for scarification.

To prevent return of the convulsions, chloral may be given in starch solution by rectum (gr. x-xxx) or by mouth (gr. v-xv) and for a few days a solution containing chloral, gr. v to x, and sodium bromide, gr. x-xv to the dose, three times daily. In case of recurrence of the fits, treatment with bromides (as for epilepsy) is indicated. Or the following prescription may be used in case of failure of bromides: \mathcal{R} Acetanilidi, ℥i ; camphoris monobromatae, ℥ii ; div. in capsules No. xxx; Sig., I capsule thrice daily. In treating bitches with convulsions after parturition, chloroform inhalation and chloral (by the rectum or mouth) with bromides thereafter, are in order, or subcutaneous injection of morphine, in place of chloroform (morphine sulphate, gr. $\frac{1}{2}$ - $\frac{1}{3}$).

Coryza—Acute Rhinitis—Acute Nasal Catarrh—Cold in the Head.

This affection is most common in horses and dogs but only warrants treatment in horses. Susceptibility to "colds" is produced in animals who are subjected to too warm an atmosphere and too much clothing in the stable and not enough exercise. A cool stable, light clothing, pure stable air and regular exercise are then

indicated. Colds are due directly to infection and chiefly to cocci contained in dust. The avoidance of dust by care of roads and isolation of animals with coryza are thus desirable.

During an attack the animal should have an abundance of cool, pure air indoors, or, better, outdoors in suitable weather. The covering should be moderate, but the legs may well be rubbed with mustard water paste, and bandaged, if the animal is in the stable. The food should be laxative, with roots, bran mashes and a few ounces of linseed oil. If medical treatment seems desirable, the dropping of fluidextract of belladonna on the tongue (H., $\bar{5}$ ss every two hours for the first few days) may arrest the coryza, and this may be aided by inhalation of steam twice daily (co. tinc. of benzoin, 1 tablespoonful to 1 gallon of boiling water). Local treatment is best but difficult to secure in veterinary medicine. Thus, following the human treatment by spraying every two or three hours adrenalin chloride in 1-10,000 dilution into the nasal chambers will be most effective (together with belladonna) in cutting short the coryza.

In ordinary mild cases drug treatment is unnecessary. When fever exists the animal should be kept quiet in the stable. The severer forms of coryza caused by special infections should receive much the same treatment: as the rhinitis in which vesicles, pustules and scabs are seen; the croupous form; and that in which yellow nodules and ulcers occur on the septum and on the skin about the nostrils and nose, with enlargement of the lymph nodes under the jaw and in the neck. Isolation is here especially important.

Cystitis, Acute and Chronic.

The causes of cystitis are, first, congestion; and second, infection. Congestion arises from over-distension of the bladder, external chills, trauma, sexual excesses, abnormal urine containing irritants, calculi, tumors, passage of instruments—these are predisposing causes. The immediate cause is infection from germs eliminated by the kidneys in general infections, those carried to the

bladder by instruments, those conveyed from the rectum through the lymphatics, and those ascending from below in infections of the genital tract.

Symptoms.—Frequent and painful passage of small amounts of urine, which is bloody or thick and turbid, is characteristic. The urine contains epithelial cells, blood, pus, mucus, and often numerous crystals of triple phosphates and bacteria. There is loss of appetite, fever, colic, and constant straining and pain in micturition. Cows lie down with arched backs, and males often straddle in walking, and have retraction of the testicles and erections. Examination per rectum in large animals shows only tenderness over the neck of the bladder and the same on palpation over the hypogastrium in small patients. There is less fever and albumin in the urine than in pyelitis, and more marked bladder symptoms, while symptoms pointing to the kidney are absent. In very severe cases, shreds of membrane are seen in the urine.

Treatment.—Acute congestion of the bladder is allayed by giving internally a great amount of bland liquids, as barley water, mash of grain, and milk to the large animals; while milk forms the best diet for dogs. Ice water irrigation of the rectum is also very serviceable in reducing the vesical inflammation. The bowels should be opened by salts or linseed oil in the larger patients, and by castor oil in the case of dogs.

Hot applications over the loins are of some service. To quiet the pain and spasmodic contractions of the bladder, opium and belladonna are most valuable. $\frac{1}{6}$ to $\frac{1}{4}$ grain each of morphine and extract of belladonna may be given in suppository to a dog. To the larger animals the following may be prescribed: Spirit of nitrous ether, and tincture of opium, aaʒi with fluidextract of belladonna and tincture of aconite, each ʒi, p.r.n. To dogs, one-half dram each of potassium citrate and spirit of nitrous ether may be administered thrice daily in water.

After the acute pain has passed, urinary antiseptics may replace

to advantage the drugs recommended above. Thus, equal parts of boric acid and sodium benzoate (H. & C., $\mathfrak{z}i$; D., gr. v to x) may be given in the drinking water to large animals; in capsules to dogs, twice or thrice daily. Hexamethylenamine is also excellent, though expensive, and is preferable otherwise to boric acid and sodium benzoate (H. & C., $\mathfrak{z}i$; D., gr. v, thrice daily in drinking water).

If the urine is acid, alkalies—sodium bicarbonate or potassium citrate—should always be employed, and sodium benzoate omitted, its place being taken by salol (H., $\mathfrak{z}i$; D., gr. v, thrice daily), boric acid, or hexamethylenamine. When the disease has a tendency to become chronic, fluidextract of buchu is of advantage (H., $\mathfrak{z}i$; D., $\mathfrak{z}ss$, three times daily). In chronic cystitis, local treatment is, however, of most avail. The solutions of chief value are boric acid, 1 per cent.; borax, $\mathfrak{z}i$ to Oi ; creolin, one-half teaspoonful to the quart. One of these solutions should be injected daily at body heat through a glass funnel attached to a catheter. Silver nitrate, in 1-1,000 solution, may be used every third day when the less stimulating injections fail.

Absolute sterility of catheters should be secured to prevent cystitis. Washing with soap and warm water and prolonged soaking in 1 to 1,000 sublimate or 5 per cent. carbolic acid solution, may be used, and lubrication with an aseptic lubricant in collapsible tubes, as vaseline with 10 per cent. boric acid. Soft rubber catheters are preferable, as they do not cause erosion of the mucous membrane of the urinary tract.

Cystitis is more common in females owing to extension of infections of the genital tract, particularly of the puerperal state. Chronic cystitis may arise from tuberculosis, new growth, or calculus in the bladder, when medical treatment would be useless.

Unfortunately, local treatment can not often be given on account of its expense, and cattle may be fattened for slaughter while receiving internal medication.

Cysticercus Disease of Swine and Cattle—Measles of Swine and Cattle.

OF SWINE.—Only the young are attacked—under 8 to 10 months. The disease is due to the ingestion by pigs of the ova of *Taenia solium* in human feces. The six-hooked embryos enter the blood from the intestines and become encysted in the interstitial tissue of the muscles of the tongue, neck, heart, flank and thigh of swine.

The symptoms are usually too indefinite for diagnosis. Sometimes transparent cysts as large as a pea may be seen and felt on the tongue or gums, and occasionally the tongue becomes paralyzed, or symptoms like sturdy in sheep arise from infestation of the brain.

Treatment.—The treatment is wholly prophylactic and consists in preventing young pigs from eating human feces by keeping them from pasture and keeping human excrement away from their quarters. Human tapeworms must be burned. Microscopic examination of the muscles will determine the diagnosis. Measly pork will cause tapeworm in man unless the pork is thoroughly cooked. There is no cure for the disease in swine.

OF CATTLE.—Cattle of all ages are affected. Ingestion of the ova or embryos of *T. saginata* of man is responsible for the disease. The embryos migrate in the blood and encyst in the masticatory muscles and also in neck, heart, etc. Diagnosis can not be made during life; only by examination of the meat post mortem. The disease rarely kills and can not be eradicated.

Treatment.—The treatment is purely preventive in keeping cattle from human feces, as far as possible, and this means the prevention of human defecation about the barn or fields. Measly beef will give tapeworm to man and roasting will not destroy the cysticercus, as the heat is not high enough in the centre of the roast.

Depraved Appetite—The Licking Habit—Pica.

Occurs in cattle owing to improper food; pregnancy; disease, as tuberculosis, osteomalacia, chronic digestive disorders, etc. Cattle eat all sorts of objects, as manure, wood, plaster, shoes, clothing, etc. Pica is thought to be due to some peculiar composition of the soil and therefore of the water and vegetation. It is more commonly seen in old countries and in animals living on swampy grounds. Death occurs after months from presence of foreign bodies in the stomach, with gradual emaciation and gastroenteritis.

Treatment consists in the care of the primary disease. Generous feeding with plenty of salt. Patients should be in the open air. Apomorphine, gr. ii, given under the skin once weekly, for three injections, is said to be a specific. A tonic powder may be given in tablespoonful doses on the food twice a day in addition to apomorphine, as ℞ Pulv. Zingiber., gentian, et ferri carb aa ℥iv; bone flour 1 lb.; sodii chlorid. ℥viii. ℥. Gastrotomy often is necessary to remove foreign bodies from the stomach.

In Calves and Lambs the habit is caused by insufficient nourishment from the mother. Calves lick hair from each other, and lambs lick off wool from their mothers. This results in the formation of hair balls in the stomach which produce obstruction and death within a day or two. The treatment embraces better feeding for mothers, which should be given plenty of salt, and calves should be muzzled and lambs segregated when not suckling. The animal from which the wool has been eaten should also be isolated from the flock, as its appearance stimulates other sheep to crop the wool from its back. Apomorphine under the skin (gr. i) is most effective.

In Horses, pica is commonly due to indigestion, and on general principles such remedies as laxatives (carron oil or Carlsbad salts in doses of a few ounces daily on the feed), bitters, and sodium bicarbonate or dilute HCl are indicated. It is more common in

foals, which lick all objects, and eat manure, bedding and sand at pasture. They should be kept stabled, and receive salt and the specific, apomorphine, subcutaneously in 1 to 2 gr. doses once or twice weekly.

Diabetes Mellitus—Glycosuria.

Diabetes mellitus is a disorder in which grape sugar is freely discharged into the blood and eliminated in the urine. It is distinguished from glycosuria in that the latter refers to any condition in which sugar is found in the urine, and it may be temporary and of no serious import (as in cattle and sheep or bitches after weaning); whereas diabetes mellitus is a chronic disease in which sugar is eliminated in the urine for months and perhaps years, and is associated with well recognized and constant symptoms. The disease is quite rare among the domestic animals, but is occasionally seen in dogs, horses, and cattle.

Symptoms.—The symptoms are in brief as follows: Emaciation, thirst, ill-condition and progressive weakness, with the passage of a large amount of urine having a high specific gravity (H. & D., 1040 to 1060), sweet, nauseous odor, and containing glucose. Cataract and corneal ulcer are complications and, in dogs, nausea, vomiting and diarrhea. Coma frequently terminates the disease. To test for grape sugar in the urine, one may use the following solution (Haines): Dissolve gr. 30 of pure copper sulphate in 1 oz. of distilled water and mix in well $\frac{1}{2}$ oz. of glycerin; then add 5 oz. of liquor potassae. Boil a drachm of Haines Solution in a test tube and after the boiling point is reached add 6 to 8 drops of the suspected urine and boil one minute more. If sugar is present, a yellow, orange or red precipitate will form in the test tube. In herbivora, it is well to first boil and filter the urine to remove phosphates before employing Haines test.

Diabetes is a chronic and ultimately fatal disease and, although proper treatment may prolong life (in human medicine, sometimes

for a great many years), yet in veterinary practice this may not be worth while. Glucose is derived from the food (chiefly carbohydrates) and is normally stored as glycogen in the liver and muscles and liberated only as needed, to be slowly converted into glucose and oxidized to supply energy. In diabetes there is great nutritive loss owing to the escape of glucose in the urine, either (1) because it is not oxidized, or (2) because it is set free too rapidly, or (3) because that formed by the digestion of carbohydrates is not converted into glycogen but eliminated at once unchanged. Diabetes may be a symptom of disease of the brain and cord, of the liver and pancreas, and sometimes is associated with obesity.

It is usually, however, impossible to remove the cause*, and the dietetic treatment, which has been carried out with such detailed precision as to amount, and chemistry (chiefly avoidance of carbohydrates) in human medicine is scarcely applicable to herbivora. In dogs an exclusive ration of broths and cooked meat and fat is often of great benefit. Coma appears to be due to the presence of acetone bodies in the blood which are derived from destruction of the tissues of the body. Among these is diacetic acid, and the discovery of this in the urine will indicate the likelihood of coma. To test for diacetic acid, add a few drops of solution of ferric chloride to the suspected urine and if diacetic acid is present the urine will take on a burgundy-red hue. Previous heating of the urine will volatilize the diacetic acid so that the test should not be positive after heating. Approaching coma may be averted by giving large and frequent doses of sodium bicarbonate.

There are several remedies which tend to lessen the loss of sugar in the urine and these may be used in dogs. Opium is the best (of powdered opium, gr. $\frac{1}{2}$ to gr. 1 thrice daily); or Fowler's solution of arsenic, beginning with 5 drops and increasing slowly to 30 minims thrice daily, if it is borne by the digestion; or urotropin (in capsule or pill) in a dose of 7 gr. twice daily.

* Williams affirms that an habitual diet of liver causes diabetes mellitus in dogs.

Diarrhea. See **Indigestion, Enteritis.**

Diarrheal Diseases of Calves.—Etiology and Symptoms.

The direct cause is usually some source of infection, as from drinking water, dirty and infected feeding utensils, infected premises, from cows about to calve or from infected calves brought upon the premises; from mother's milk infected owing to mastitis. Predisposing causes are lack of fresh air and therefore presence of bacteria; milk over rich in fat or, less often, casein; feeding at infrequent intervals and teething.

The symptoms of diarrhea are so well known as to scarce require notice. Appearing from birth to the end of the second week, the fecal movements become frequent—from 5 to 20 movements daily—foul, and contain mucus and pus; in color of a yellow or yellowish white. There are fever, rough, staring coat, emaciation, prostration, anorexia, and erosion about the rectum with often a fatal ending in one or two days or weeks.

Prevention and Treatment.—Prevention aims at avoiding or remedying the causes noted. Calves should be kept away in separate buildings from calving cows or those about to calve. They should be allowed to suck thrice daily unless running with the mother. Feeding utensils should be scrupulously clean and treated with boiling water. On the appearance of diarrhea the calf should be segregated and the premises disinfected (see p. 282). The milk should be boiled and diluted with $\frac{2}{3}$ boiled or pure water; or broth or barley water with eggs given; or whey made by adding rennet to warm milk. At the very outset two ounces of castor oil should be administered and followed with one teaspoonful of bismuth subnitrate three times daily. A mustard paste or oil of turpentine may be rubbed once daily over the belly.

DYSENTERY, WHITE SCOURS OF CALVES.—This fatal contagious disease is apparently due to a specific bacillus which inhabits barns and leads to enzoötic and persistent attacks year after year.

The disease appears the first or second day after birth with great prostration and dulness so that the animal remains down and usually dies in one or two days of a profuse, foul, yellowish or white diarrhea. If this is survived pneumonia is apt to follow in a fortnight.

Prevention and Treatment.—The organism apparently enters at the navel of the new-born. If a cow calves in a separate clean barn the disease is not seen in its calf. At calving the hind quarters of the cow should be disinfected and the calf born on carbolized straw. The cord is tied with sterile string and the stump disinfected with pure carbolic and alcohol, or tinc. iodine and painted with collodion. After one week the healthy calf may join the herd. One dram sacch. pepsin t.i.d is said to prevent the disease. Sick calves should be isolated, the premises must be properly disinfected (p. 282), separate attendants and utensils must be provided for the sick, and the infected feces should be mixed with chlorinated lime and buried.

Diarrhea in Fowl and Other Birds.

Exclusive of worms (see p. 187) and tuberculosis, diarrhea is commonly due to intestinal catarrh in fowl living in cold, damp houses. The latter condition should be remedied and great cleanliness observed, together with the feeding of boiled rice, boiled milk and giving laudanum in doses varying from 1 to 5 drops. Constipation in fowl may be treated by the use of calomel (gr. 1) on the food; while small birds may be given Carlsbad salts in drinking water (5 gr. to ℥ii).

Diphtheria—Membranous Croup—Pseudo-Diphtheria—Pseudo-Membranous Pharyngitis—Roup or Croup.

An inflammation of the mucous membranes of the mouth, pharynx, nasal cavities, eyes, and intestines of fowl, including pigeons, pheasants, turkeys, guinea fowl and peacocks, with the

production of a white, yellowish or greyish membranous deposit. 1. Caused by mixed infection of cocci, of which the streptococcus is foremost. 2. Less commonly by protozoa—Gregarines—which is characterized by frequency of wart-like growths about the unfeathered parts of the head. 3. Another variety in fowls is produced by infusoria—Cercomonas—and is of a milder type.

Treatment.—Roup or croup in fowl is very fatal (50–70 per cent. mortality) and prevention by isolation of newly-bought fowl, and of the sick, is most important. Infected premises should be cleaned thoroughly, fumigated by burning sulphur or evaporating formalin, and whitewashed, with the addition of 2 per cent. carbolic acid to wash. Fowls dead of the disease should be burned, and contaminated utensils cleaned and disinfected.

Vaporizing oil of turpentine and oil of eucalyptus (℥ii of each in 1 quart of water) is useful in the henhouse. Local treatment is done by painting the affected parts with hydrogen dioxide (full strength with ℥i sodium bicarbonate in each ℥ii, to prevent irritation). This tends to remove the membranes, which should not be forcibly detached but only removed when the act is easily done without causing bleeding.

A mixture of equal parts hydrogen dioxide and Dobell's solution is one of the most effective local applications, containing salines and carbolic acid. Innumerable other antiseptic solutions have been recommended. The internal use of the following is also advisable:

℞

Potassi Chloratis	gr. 75
Tinc. Ferri Chloridi	℥ 75
Glycerini	
Aquae	aa ℥iiss

M.

Sig. two teas. for large birds; ½ teas. for pigeons, twice daily.

Diarrhea is relieved by a 2 per cent. solution of tannin (℥ 5 for pigeons; ℥ 10 for fowl) given in pills made with bread and butter and a few grains of bismuth, which is harmless.

Distention of the sinus under the eye should be treated by opening with the knife; bleeding from the cavity is arrested by packing with cotton saturated with Monsel's solution. The eyes are to be frequently cleansed with saturated boric acid solution.

A false diphtheria also occurs in calves, lambs and young pigs. What is meant by false is that the disease in fowl and animals (except dogs and cats) is entirely distinct from true diphtheria of man. It can neither be communicated to him nor can the human form be conveyed to them. The human disease is due to a special bacillus (Klebs-Loeffler), while that of animals—as sometimes occurs in man (spurious diphtheria)—is due to mixed infection. In animals it is characterized by a severe inflammation of the mucous membranes of the nose and throat, which are occasionally covered with patches of a white, yellowish or greyish color and attended with salivation, nasal discharge, high fever, great prostration, and often death within 24 hours. It is occasionally a complication of acute infectious diseases, as rinderpest, swine plague, puerperal septicemia, glanders, etc., but also occurs as a separate infection.

Treatment.—This is conducted on the same lines as the treatment of fowl, as regards isolation of the sick, disinfection of premises and vaporization of antiseptics (see above). The tincture of ferric chloride and potassium chlorate (of each $\frac{1}{2}$ dram) should be given three times daily in equal parts of water and glycerin.

Attempts should be made to cleanse the nose with salt solution (gr. x to Oi), and the throat with saturated boric acid solution by means of syringe or swab. Whisky and nourishing food, as milk and raw eggs, are also desirable. Green food and laxative salts may be needed to relax the bowels.

True diphtheria due to Klebs-Loeffler bacillus occurs in dogs and cats, as has been shown by cultures from their throats. Cases of diphtheria in man have arisen from the disease in cats and dogs and the latter should not be allowed to come in contact with the

human diphtheria patient and should be killed if they acquire the disease. (See also Stomatitis, Necrotic.)

Distemper in Dogs and Cats.

Since distemper is a disease of germ origin, and there is no known specific, it follows that the treatment must be chiefly symptomatic.

The first symptom to attract attention is usually the collection of muco-purulent matter about the eyes of puppies. The conjunctivitis causing this is best treated by washing the lids and dropping into the eyes the same solution (boric acid, gr. x to $\bar{3}$ i) several times daily. If this is not soon effective, one grain of zinc sulphate to the ounce may be added. If the inflammation is severe and purulent it is wise to drop 5 per cent. argyrol solution into the eyes once daily—in addition to the use of boric acid. Cocaine (gr. x to $\bar{3}$ i) may be combined to advantage with the boric solution if the patient rubs the eyes. The complication of ulcerative keratitis calls for anesthesia with cocaine, followed by gentle curetting of the ulcer, application of pure carbolic on a probe, and confinement in the dark. Diffuse corneal opacities may be treated with a little yellow oxide of mercury ointment (place on the inner surface of the lid) with massage of the lid.

Cough may be benefited by the use of a wet flannel covered with oil silk about the throat, and the employment of expectorants and sedatives, as syrup of ipecac (\mathfrak{m} v to xv) in a dram of syrup of squills, thrice daily, with codeine (gr. $\frac{1}{8}$ to $\frac{1}{2}$) or morphine (gr. $\frac{1}{10}$ to $\frac{1}{4}$) if necessary. Cough mixtures upset the digestion and should be avoided as far as possible.

Digestive symptoms: loss of appetite. This may be combated by tinc. of nux vomica (\mathfrak{m} v to xv) with co. tinc. of gentian ($\bar{3}$ ss to i) and diluted hydrochloric acid (\mathfrak{m} v to x) given at one dose after meals in water. Vomiting and diarrhea are relieved by bismuth subnitrate (gr. x to xxx) and, if severe, tinc. of opium

(\mathfrak{m} v to x) or paregoric ($\mathfrak{5i}$ -ii) may be given. When diarrhea persists, tannigen (gr. v to x) is a good remedy given thrice daily. The diet in diarrhea should consist chiefly of boiled milk and boiled rice.

Nervous symptoms, as active delirium and excitement or convulsions, are quieted by chloral (gr. v to xxx) with sodium bromide (gr. xv to i) in solution by the mouth (or rectum in boiled starch water).

Later in the disease, paralyses and weakness are antagonized by various general and nerve tonics, as syrup of the phosphates of iron, quinine and strychnine ($\mathfrak{3ss}$ -ii; $\mathfrak{5i}$ =strychnine gr. 1/80). A pill of arsenic trioxide (gr. 1/60 to 1/40), strychnine (gr. 1/100 to 1/40) and reduced iron (gr. i), given three times daily, is also efficient.

The characteristic pustular eruption on the inside of thighs and lower part of belly needs little attention, but zinc oxide and starch (1 to 4) may be dusted on moist spots and carbolized vaseline used to soften crusts.

A nutritious diet is of great importance throughout—as milk, raw scraped beef, bovine, and beef juice squeezed from slightly broiled meat. Brandy or whiskey may be given in milk with white of egg. Strong soups, broths and beef tea are also serviceable, but boiled milk is better if there is diarrhea. The patients should be isolated and, when well, the premises thoroughly cleaned with soap and water and a disinfectant. Country air favors recovery over that of the city. A few grain doses of calomel night and morning at the onset of the disease may lessen the severity of the attack.

The treatment of the cat is much the same as that outlined above for dogs, but the doses should be about one-quarter of those given. There is a kind of distemper called Dog Plague, which is thought to be a distinct disease because it appears to afford no protection against future attacks of ordinary distemper and occurs often in adult dogs, which have had distemper. The incubation

period is two to three days. Severe diarrhea with 15 to 20 stools a day (often bloody), together with vomiting, characterizes this disorder. From the enteric form of common distemper the dog plague may be separated, as in the latter there is usually absence of nasal discharge, cough, chorea, and continued high fever. There may be, however, intermittent temperature and cough with hypostatic pneumonia and convulsions. General treatment as for common distemper, and special treatment as for the intestinal form of common distemper are indicated. Dog plague may be epizootic and is often contracted at bench shows.

Chronic Bacterial Dysentery (Pearson), Chronic Hypertrophic Enteritis, Johne's Disease of Bovines.

This hitherto little known disorder is often indigenous on certain farms for years and has heretofore been confused with other maladies but is now known to be due to a special bacillus and to constitute a specific disease. The bacillus is acid-fast and has the appearance of the tubercle bacillus but is shorter and relatively thicker and can not be grown on usual culture media. The subcutaneous inoculation of animals with pieces of the diseased mucous membrane commonly fails to transmit the disorder, but when feces or pieces of bowel from sick animals are fed to sound animals the disease has been transmitted.

Symptoms.—In a herd, more commonly young, but sometimes adult, animals begin to show loss of condition and weight with rough staring coat and dry, inelastic skin. Soon it is noticed that the animal has diarrhea, the discharges being often brown and of the consistency of molasses. Fever is absent. Loss of appetite is manifest after a time. Emaciation, weakness, anemia and anorexia are progressive.

The duration of the disease is long—from two months to two or three years. The result appears to be invariably fatal and the course of the disease is but little affected by medicinal treatment,

although change of diet often causes temporary improvement, as from dry food to pasture.

The severity of the symptoms is much greater than one would suspect from the post mortem appearances. On autopsy the chief lesions are found in the lower two-thirds of the small and in the large intestines. The mucous membrane is commonly alone involved and ulceration is generally absent. The most noticeable condition is an unusual corrugation of the mucous membrane. The rugae or ridges are stained on their summits with points, streaks or patches of congestion or hemorrhage. The mesenteric glands are enlarged.

The disease is chiefly to be differentiated from tuberculosis by the tuberculin test, and from secondary anemia from intestinal parasites by microscopic examination of the feces.

Treatment.—Since the disease is infectious and its existence threatens sound cattle, and since treatment has little permanent effect, the treatment should be prophylactic. Diseased animals should be at once isolated and destroyed when the diagnosis is certain. All feces from them should be deeply buried or burned. The stable, after thorough removal of fecal contamination by scraping and scrubbing, should be disinfected. Quicklime may be used on the floors and 5 per cent. solution of chlorinated lime or 3 per cent. solution of formalin applied to the walls, and whitewash containing the same amount of one of the latter, brushed on the walls.

Internally, intestinal antiseptics and astringents, as salol, bismuth subnitrate, turpentine, etc., have been given, and creolin subcutaneously. (For Dysentery, see also Enteritis.)

Eczema.

IN DOGS.—This is the most common skin disease of dogs. The treatment depends upon the stage. There are, from a practical point of view, three stages: an acute stage, with swollen, red, itchy and often pimply (papules) skin; an exudative stage, in which

papules, vesicles and pustules form. These, however, usually escape detection and we observe scabs and crusts, with loss of hair in patches, or areas of weeping or suppurating skin with the hair glued together or fallen out. Then, lastly, a chronic stage is found, in which the skin is much thickened, shiny and scaly, with hair thinned or fallen, and pruritus.

Drug treatment consists in the use of soothing remedies in the acute stage; astringent, drying and protective agents in the exudative stage; and stimulant applications in the chronic form.

Water is generally prejudicial in the treatment of eczema except to remove scabs and crusts. These must always be gotten rid of before making any application. This is accomplished by applying sweet oil, and after soaking for 12 hours the parts are washed off with castile soap and warm water, or—in chronic cases—shampooing of the skin with green soap and water is very beneficial. The hair should be cut in chronic cases and where discharge is profuse. The use of a muzzle and of bandaging is necessary to prevent irritation from scratching, biting and rubbing, and to avoid licking off of the medication. Drugs of a poisonous nature must be avoided.

In the acute stage the application of sweet oil and lime water, equal parts, is serviceable. Sopping the parts with calamine lotion (℞ calaminae, ℥i; zinci oxidi, ℥ss; glycerin, ℥i; aquae ad ℥iv) is also of value.

In the exudative stage zinc oxide ointment is one of the most commonly useful remedies. If the parts are first sopped with black wash (calomel, ℥i; lime water, 1 pint) and permitted to dry before applying the zinc ointment, the result is more satisfactory. In weeping patches, silver nitrate in 2 to 6 per cent. solution is a valuable remedy when painted over the moist surface. Suppurating areas should be cleaned with hydrogen peroxide before the silver nitrate is applied. Afterwards astringents are indicated, as dusting powders—(℞ bismuth subgallatis, ℥i, amyli, ℥i; or ℞ zinc oxidi,

3ii, amyli, 3i.) Ointments containing tannic acid (1-10) or creolin with zinc ointment (1-20) may also be used—the latter with much itching. The admixture of liquor picis liquidæ or oil of cade to zinc ointment (3i to 3i) is a good combination in subacute eczema.

In the chronic form, tar or some of its substitutes are of most worth. Thus, unguentum picis liquidæ, or oil of cade and sweet oil (3ss-ii in 3i of sweet oil), or salicylic acid (3ss-3i) in olive oil, are found to be good applications. Friedberger speaks highly of creolin ointment (1-10-20) or creolin and green soap, each 3iii, alcohol, 3iss.

Eczema is chiefly due to local irritation, as to fleas, dirt, friction, etc., but the general condition may predispose. Thus constipation should be relieved, as by the daily use of aromatic extract of cascara sagrada (3ss to 3i), and the occasional use of liver and dog biscuit. Exercise is often of importance. Of internal remedies, Fowler's solution of arsenic may be remedial in chronic scaly eczema (ᵐii-v in drinking water twice daily every other fortnight). In overfed animals a good purge (2-3 comp. cathartic pills) and a certain amount of starving will be found of advantage, while a diet of bread and soup or milk is indicated in acute cases. Oatmeal is thought to favor the disease.

IN HORSES. (GREASE, GRAPES).—In the horse, eczema represents practically all forms of skin disease seen in this animal, except the parasitic, and is—according to the classification of Friedberger—seen in the following forms and regions. A form seen in hot weather and known variously as herpes, lichen, summer or saddle mange and heat pimples. This occurs under the harness, where sweating is most profuse, as papules and vesicles. These result in scabby pimples and the hair sticks together and falls, leaving scaly, bare patches.

Then there is a form of squamous or scaly eczema, thought by some erroneously to be akin to psoriasis and pityriasis of man, which attacks the head, neck, shoulders, elbows, etc., of animals.

This is a chronic form with the production of branny scales and thickening of the skin and is accompanied by itching.

A pustular or impetiginous form attacks chiefly the skin under the mane and tail. The skin is raw, weeping or suppurating, while the hair mats together in masses and falls, and there is a tendency to the chronic scaly form.

Eczema attacking the extremities is known as mallenders and sallenders in the flexures of the carpal and tarsal joints, while above the heels, in the bend of the pastern it is known as grease. This is characterized by heat, swelling and redness, followed by a vesiculated, weeping surface with the formation of a greasy, fetid discharge, scabs and cracks in the skin, followed by loss of hair. Sometimes the irritant secretion gives rise to the production of fungoid wart-like granulations, known as "grapes" (chronic verrucous dermatitis) accompanied by great thickening of the skin and swelling of the limbs.

Treatment.—Prevention of squamous eczema consists in thorough grooming and cleansing of the skin, and in the destruction of parasites. The pustular form is sometimes caused by exposure of the animal to constant rain or to the frequent use of common soap on the skin. Grease may be avoided by not clipping the hair about the fetlock in cold weather and by allowing the hair to dry before any cleaning is done.

In the scabby, scaling forms, the parts should be permitted to soak over night in olive oil and then should be well washed with green soap and warm water and a stimulant remedy applied, as oil of cade, liquid tar or creolin dissolved in alcohol in the strength of 10–20 per cent.

In the suppurating form, as about the mane and tail, the hair should be clipped, the parts washed with castile soap and water, sopped with hydrogen peroxide, and treated with an antiseptic, stimulating agent. For this purpose the skin may be painted with a 5 per cent. silver nitrate solution and dusted with iodoform and tannic acid (1–3), or unguentum picis liquidæ may be applied.

In the first stage of eczema of the heels, with erythema, zinc oxide ointment is of benefit, or white lotion (3 drams each of lead acetate and zinc sulphate to a pint of water). This should be shaken well when applied. The pink ointment is also excellent, as follows:

R	
Zinci carbonatis (impure)	ʒii
Alumenis	ʒiiss
Calcei carb. praecip.	ʒx
Creasoti	
Cerae flavae	aa ʒiiss
Adipis	ʒxv
M.	

Melt lard and wax and add the other ingredients.

In the later stages, with much discharge the hair should be cut and the parts should be cleansed with soap and water and 2 per cent. lysol solution and a stimulating antiseptic application made. This consists of balsam of Peru in the pure state kept in place by dry wool dressing and bandaging. The powder of iodoform and tannic acid (1-3) is also useful. Exuberant granulation or proliferation of the papillæ (grapes) must be treated surgically by lunar caustic, or, better, by the white-hot firing iron, knife or scissors. The parts are then dressed with gauze saturated with 5 per cent. creolin solution, and later with balsam of Peru.

IN CATTLE.—In cattle there is an acute and chronic form observed. The acute form attacks the legs chiefly with symptoms of general dulness and loss of appetite, followed by swelling, stiffness and elevated points of hair over the legs. The exudative stage is shown by matting of the hair, scabs, loss of hair and fissures, with often infection of the skin. A chronic form is also seen attacking various parts of the body, causing loss of hair in patches and exhibited by papules, minute vesicles, crusts and branny scales. Occasionally a form involving the hair follicles and starting with loss of hair in patches may lead to total alopecia, the skin being covered with thick crusts but not thickened. Finally, there is that pe-

cular form of eczema caused by the ingestion of potato pulp in quantities greater than 60 lbs. daily. This attacks the limbs with stiffness, redness, swelling, exudation, crusting, etc., and general failure of condition.

Treatment.—The treatment for the acute and chronic forms of eczema in the ox is identical with that in the horse. In that form in which total loss of hair threatens, the tar preparations in alcohol are advisable. In that produced by potato pulp, change to sound food of hay and grain, with local treatment adapted to the condition as indicated above, will secure recovery.

Edema, Malignant—Gangrenous Septicemia.

This is an acute, specific infection due to inoculation of *B. oedematis maligni*—a slender, spore-bearing, motile anaerobe, occurring in soils, foul water and in the intestines of animals. The disease attacks horses, cattle, sheep, swine, dogs, cats, goats, poultry and man.

The bacillus enters through local inoculation by accidental wounds, or by surgical operations—shearing, docking, castration, parturition, etc. The disease begins as a doughy, painful, crepitating swelling which spreads rapidly. The centre is soft, jelly-like and gangrenous; the margin of the tumor is tender, tense and hot to the touch. If the infection starts in an open wound there is a stinking, frothy discharge owing to the development of gas.

The disease is difficult to distinguish from black quarter. The history of local wound and the presence of a fetid discharge favors the diagnosis of malignant edema, but inoculation of rabbits is the best test. Rabbits succumb to the malignant edema bacillus, but are not killed by inoculation with blackleg virus. From anthrax malignant edema differs in not showing the post mortem changes of tarry blood and enlarged spleen seen in anthrax.

Prevention and Treatment.—The preventive treatment consists chiefly in the avoidance of soil infection of wounds and in thorough cleansing of wounds and disinfection, as with hydrogen dioxide,

since the bacillus is anerobic. For the same reason thorough drainage of wounds is advisable. The treatment is often useless on account of the great fatality of the disease and also endangers the surgeon. Free incision of the local point of infection, and disinfection with hydrogen dioxide and drainage with antiseptic treatment, are indicated. All carcasses should be buried 6 ft. deep and covered with quicklime, or burned, and the premises thoroughly cleaned and disinfected (see p. 282).

Electric Shock and Lightning Stroke.

The condition simulates concussion of the brain with a state of general relaxation or of spasms and convulsions. The respiration is irregular, slow and weak or arrested.

Cold douches should be applied to the head and the body rubbed with mustard. An enema of an ounce of stronger ammonia water in a quart of water may be given and the same dose repeated by mouth when consciousness returns. Atropine and camphorated oil (H. 5 iv) should be given under the skin and artificial respiration continued for a long time.

Encephalitis or Meningo-cerebritis—Inflammation of the Brain.

Under this head we will include the various forms of meningitis which may be combined with focal or diffuse cerebritis. It is impossible to clinically discriminate between the two and therapeutically it is unnecessary, *i. e.*, whether we have a cerebral meningitis pure and simple, or associated with a cerebritis.

Horses, cattle, dogs, sheep, pigs and goats are susceptible. As causative factors we include infection (septicemia, emboli from purulent foci, glanders, anthrax, pneumonia, tuberculosis, strangles, etc.), parasites (cysticercus, oestrus, coenurus, *S. armatus*); excessive heat, and exertion; food poisons, unripe rye and overfeeding with legumes; traumatism; and new growths. Some of these etiological factors may be prevented. The general symptoms embrace a period of maniacal excitement, often followed by stupor and coma; the pupils, at first contracted and often unequal, react slowly

to light and finally dilate; there may be ptosis or strabismus; the gait is staggering or there is complete inability to stand; retention of feces and urine is commonly followed by incontinence.

SLEEPY STAGGERS. DROPSY OF THE CEREBRAL VENTRICLES.—This condition often is a sequel of acute inflammation of the brain, and overheating, overfeeding or overexertion are said to predispose. It is a chronic disease in horses, without fever, but exhibited by a sleepy state with drooping lids and head; standing with legs in unnatural positions; slow or difficult movements; loss of skin sensation; eating and drinking in an unnatural way with food held for a long time in the mouth. Not incompatible with slow work for a long period.

CEREBRO-SPINAL MENINGITIS.—This attacks horses and mules chiefly in enzoötic or epizoötic form, but is occasionally sporadic. Cattle, dogs and goats are less frequently attacked. It is shown by sudden onset with fever; stupor; (rarely excitement); spasms of muscles of head, neck and limbs; opisthotonos; local paralyses and paraplegia.

EPIZOOTIC CEREBRO-SPINAL MENINGITIS is thought to have some etiological connection with fungi, as it occurs in wet seasons and localities and where mold grows on herbage and fungi in stagnant water. No specific organism has been discovered in the case of the horse, although in the human the meningococcus has been shown to be the sole cause of epidemic cerebro-spinal meningitis.

The disease may be divided into 3 forms according to its severity: 1. In the first the disease is ushered in with trembling, weakness and staggering gait. There is difficulty in swallowing and soon convulsions, opisthotonos, and paralysis and unconsciousness occur. The respiration is rapid and the pulse and temperature are variable. Blindness, delirium and coma end the scene in 5 to 48 hours. 2. In the milder form the chief symptoms are dysphagia and inability to switch the tail or for the patient to resist when one holds the tail up against the croup. The patient may improve after a few days or

grow rapidly worse and exhibit spasms, paralysis, rigidity, contractures of muscles, delirium and coma, with death in 8 to 10 days. 3. In this there is never more than partial paralysis affecting the limbs (paraplegia or monoplegia) or tail or muscles of deglutition, together with coryza and conjunctivitis.

General symptoms are absent. Recovery is usually complete, although it may be slow. (Circular 122, U. S. Bureau of Animal Industry.)

Treatment.—The treatment of these various disorders may be considered under one head, as it is much the same for all. They are very fatal diseases and treatment is usually unavailing and will hardly be economically worth while in many cases. Quiet, darkened, cool quarters, where the animal may freely move without getting cast, are best, and slings should be used when the animal can not stand. Ice to the head with the use of a physic are desirable in the early stage;—for the horse a physic ball of aloes, 8 drams, with calomel, 1 dram; or the use of eserine or barium chloride under the skin, if swallowing is impossible. Cattle should receive 1½ lbs. of Glauber's salts with ½ dram of croton oil.

When the pulse is frequent and strong, and the fever high, circulatory depressants, as venesection (1 to 2 gallons) and tincture of aconite (H. & C., ʒi–ii every 2 hours till pulse is reduced in force and frequency) are indicated. To assuage excitement and mania, morphine should be given under the skin (H., gr. v–viii), or chloral and bromide of sodium, by the mouth or per rectum, in boiled starch solution (of each, ʒi for horses). The diet should be of green fodder and gruels. Collargol is worthy of trial and may be given horses intravenously dissolved in 20 parts of boiled water in one or several doses of ½ to 1 dram each. Puncture of the spinal canal below the end of the cord has proved remedial in some cases in human medicine and certainly deserves trial in veterinary practice. A long sterile trocar and canula is entered between the 3rd and 4th or behind the 5th lumbar vertebrae until the subarachnoid space is reached and cerebro-spinal fluid escapes from the canula.

Besides relieving pressure in the cerebro-spinal canal and draining the canal, bacterial examination of the fluid may throw light upon the etiological cause.

In the event of abatement of acute symptoms, improvement in paralysis and acceleration of resolution may be assisted by ergot, fluidextract, and potassium iodide (H., of each $\frac{5}{8}$ ss tid by the mouth).

Strychnine and atropine are also useful in convalescence.

In the epizoötic cerebro-spinal meningitis a clean, dry (in view of moisture as a possible etiological factor) airy barn is desirable, and the avoidance of moldy food and stagnant water. The premises should be thoroughly disinfected, after recovery of the animals, with the application of 5 per cent. solution of chlorinated lime on the floors and in whitewash to the rest of the premises.

Endocarditis, Acute.

Acute endocarditis occurs in all the domestic animals, especially in horses, cattle, dogs and pigs. The acute infections—as articular rheumatism, septicemia, pneumonia, etc.—are responsible for it. Chorea, of humans, is very frequently a cause.

Symptoms.—Fever; dyspnea; rapid, irregular, weak pulse, associated with a violent palpitation of the heart at first, are characteristic. The heart sounds are often not clear and run together, and presystolic, systolic or diastolic murmurs develop over the region of the diseased valves—more commonly a systolic murmur over the right or left auriculo-ventricular valves. In malignant or ulcerative cases the fever is high and intermittent, and embolism of the kidneys (hematuria), of the brain (apoplexy), of the lungs (orthopnea) and of the extremities (lameness and paresis) is likely to develop. A contagious form is said to affect dogs. Auscultation of the heart may be facilitated by shaving of the hair over the cardiac region so that a stethoscope (human) may be used.

Treatment.—In acute infections—especially in acute articular rheumatism—the application of blisters over the heart and alkalies

(sodium bicarbonate) internally, together with absolute rest of the body, will aid in preventing the occurrence of endocarditis. In the early stage—but only if the heart's action is strong and tumultuous—tincture of aconite should be given hourly (H., ʒix; D., ʒviii) and an ice-bag applied externally till palpitation ceases. Morphine under the skin (H., gr. v; D., gr. ⅛ to ¼) may also be employed to quiet dyspnea. Digitalis does not act well in febrile conditions and is only indicated to regulate the heart when irregularity is marked. Small doses should be used (fluidextract of digitalis, H., ʒxxx; D., ʒi) with nux vomica (fluidextract, H., ʒi; tincture, D. ʒxx). The aconite should only be used at the very beginning and as soon as the pulse weakens stimulants are in order, as strychnine (H., gr. i; D., gr. 1/60 to 1/30), whiskey (H., ʒii; D., ʒi at frequent intervals), and quinine (H., gr. xxx; D., gr. ii–iii thrice daily), particularly in the malignant form. The diet should be very nutritious. (See Heart Disease.)

Enteritis in Horses.

GASTRO-ENTERITIS, ACUTE.—Distinguished from gastro-intestinal catarrh by the greater severity of the symptoms. Caused by irritant food, very hot or cold drinks, bacterial poisons, poisons of all kinds, foreign bodies, parasites, etc.

The symptoms in horses are those of gastro-intestinal catarrh intensified. Severe colic, tender belly, fever and rapid pulse, constipation succeeded by diarrhea, in the last stages, with nervous symptoms—as excitement or stupor—comprise the salient symptoms. In dogs, violent vomiting exists together with severe colic. Enteritis is one of the most fatal maladies in horses.

Treatment.—All food must be withheld while the acute symptoms last. Water with the chill removed should be given horses, while neither food nor drink are permissible for dogs while vomiting persists. Drastic cathartics are contra-indicated, and all cathartics in the horse when the disease is well established. In the first stages

in horses, castor oil (O*i*) in warm flour gruel with laudanum (℥*ss*) and fluidextract of belladonna (℥*i*) may be administered. Or calomel (℥*ss*) with powdered opium (℥*ii*) in ball or emulsion. To relieve pain and quiet peristalsis, opium in the form of laudanum (℥*iss-ii*) with chloroform (℥*ii*) may be given, every few hours in drench; or morphine may be given under the skin (gr. ii-iv). Bleeding or tinc. of aconite (℥*xx* every 3 hours) are applicable in strong subjects with high fever. Counter-irritation externally should be done by using hot turpentine stupes frequently changed.

Only cooked gruels of oatmeal, barley, or linseed, should be given horses in convalescence—followed by scalded or steamed oats and a little green fodder. Dogs may receive meat juice, broth, or equal parts of lime water and fresh milk.

Stimulants, as strychnine under the skin, and alcohol—in the form of brandy or whiskey—may be required in case of threatened collapse.

The use of saline infusions of normal salt solution (one level teaspoonful of sodium chloride to the pint of boiled water) is indicated when diarrhea has been profuse and exhaustive (see p. 287).

ACUTE ENTERITIS OR GASTRO-ENTERITIS OF CATTLE.—This begins with loss of appetite and rumination, dry mouth, tenderness in the right flank, feces constipated and covered with mucus or membranous casts of the bowels, followed by a fetid diarrhea. A form occurs with profuse hemorrhage from the bowels which may be due to irritant food or, if it lasts some days, is likely to be caused by parasites (intestinal psorospermosis).

The mucous or membranous form is not liable to be fatal if properly treated from the start. 1 lb. of Glauber's salts, with ¼ lb. of ginger, should be given. After the bowels are freed of irritant matter it is well to place 2 to 4 drams of sodium bicarbonate on the food, thrice daily, which tends to dissolve intestinal mucus. Laudanum with chalk (of each, 2 ounces) should be administered to arrest persistent diarrhea.

Counter-irritation externally with mustard paste or turpentine stupes is valuable in mucous or hemorrhagic enteritis. In the latter, tannic acid (5ii) should be prescribed every three or four hours with laudanum (5i-ii).

Ergotin (gr. 30-40 for adults; gr. 5-10 for young animals) may be injected under the skin also, if the bleeding does not soon cease. Strychnine subcutaneously, and alcohol by the mouth, are demanded to relieve exhaustion, together with the use of normal salt solution intravenously or under the skin.

Boiled milk, raw eggs, with wheat or barley flour gruels, and cooked roots, may be allowed.

Entropion.

This is a condition in which the edge of the eyelid is turned inward against the eyeball. It follows trachoma and contraction of scar tissue of the palpebral conjunctiva; it also may be due to wounds or burns. A spasmodic form may originate from photophobia. Entropion is more frequent in dogs. The chief harm produced by entropion is the rubbing of the eyelashes against the eyeball (trichiasis) and consequent inflammation of the cornea.

Treatment.—In mild cases, with a few inturned lashes, these may be pulled out at frequent intervals. The application of several coats of collodion may cause eversion of the lid when the collodion dries and contracts. In the lower lid the method of Theobald, by which the lid is everted by means of contraction of an eschar produced by caustic, may be used. A pencil of caustic potash, sharpened to a point by rubbing it on wet blotting paper, is employed. The lid is drawn away from the eyeball and held on the stretch. Then the point of the pencil is rubbed along a line about an $\frac{1}{8}$ of an inch away from the lid margin, and parallel with it for the greater part of its length, a number of times. After the caustic has spread out somewhat its action should be stopped before the lid is released by bathing it with equal parts of vinegar and water.

The eversion of the lid should occur within a few minutes. Among the operations for marked entropion the simplest is removal of an elliptical piece of skin from the lid and closing the wound by means of fine silk. It is well to also remove some of the underlying muscle.

Favus—Honeycomb Ringworm—Scall.

Favus is a disease of the skin caused by the fungus *Achorion schoenleinii* or *Tinea favosa*, which is almost identical with *Tinea tonsurans* of ringworm. It attacks more often the young of cats and dogs, man, horses and cattle, fowl, rabbits and mice. The head, belly, inner side of the thighs and extremities are the more common seats of the disease. It is characterized by the appearance of discrete or confluent, sulphur-yellow, cupped, circular crusts, and sometimes of gray, mortar-like crusts, with loss of hair and the development of a peculiar odor. In fowl the disease begins on the comb as white spots like mould, spreads to form a general crust on the comb, and thence over the body with crusts and loss of feathers. The disease is communicable from animals to man and from one species of animal to another, save in the case of the fowl fungus. In the cup-like depressions in the centre of the crusts may be found an almost pure culture of the mycelium and spores of the fungus.

Treatment.—The crusts must be removed by soaking with oil, or a mixture of soft soap and lard, and by washing with soap and water. The same parasitocides are used as for ringworm. Sulphur ointment is good, or ointments of naphthol, resorcin, thymol, tar, creolin, etc., in strength of 5 to 10 per cent. Salicylic acid in sweet oil (5 per cent.) or sulphur ointment are among the least toxic. Painting with tincture of iodine, and pure iodine crystals (1-8) with goose grease are also effective.

Fleas (*Pulex Irritans*, var. *Canis et Felis*).

These commonly attack the dog and cat. Frequent washing and grooming and clean bedding often changed, as of shavings or

sawdust, will prevent to a considerable degree their presence. The best remedies are Persian insect powder, applied to the dampened hair by an insect powder-blower, and a 2 per cent. lysol or creolin bath. In using the powder it is well to keep the patient outdoors for a time, as the fleas leave him after the use of the powder. In puppies and kittens the powder may be fatal if licked off. The lysol or creolin bath, followed by washing in plain water and drying, is perfectly safe. Carbolic soap is also effective against fleas.

Foot-and-Mouth Disease—Epizootic Eczema.

An infectious, febrile disease characterized by the eruption of vesicles in the mouth, between the toes and about the coronets, and on the udder and perineum.

This disease is peculiar to cattle, sheep, swine and goats, but is sometimes communicated to horses, dogs, cats, birds and other animals and to man. It spreads with alarming rapidity and may be conveyed by all the secretions and excretions of the sick, and by premises or even roads, railroads, stock and barnyards and pastures over which the sick have walked; by utensils, hay litter, attendants, animals and any objects coming in contact with patients.

The disease is acquired by man—and especially babies—chiefly through the ingestion of raw milk, buttermilk, butter and cheese derived from sick cows, and by milkers and attendants on sick animals. The cause of foot-and-mouth disease is a germ so small that it readily passes through unglazed porcelain filters and the organism has not yet been isolated. The period of incubation is 3–5 days; the duration of the disease about 8–14 days; and of an outbreak in a barn about 1–2 months.

Symptoms.—In cattle, sheep and swine there is a period of anorexia and loss of spirits for a few days, ending in chills and fever (as high as 106° F.) and the appearance in 24 to 48 hours of vesicles, increasing in size from a pea to a silver half-dollar or larger, on the tongue, lips, gums, dental pad, buccal mucous membrane and

muzzle. These later (24-72 hours) rupture and give rise to erosions or ulcers. In cows, vesicles arise on the teats and udder and perineum and the milk becomes thick and slimy or colostrum-like, of bad taste and shrinks greatly in quantity. A day or two after the eruption occurs in the mouth, vesicles are seen, accompanied by swelling, redness and heat about the coronets, heels and between the toes of cattle, while in sheep and swine the eruption is often confined entirely to these parts and does not appear in the mouth. There are also salivation, difficult mastication, lameness, mastitis, discharge from the eyes and nose, abortion, and great losses in flesh and milk.

While recovery is commonly the rule, yet in certain outbreaks, complications—as pharyngitis, bronchitis, foreign-body pneumonia, abortion, bedsores, general skin-eruption, gastro-enteritis, sudden heart or respiratory failure, septic infection of the feet and legs with cellulitis and purulent arthritis, necrosis of bones and loss of hoofs,—lead to considerable mortality. The loss in flesh and milk is said to average \$20.00 per cow, and the mortality in light outbreaks is 1 to 3 per cent.; in severe epizootics, 5 per cent. The duration of the disease is 10 to 20 days in mild attacks; extending to a year in the malignant type.

In man, with malaise and fever, appear vesicles on the lips, tongue, pharynx, sometimes on the face, hands (in milkers about the nails and interdigital spaces, with ulceration of these parts), feet, arms and chest. Heat, swelling and burning pain are present in the mouth, with salivation and painful mastication. There may be swelling of the glands about the jaw. The eruption may be general, and colic, vomiting, diarrhea and dysentery often occur and may prove fatal in infants.

In human adults the disease is not fatal.

In making a diagnosis one must eliminate cow-pox and horse pox, ergotism, mycotic stomatitis and foul foot in cattle. In none of these is a similar eruption seen in the mouth nor is general in-

fection of a large number of animals seen. Then an inoculation test—in which a little mucus from the mouth of a diseased animal is rubbed with the gloved finger upon the mucous membrane of the mouth of a healthy calf—will show typical vesicles in the inoculated animal in 24 to 72 hours in foot-and-mouth disease, but will not occur if the original disease is not foot-and-mouth disease.*

Treatment.—The only rational treatment is prophylaxis. Considering the certainty of widespread outbreaks among cattle, losses from the same and danger to man, the best course consists in strict quarantine of the infected premises and animals; in slaughtering both the diseased and exposed animals; and finally in cleansing and disinfecting the premises and all objects which may have become contaminated by the infection. Healthy animals should not be put into infected premises until one month after disinfection has been completed. Diseased carcasses should be burned or buried six feet deep and covered with quicklime. Infected manure should be burned or buried. Utensils and premises may be disinfected with 3 per cent. formalin or 5 per cent. chlorinated lime solution. The walls should receive whitewash containing 3 per cent. of formalin.

Foot-and-mouth disease is self-limited and in ordinary uncomplicated cases does not require much medical treatment. When this is permissible, the diet must be liquid or soft, as gruels, bran mashes, pulped roots and green fodder. A liberal supply of cool water should be constantly at the patient's command. The mouth may be swabbed frequently with hydrogen dioxide, or a saturated solution of boric acid or potassium chlorate. Ulcers in the mouth should be touched with a pencil of silver nitrate.

To avoid serious infection about the feet, the stalls must be clean and dry and supplied with clean bedding. And ulcers and suppurating foci must be washed with 2 per cent. lysol or creolin and horn removed over purulent areas. Over the affected region the continuous application of the following is recommended by

* The writer is indebted to Circular 141, U. S. Bureau of Animal Industry.

Williams:—lead acetate and zinc sulphate, each ʒii; carbolic acid, ʒi; water, 1 pint. Absorbent cotton or tow saturated with the solution may be kept bandaged over the coronets. Sheep may be driven through troughs containing the same solution, twice daily, or through solutions of 2 per cent. lysol or creolin. Tar and 10 per cent. ointments of creolin and lysol are also effective about the feet. If there is much sloughing about the hoof, a solution of carbolic acid in glycerine may be applied (1-16).

Both animals and persons with foot-and-mouth disease should be isolated and those caring for them. Milk from sick cows is unfit for food and the disease is very fatal for this reason in sucklings. Boiling the milk for 20 minutes will render it non-infectious, but at the same time, being altered in composition and often containing pus and products of mastitis, it can not be wholesome nutriment.

When the udder is attacked, frequent milking and application of glycerite of boroglycerine, together with treatment recommended for mammitis, are advisable.

Infection about the premises may last from one to several months; the bodies of the patients may harbor living infection for about two weeks after the lesions are scabbed over. After this latter period thorough cleansing and disinfection of the premises are indicated. One attack does not confer immunity. Inoculation of the saliva of a patient into a healthy animal by rubbing it into the abraded membrane of the mouth, or by introducing it under the skin on the point of a knife, will render an attack lighter and shorten the duration of an outbreak in a barn. But this is rarely permitted nowadays, as it only tends to spread the disease.

In the latest outbreak in the United States (1908) the cost of quarantine, destruction of animals, etc., was borne by the federal government and states, the government paying two-thirds and the state one-third of the cost. We must conclude by emphasizing the fact that medical treatment is not permissible in civilized communities.

Foot Rot in Sheep.

This is probably due to a specific organism and occurs enzootically in certain regions. It is readily communicated by contact, by pastures, infected quarters, litter, inoculation, etc. It may be prevented by segregating newly-bought animals for a period of three weeks, and by keeping healthy sheep away from infected places.

Briefly, it is characterized by ulceration and fetid discharge beginning in the interdigital space, accompanied by swelling above the coronet. The ulceration is progressive and separation of the claw in the interdigital space and exposure and necrosis of soft parts ensues until the claw is lost and the ligaments, tendons and joint are involved. Death often occurs in 5-8 months if untreated. It must be distinguished from foot-and-mouth disease. In the latter there is fever, several feet are apt to be affected, and vesicles often occur in the mouth.

Treatment.—Sheep with foot rot should be isolated from their fellows and given dry, clean quarters and bedding. In the earlier stages it is sufficient to drive them through a foot bath three times a week. This may be of various antiseptics. Among those found most useful are creolin (3 per cent.), or iron sulphate (4 per cent.), which has the advantage of being very cheap, and lime slaked with water and mixed into a creamy consistence.

When the cases are more severe, local treatment of the foot must be undertaken. When the horn has begun to separate from the sensitive parts, all the dead and separated horn must be cut away, to expose the diseased soft structures, and these must be treated by applying an antiseptic wash (2 per cent. creolin or lysol) and carbolic acid in glycerin (10 per cent), or iodine or creolin ointment (5 per cent). Fungoid growths may be cauterized with fuming nitric acid or phenol and the soft parts protected by tar. A protective dressing and bandage would be advisable if this were not difficult and too expensive.

Foot rot was formerly believed to result simply from bruising of the feet on sandy, gravelly pastures or roads; or to be due to exposure to wet and not to be contagious. While the contagious form is most common, there is apparently a variety due to traumatism, and beginning with inflammation of the sole of the foot with destruction of horn and soft parts at this point. In this case, removal of animals to dry, soft pastures; cutting away of loose horn and dressing the foot with tar; cauterizing fungous growths with pure phenol; and protecting the parts with a coating of varnish, will be indicated.

Foul in the Foot of Cattle or Canker.

This condition follows exposure of the feet to filthy floors and litter and may follow injury or tuberculosis. It is characterized by softening and progressive destruction of the sole of the foot with involvement and exposure of the sensitive parts beneath, and separation of the horny claw. It is accompanied by a fetid, cheesy-looking discharge escaping from between the soft and horny parts. Hypertrophy of the horn occurs hand in hand with its destruction.

Treatment.—Dry, clean litter and stabling must be supplied. All dead, separated horn must be cut away, and the diseased soft parts exposed for treatment. To these, apply an antiseptic solution (3 per cent. creolin or lysol); dress with tow and tar, and apply a bandage. To exuberant growths, cauterize with fuming nitric acid, or dust on powders composed of equal parts of iodoform and alum or tannic acid (Moussu), and bandage.

Foreign Bodies in the Alimentary Tract.

IN DOGS.—Various bodies may be swallowed, but the diagnosis is not positive unless the act has been seen or unless the object can be felt by palpation of the abdomen. Vomiting may be induced and the foreign body may be thus expelled, or may pass into the intestines and be expelled with the feces. It may not infrequently

become lodged just within the anus, when unsuccessful attempts at defecation should lead to examination per rectum. The treatment is purely expectant unless symptoms are pronounced and it is thought safer to remove the foreign body by abdominal section than to risk the dangers of lodgment and obstruction produced by the object. Feeding bulky food, as large quantities of bread and porridge, assists the expulsion of the foreign body. Emetics are usually needless, as vomiting is spontaneous, but a cathartic may be given 36 hours after ingestion of the body—providing it be a blunt object and has not appeared.

IN RUMINANTS.—Foreign bodies are often swallowed by cattle, sheep and goats. A positive diagnosis from the symptoms is impossible unless the act is seen. Soft bodies, as cloth and sand, cause chronic indigestion and may end fatally, while sharp objects often penetrate the rumen and reticulum and cause inflammation of neighboring parts—as the lungs, pleuræ, spleen, liver, pericardium, etc. Treatment is purely surgical.

Fowl Cholera.

This, with croup or roup of fowl, constitute their most common and severe disorders. Cholera is due to a specific bacillus and is communicated to healthy fowl by ingesting feces and portions of dead infected birds. All kinds of birds are subject to the disease and it tends to occur as an enzoötic and epizoötic disorder. The bird stands apart, dull and drooping, froths at the mouth or vomits and suffers from increasingly severe diarrhea. Then follow great weakness, dyspnea, stupor or convulsions, and the bird dies within one to three days. The incubation period is only twenty-four hours or thereabouts.

The mortality is often 90 per cent. but may be lowered by early treatment. One of the following is recommended by Friedberger and Fröhner. Acid is found to kill the cholera microorganism very readily. Acid hydrochloric dil., $\text{m} \text{v}$: or ferrous sulphate, gr. v ; or

tannic acid, gr. v;—one of these in an ounce of peppermint water, and the dose of either is one tablespoonful for fowl, or one teaspoonful for pigeons, hourly.

Prophylaxis includes: Taking healthy birds away from the infected premises. The dead should be burned and also all discharges from the sick. Before the henhouse or yard are occupied by the well the premises must be thoroughly disinfected by scraping and putting fresh dirt on the yard; by cleaning and washing floors, roosts and walls with boiling water; by fumigating with sulphur; by washing with 5 per cent. carbolic roosts, walls and floors; and finally by applying whitewash containing 5 per cent. carbolic acid.

Frost Bite.

Frost bite attacks particularly the extremities, and in horses the region about the coronet is affected. The damage is due to venous stasis and is—like that of burns—divided into three degrees: (1) of superficial inflammation (chilblain of man); (2) of vesiculation; and (3) in which deep destruction of tissue and gangrene occur. In the beginning, all forms should be treated alike in gradually restoring warmth to the part by rubbing with snow, or rubbing the part immersed in cold water. The temperature of the stall or premises must be low for the first twenty-four hours.

In the mild form a stimulating remedy, as the official turpentine liniment, may be rubbed into the part. With vesiculation and gangrene the treatment is similar to that in burns (see p. 41).

Glanders and Farcy.*

The name Glanders includes both glanders and farcy. Farcy refers only to the external form of the disease, although internal lesions always exist as well. Glanders is a disease of the horse, ass and mule, communicated readily to the dog, cat, rabbit and

* The writer is indebted to Circular No. 78, U. S. Bureau of Animal Industry on Glanders and Farcy for some matter herein.

guinea pig; with difficulty to sheep and goats; and not at all to cattle. Man is likewise susceptible. The disease is produced by a specific bacillus present in the discharge from the nasal and glandular erosions. These enter the body externally or through the respiratory tract in dust or in food. The disease is of variable course and usually fatal. The discharge is most virulent in acute cases. In chronic glanders or farcy the discharge may or may not be infectious.

Mode of infection.—An acute case near a sound animal in the barn or at work; contaminated feed, feed boxes, water, dust, harness, employees, and utensils. The unsuspected latent case may convey infection or may at any time become acute and virulent. The ass and mule are more susceptible to glanders, while chronic farcy is rarely seen in them. The chronic form of glanders becomes acute through debilitating influences. External infection is apt to become an acute form; that through food produces a chronic type.

Symptoms.—The local lesion begins by a proliferation of connective tissue (nodules) until the circulation is impeded, and breaking down and erosion occurs. The size of the lesion often depends on local irritation of harness, rain, mud, etc. In speeded horses the lungs are apt to become affected.

1. CHRONIC GLANDERS.—When the disease becomes clinically evident it is far advanced, and there are many cases which show no visible signs of the disease, while in others only one or more signs are present. Typical cases include nasal involvement, in which nodules (from the size of a shot to a pea) on the alæ, septum or turbinates, break down in ragged ulcers, having a punched out appearance and a dirty base. The nasal discharge is peculiar, of a gluey or starchy nature and more or less bloody and escapes from one nostril. According to the stage, are seen on the mucous membrane of the septum or about the alæ, the ulcers with thickened borders and yellow bases; or stellate, radiate, or elongated cicatrices. The lungs are often involved, when cough and irregular

breathing or broken wind are present. If the superficial lymphatics are affected we have

2. CHRONIC FARCY.—In this, nodes from the size of a bullet to a walnut appear on the skin—hot, elastic and sensitive. These break down into ulcers with irregular, overhanging edges and a grayish-dirty base. The discharge has been described as having the appearance of olive oil and the consistency of white of egg. Brownish-yellow crusts form. Finally the discharge becomes purulent and the ulcers heal by ordinary granulation. Farcy occurs on the lips, the side of the neck, lower part of the shoulders, inside of the thighs and outside of the legs. Radiating from the ulcers or chancres are hot, tender, corded lymphatics which may ulcerate. With lung involvement in glanders there is often sudden swelling of one hind limb, which is hot, tender and edematous from stifle to pastern. Serum exudes and then farcy buds appear. The testicles are often acutely inflamed. Glanders is very chronic and may persist for years. Loss of flesh, weakness and irregular fever are seen in advanced cases.

3. An acute form occurs primarily or more often terminates the chronic cases. In this there is a high fever (103° – 105° F.), rapid pulse and breathing, much nasal discharge, cough and farcy buds. There are mucous and sibilant râles, but no dulness over the lungs. Areas of bronchial pneumonia exist. Acute forms may become latent and apparently recover with cough and heaves and are a great source of infection, or eventuate in death within a few days or a fortnight.

An exact diagnosis is best determined by the use of mallein. The mallein test is most valuable in animals with a normal temperature, but in those with fever (over 102° F.) a large, persistent swelling occurring at the site of injection renders the existence of glanders probable. In many febrile cases the test is, however, unreliable.

To apply the test the temperature should have been taken for

several days. 1 c.c. of mallein (this is the usual dose but may vary with the method of preparation) is aseptically injected into the side of the neck. A rise of temperature of two or three degrees F. (in an animal of previous normal temperature) within 15 hours, together with a hot, hard, tender swelling at the site of injection, 5 to 10 inches in diameter, constitute positive proof of glanders. In the normal animal a swelling occurs at the site of injection without fever, but the swelling is much smaller and is disappearing at the end of 24 hours, while in the glandered animal the swelling is at its maximum at the 30th hour.

After several injections of mallein have been made the reaction may fail in the glandered animal. Indeed it is possible that patients may be thus cured of the disease, but this is not yet certain. Nocard has obtained several cures with mallein. It has, however, been apparently shown that healthy animals may be protected against glanders by mallein (Semner).

In suspected febrile cases of glanders the agglutination test—the effect of the serum of a glandered animal in causing agglutination of the glanders bacilli in an emulsion of the same—has proven reliable for diagnosis.

The most positive diagnostic test of glanders is the inoculation of some discharge from the nasal or farcy ulcer into a wide incision made with scissors, through the skin on the side of a guinea pig. Within a month the animal dies with characteristic lesions.

All horses which have been exposed to glanders, or those showing suspicious symptoms, should be tested with mallein. If they react positively they should be killed. If reaction does not occur they should be considered free from glanders. Animals which exhibit unquestionable clinical signs of glanders should be slaughtered without recourse to the mallein test. Glanders is practically incurable and the treatment of a case is unjustifiable under general conditions because of the danger of its transmission to man and other animals.

After isolation of a suspected animal—and a cow barn is a suitable place—the most thorough cleansing and disinfection of the infected premises must be undertaken. The harness, utensils, stable fittings, mangers, walls, floors and every possible object which may have been contaminated by discharge must be cleaned with soap and boiling water and 5 per cent. carbolic acid solution, and painted or whitewashed (containing 5 per cent. carbolic acid), and the premises thoroughly disinfected with sulphur or formaldehyde (see *Vet. Mat. Med.*, p. 725) and aired before they are occupied again by horses.

Glaucoma.

This is a condition where either the flow of lymph into, or the drainage from, the humors of the eye are impaired and the result is hardening of the eyeball and pressure on the vessels and nerve of the eye. In the acute form there is an active, painful congestion of the visible eyeball, with enlarged pupil which reacts poorly to light, shallow anterior chamber, a steamy-looking, somewhat anesthetic cornea, and, above all, marked hardening (increased tension) of the affected eyeball on palpation.

In the acute stage, a smart purge should be given, and the diet must be restricted, while a solution of eserine sulphate (gr. iv- $\bar{3}$ i) should be dropped on to the eyeball thrice daily. Iridectomy is, however, the most useful treatment between attacks, or during an acute attack if required. It is well to employ a milder solution between the attacks to sustain contraction of the pupil for some time (eserine gr. ss to $\bar{3}$ i).

A chronic form occurs in which there is failure of vision with increased intraocular tension on palpation, but without inflammatory signs.

Secondary glaucoma follows injuries and ulcers of the cornea, iritis, injuries of the lens and traumatic cataract, and intraocular growths. The treatment is mainly surgical, as iridectomy, extraction of the lens, or enucleation of the eyeball.

Glossitis.

Inflammation of the tongue is caused by all kinds of local irritation; rough handling of the tongue, sharp teeth, hot or irritant drenches, wounds, caustic alkalies, etc. That is, injury plus the invasion of pyogenic bacteria. Swelling and heavy coating of the tongue, salivation, difficulty in mastication, fetid breath, with fever, are seen. Abscess may ensue.

Treatment consists in superficial scarification in many places, if there is much swelling. The tongue should be frequently swabbed with equal parts of saturated boric acid solution and a solution of gum arabic or boiled starch or barley flour. Ice water should be kept before the animal. If deglutition is interfered with, food may be given the horse through a stomach tube introduced into one nostril, or rectal feeding may be undertaken.

In glossitis due to caustic alkalies, swabbing frequently with a solution of vinegar and water (1-2), will afford relief.

In wounds and lacerations of the tongue all tissue should be saved, so far as possible, and suturing employed as indicated.

Abscess demands incision.

Heart Disease, Chronic.

(a) VALVULAR DISEASE, CHRONIC ENDOCARDITIS.—Valvular disease of the heart arises from sclerosis of the valves, resulting in narrowing of their orifices or imperfect closure of the valves. The effect upon the circulation is to cause underfilling of the arterial, and overfilling of the venous systems. This follows because of obstruction in the heart (stenosis) to flow of blood from the venous to arterial systems; or to flowing back of the blood through leaky valves from the arterial to the venous side of the heart. Nature attempts to remedy these defects by bringing about increased muscular development of the heart, or hypertrophy. Hypertrophy is often sufficient to prevent symptoms, when "compensation" is established, and drug treatment is unnecessary. If compensation

fails, symptoms appear and medical care becomes imperative. Valvular disease is common to all animals, particularly so to the horse, dog and pig. Acute endocarditis, secondary to the various infections, is often the beginning of the chronic form, but over-exertion, atheroma, etc., are also etiological factors.

Symptoms.—These indicate loss of compensation (dilatation) and consists in dyspnea and weakness on exertion, palpitation with rapid (rarely slow) and often irregular pulse, cyanosis, dropsy and edema, and valvular murmurs. The murmurs are systolic in time in stenosis, and diastolic in incompetency of the various valves. The auriculo-ventricular valves are those most often affected. The occurrence of a valvular murmur does not, however, indicate organic valvular defect, as murmurs are heard in anemia, during exhausting disease, etc. (relative incompetency). In such cases the general symptoms following loss of compensation are absent. The use of the stethoscope (see Acute Endocarditis) will greatly facilitate diagnosis.

(b) ENLARGEMENT OF THE HEART, HYPERTROPHY AND DILATATION.—Under this head we consider simple hypertrophy, a heart with thickened walls; hypertrophy with dilatation, a heart with thickened walls and dilated cavities (the common form); and simple dilatation, a heart with large cavities and thinning of the walls. The symptoms and treatment differ considerably according to the pathology. The etiology embraces valvular disease, over-exertion, myocarditis, pericardial adhesions, plethora and obstructions in the circulation, especially lung disease, and arteriosclerosis. The disease is more often seen in horses and old dogs.

In simple hypertrophy there may be no symptoms and a regular, full, strong pulse with enlargement of the cardiac area of dulness. Or palpitation may occur with a loud, strong, prolonged first sound and strong, clear second cardiac sound. With dilatation and hypertrophy the impulse of the heart is forcible and abrupt. As hypertrophy fails and dilatation ensues the pulse becomes irregular

and intermittent. Dilatation is also shown by the heart's impulse being seen and felt over a large area, by the sounds becoming short and weak and the action irregular and intermittent with the existence of a weak, quick, irregular pulse. Palpitation, shortness and difficulty of breathing (cardiac asthma) on exertion or movement, the pulsations of the heart not corresponding with those of the artery, dizziness, twitching, cyanosis, edema, and dropsy, are additional symptoms characteristic of cardiac dilatation. Heart murmurs may be present owing to dilatation and incompetency of the valves or to complication with valvular disease.

(c) MYOCARDITIS, ACUTE AND CHRONIC.—Under this title are included many forms of degeneration of the heart muscle, cloudy swelling, fatty, amyloid, calcareous and fibroid in nature. Direct extension in endo- and pericarditis, or invasion of bacteria in general infectious diseases, commonly give rise to the acute forms, which may eventuate in the chronic. Disease of the coronary arteries (arteriosclerosis), with obstruction to the cardiac circulation, is another frequent source of chronic myocarditis.

Symptoms.—These indicate failure of the heart muscle, as feeble, rapid, irregular (sometimes infrequent) pulse, shortness of breath and edema without valvular murmurs and with dilatation. Palpitation may sometimes occur, also general weakness, trembling attacks, and dizziness. Diagnosis is very difficult, except in heart failure following infectious disease, as valvular murmurs may be present, and, on the other hand, no symptoms occur until the animal drops dead.

Treatment.—The treatment of the various forms of chronic heart disease enumerated is dependent upon the predominant signs and symptoms. The symptoms of chronic valvular disease are due to failure of hypertrophy and compensation, so that the treatment of this disorder is identical with that of enlargement of the heart, when dilatation prevails over hypertrophy. Simple hypertrophy, with violent action of the heart, can be best subdued with tincture

of aconite (H., $\mathfrak{z}i$) and spirit of chloroform, $\mathfrak{z}i$; D., \mathfrak{m}_{v-x} tinc. aconiti with $\mathfrak{z}ss$ of spirit of chloroform given in water every three hours. This remedy may be prescribed in palpitation, when the cardiac pulsations are strong and the sounds loud and clear, but if the apex beat is feeble and the sounds muffled, then digitalis or other heart stimulant is in order. The addition of tincture of belladonna to the aconite may increase its efficiency in palpitation (H., $\mathfrak{z}iii$; D., \mathfrak{m}_{v}).

Digitalis is the most important drug in chronic heart disease. The fluidextract may be used (H., $\mathfrak{z}ss-i$; C., i ; D., \mathfrak{m}_{i}), or the tincture (D., \mathfrak{m}_{v-x}) given twice or thrice daily. Digitalis may often be combined to advantage with strychnine sulphate in solution (H., gr. $i-ii$; D., gr. $1/120$ to $1/30$).

As substitutes for digitalis, we have the tincture of strophanthus (H. and C., $\mathfrak{z}iii-vi$; D., \mathfrak{m}_{x-xx}) or caffeine (H., $\mathfrak{z}i-ii$; D., gr. $ss-iii$), which do not cause the vascular spasm produced by digitalis and may be used alternately or as substitutes for digitalis. They are generally not so efficient, however. When the vascular tension is high, nitroglycerin (H. and C., $\mathfrak{z}ss-i$; D., \mathfrak{m}_{i}) may be combined with digitalis to offset its effects upon the vessels.

Morphine injected under the skin is the most useful agent in relieving dyspnea (H., gr. v ; D., gr. $1/8$ to $1/2$).

The occurrence of dropsy calls for the use of purgatives and diuretics. For the horse, an aloes ball; cattle, salts; and for dogs, compound jalap powder, $\mathfrak{z}ss$. Digitalis is a good diuretic, but for larger patients it may be given with potassium acetate, $\mathfrak{z}i-ii$; for dogs, a combination of digitalis and squill, each gr. i , with calomel, gr. ss , in pill is of advantage administered thrice daily.

When the heart is dilated and engorged with blood, as indicated by severe dyspnea, cyanosis and great disturbance of rhythm, no measure is so life-saving as venesection (see p. 283).

In old animals, and otherwise when atheroma and fibroid degeneration of the heart may be suspected, sodium iodide, given for

a considerable period thrice daily, may prove of benefit (H., ʒi; D., gr. x), but in the larger doses entails very considerable expense. It may be given to dogs in capsule; to horses in solution.

Rest is of the greatest importance in heart disease and alone will accomplish more than any drug. Diet is also of much moment. It should be highly nutritious and in concentrated form so that distension of the digestive canal will not embarrass the heart. Feeding at frequent intervals, with water between meals, should be the rule.

In myocarditis the same treatment applies as that advised for valvular disease—rest, diet, heart stimulants, iodides, etc. Reduction of fat in the obese should be attempted. With an infrequent pulse, digitalis is contra-indicated and in its place camphor (H., ʒi; D., gr. iii-x), ether, alcohol or aromatic spirit of ammonia (of either, H., ʒi-ii; D., ʒss-i) should be given.

When anemia is present the administration of iron is of prime importance (tincture of the chloride, H. and C., ʒi-ii; D., ʒ v-x).

Hematuria or Bloody Urine.

This is merely a symptom of trouble in any part of the urinary tract. Thus blood issuing from the urethra just previous to micturition arises commonly from the prostate or urethra. In bleeding from the bladder, light-red blood either follows the passage of clear urine, or else the urine, slightly tinged at first, grows more and more bloody during micturition.

When the kidney is the source of hemorrhage, the blood is uniformly mixed with the urine; that is, the urine is uniformly discolored (occasionally of a smoky or bright-red color) during its passage. In human medicine the use of the cystoscope may make clear the source of bleeding, by direct inspection of the bladder and ureteral orifices.

Causes.—Inflammation (acute nephritis, pyelitis, cystitis, and

prostatitis), poisons, growths, calculus (in the kidney, bladder or prostate), mechanical violence (fracture of pelvis may cause bladder hemorrhage), general infections, renal tuberculosis, parasites (filaria in blood and *Eustrongylus gigas*), blood disorders, as hemophilia, pernicious anemia, etc. Hematuria must be distinguished from hemoglobinuria by the microscope. See also hematuria in cattle.

Treatment.—The treatment naturally depends upon the cause. Until this is determined, treatment will largely hang upon the severity and apparent origin of the bleeding.

The following measures are employed with the simple purpose of arresting hemorrhage. When severe bleeding occurs from the kidney, ice poultices may be applied to the loins and ergot injected under the skin (H. & C., $\bar{3}$ ss-i; D., gr. ii-v of ergotin). Or gallic acid may be given internally with ergot in capsule (H. & C., gallic acid, $\bar{3}$ iv; D., gr. v; extr. of ergot, H. & C., $\bar{3}$ i; D., gr. v). In hematuria of acute nephritis, small doses of tincture of cantharides may be given after the first week. Thus $\bar{3}$ ss may be given to horses, and \bar{m} i to dogs, with an equal amount of fluidextract of *cannabis indica*.

Vesical hematuria may be attacked by the internal remedies noted above, and also more effectively by bladder injections. Among the latter, adrenalin chloride in 1-5,000 solution is the most efficient. The injection of water at 120° F. is also serviceable, or of alum ($\bar{3}$ ss to 1 pint of water), but the clots formed by alum may decompose and lead to cystitis.

If the injection of adrenalin into the bladder arrests the hematuria, then the source of the blood is discovered. Urethral hemorrhage may be stopped by passage and retention of a catheter.

Hematuria in Cattle.

The occurrence of free blood in the urine is a symptom of inflammation and injury in any part of the urinary tract. It must

be distinguished from hemoglobinuria caused by the parasite *Piroplasma bigeminum* (see p. 114). There appears to be a specific form of red water in cattle which occurs enzoötically in animals at pasture in low-lying regions, attacking chiefly the young and females. Oxen, sheep and goats are rarely sufferers. Unlike that caused by the piroplasma, it is a chronic disease with the appearance of true blood in the urine, and accompanied by ulceration of the urinary bladder, probably caused by an unknown parasite. It begins with frequency and turbidity of the urine, which later becomes red or reddish-brown. It progresses, but often with long intervals of freedom from bloody urine. The patient grows gradually weaker and paler and has dropsical swellings, while blood is often seen about the hair at the lower commissure of the vulva. The urethra often is blocked with clots, in the male, so that the bladder is distended and perhaps ruptured. A fatal result is the rule, but rarely sooner than two years.

Treatment.—This is of little avail except to send patients to an uninfected region. The drainage of pastures and fertilizing of them with superphosphates and lime are of value as preventive measures.

Hemoglobinemia, Hemoglobinuria, Azoturia, Black Water, etc., in Horses.

This disease appears to be an acute degeneration of the muscles of the loin and hind quarters, with general toxemia from the entrance of decomposition-products (hemoglobin and methemoglobin) into the blood and urine. It develops when the horse is put to work following a period of rest and generous feeding in the stable (Monday morning disease). The first signs are stiffness, lameness and weakness in the hind legs. The animal sweats, moves unsteadily, and usually ends by falling. The muscles of the hind quarters are hard, tense and tender to the touch, and there is commonly retention of dark colored urine.

Treatment.—The treatment consists first in transporting the patient in the shortest space to the stable, where he should be supported at once in slings in a box stall. The bladder must be emptied by pressure on the bladder, through the rectum, or by catheter.

Further therapeutics are directed to rid the blood of toxic products. This may be accomplished by rapid purgation, by exciting the skin and kidney actively, and, most rapidly, by bleeding followed by intravenous saline infusions. Barium chloride (gm. i-ii in 3i-ii of water) may be given intravenously; or gr. i-ii of eserine sulphate may be injected under the skin to induce purgation. The action of the skin is excited by the use of hot blankets. The renal function is stimulated by supplying only sloppy food and by causing warm, normal salt solution (one level teaspoonful of salt to the pint of water) to flow from a slight elevation in a small stream into the rectum so that it may be absorbed.

Bleeding (p. 283) is especially indicated when the respiration is labored. In strong, full-sized animals, 4 to 6 quarts may be removed, and this amount of blood replaced by normal, sterile, salt solution (p. 287).

Cerebral symptoms only follow from nephritis consequent upon the effects of the toxic products upon the kidneys. The urine often contains many casts. Sedatives, as chloral or morphine, may be used to quiet restlessness. If there is heart weakness, give strychnine (gr. i to ii) under the skin.

The food should consist of bran mashes, green food, carrots and a little hay.

The disease may be averted by working or exercising animals every day and by giving only bran mash, hay, roots, etc., on days when the animal is not at work.

Hemoglobinuria of Cattle.

This is another name for Texas Fever, Black Water, Red

Water, Dry, Yellow, or Bloody Murrain, Bovine Piroplasmosis, Splenic Fever, Protozoan Fever, etc.

TEXAS FEVER.—An infection of the blood of cattle with protozoa (*Piroplasma bigemimum*) transmitted to the affected animal by means of the cattle tick, *Boophilus annulatus*. Only cattle are susceptible to Texas fever, although other animals harbor the tick. The disease is characterized by an acute and chronic form. The acute type attacks non-immune Northern and susceptible Southern cattle in hot weather. In the acute form, fever (temp. 107°–108° F.), depression, loss of appetite and rumination are seen. The animal lies down, or stands in a dejected state with arched back from pain in the kidneys and liver. The appearance of bloody urine, due to disintegration of the red corpuscles by the parasite and leading to hemoglobinuria, is most characteristic. The color of the urine ranges from pinkish to black and rarely abnormal pigmentation is absent. Albumin is usually present and the specific gravity is raised from 1010–20 to 1030–40.

The blood is pale and watery and the parasite is found within the red corpuscles. A drop of blood spread evenly over a cover glass in the usual manner and dried and fixed over a flame and stained in a 0.5 per cent. methylene blue solution shows pear-shaped or round bodies, two or three in number, in the old corpuscles. Cerebral symptoms, as evidenced by staggering gait, delirium and blindness, are sometimes present. Abortion and arrest of lactation are frequent. Death occurs within three or four days, preceded by a great fall of temperature. In non-fatal cases the fever drops gradually and convalescence is very prolonged.

The chronic or mild type is seen in non-immune animals in the fall and in the partially immune animals in the Southern states at any time. There is fever, the temperature ranging from 103° to 105° F. Loss of appetite and rumination, with constipation and albumin in the urine, are present. The blood is pale and the mucous membranes anemic, but blood seldom appears in the urine. Death

rarely occurs, but emaciation is often extreme. A relapse, or a chronic form of the disease, may come on from three to six weeks after apparent recovery from an acute attack.

The period of incubation after exposure of susceptible animals to the tick varies from thirteen to ninety days. This depends on the fact that the tick lays its eggs on the ground and the hatching period varies with weather conditions. The mortality is 90 per cent. in adults in hot months, and 50 per cent. in fall and winter. In young animals the disease is much less fatal and under nine months it is rarely fatal.

Texas fever must be differentiated from anthrax and blackleg. In Texas fever ticks are found on the hide. Calves are exempt, and only adult cattle are affected; whereas all species of animals are attacked by anthrax. The mucous membranes are pale, but congested in anthrax. The liver is large, yellowish and mottled in Texas fever; but large and darkly congested in anthrax. In blackleg, the victims are young animals six months to two years. The characteristic crackling swellings and gas under the skin are present, while the liver is unaffected in blackleg.

Treatment.—Preventive treatment is the only satisfactory form. Medicinal therapy is of little avail save in chronic cases. Here quinine sulphate is given in solution (average dose, $\bar{3}i$) four times daily, for a week or so. Whiskey ($\bar{3}ii$) and fluidextract digitalis ($\bar{3}i$) may be given thrice daily for depression. Epsom salts are indicated in constipation, and during convalescence a powder of reduced iron ($\bar{3}i$), with powdered nux vomica ($\bar{3}i$) and gentian ($\bar{3}iv$), may be given on the food thrice daily. The patient should have all ticks removed and be kept in a tick-free enclosure and fed on nourishing diet.

Prevention.—For cattle in infested districts the following methods are preventive :

1. For small numbers of cattle: Picking, scraping with curry-comb, or brushing the ticks off three times a week, especially from

under the belly, about tail and udder, and inside legs, from June 1st to November 1st. This will save animals and also protect pastures from mature ticks, fertilized and ready to lay eggs on them.

2. Smearing the legs and sides of cattle twice weekly with one of the following: Beaumont crude petroleum; or a mixture of 1 gallon each of cottonseed and kerosene oil containing 1 lb. of sulphur, put on with a brush, or sponge, or syringe. Or spraying the animal (tied up) with sprinkling nozzle or fruit tree sprayer with Beaumont oil, or 5 per cent. solution of coal tar dips, is useful. It should be continued from June to November.

3. Large numbers of cattle are treated by dipping in a vat especially constructed for the purpose (see Farmer's Bull. No. 152, U. S. Bureau of Animal Industry). Beaumont crude petroleum oil is used for the bath. Dipping is not to be done until after the winter coat is shed and animals must stand four to eight days to drain after dipping before shipment.

4. Ticks mature on cattle for twenty to forty-five days and then the female spends three weeks or more on the ground in laying and hatching eggs. In the "soiling method" the cattle are placed in a small tick-free enclosure and cleaned, and, at the end of three weeks, removed to another similar enclosure. At the end of another three weeks they are examined, and, if free from ticks, may be placed in a non-infested pasture. If not, they are placed in a third pen for two weeks more. By this time all the ticks originally on the cattle will have dropped off and no new ticks will have got on them since they were not in any pen long enough for eggs to have hatched and young or seed ticks to have gotten on them. The pens must be disinfected before being used again, and any hay fed must come from non-infested fields.

Freeing Pastures.—This is done by the following methods:

1. Cattle should be removed from a tick-infested pasture on September 1st and cleaned of ticks and then be placed on a non-infested pasture where no ticky animal has been for six months,

and where they will not come in contact with ticky animals. Then the original tick-infested pasture is not to be restocked until April, when it will be tick-free. This happens because ticks will all have hatched before this date, and unless they can fasten on an animal they will die.

2. Cultivating land for a year, without permitting any ticky animal thereon, will rid it of ticks.

3. Burning over ticky pastures in spring and fall and keeping off tick animals from the land will free pastures of ticks.

4. Feed Lot Method. Fence off three enclosures within a field of maize, millet or other forage. It is well to turn up a furrow against the bottom board of both sides of a fence to keep ticks from escaping. Then ticky cattle on June first are put in these inclosures in rotation, staying in each twenty days. All the ticks will have then fallen off, and the cattle do not stay in any one inclosure long enough to be reinfested by young or seed ticks. The inclosures are then plowed and their edges sprayed with petroleum. The cattle in going from one lot to another should pass on cultivated soil and they must not be fed hay from tick-infested pastures. Neither must water come from such a pasture.

Immunization of Susceptible Cattle.—If stock is to be sent into a tick-infested region, young animals, six to fifteen months old, may be immunized by either placing a few (25 to 50) virulent young ticks upon them or by injecting 1 to 3 c.c. of defibrinated blood from an immune animal into the one to be immunized. The immune animal is one in good health but infested with fever ticks, or one which was so infected the previous year. The injection is made subcutaneously into the disinfected skin of the shoulder—1 c.c. for an old animal; 2 c.c. for a two-year-old; and 3 c.c. for animals nine to fifteen months old. An attack of Texas fever is produced in which the mortality is 3 per cent., but 7 per cent. more are not rendered immune. If the fever is slight after the first injection, another is made in forty days, increasing the dose 50 per cent.

Possibly it may be necessary to make a third injection after a similar interval. Three to ten days after the injection the fever begins and lasts six to eight days, and, in about thirty days, is followed by a milder attack. By the end of forty days the animal is well and may receive the second injection if necessary. The best results are obtained by immunizing six to fifteen month-old animals in the fall or winter. For a full account of the tick and Texas fever the reader is referred to the admirable monograph of Mohler (Bull. No. 78 U. S. Bureau of Animal Industry), to which the writer is much indebted.

Hemophilia.

Hemophilia is a rare condition seen in the horse, in which there is a congenital tendency to uncontrollable hemorrhage owing to slight wounds and surgical operations, as incisions or castration. One can not foresee and therefore prevent it.

Treatment.—The treatment should consist in the application of 1-1,000 adrenalin solution, by compress, to the part; or the subcutaneous injection of the same, diluted with nine parts of sterile, normal, salt solution, into the part to almost any amount. Among other less valuable external measures are the use of very hot or cold water, compression, the application of pure tannic acid or solution of ferric chloride, and last, and least desirable, actual cautery and ligation. Internally, calcium chloride (H., ʒii; D., gr. ii) may be given in solution every two hours to increase the coagulability of the blood. For the same reason a 5 per cent. solution of white gelatin is useful internally or by rectum. Fluidextract of ergot (H., ʒi; D., ʒi) may also be given in water by the mouth.

For use of blood serum in treatment, see treatment of **Hemorrhage** (p. 120).

Hemorrhagic Septicemia—Deer and Cattle Disease—Pasteurellosis Bovina.

This is a specific septicemia attacking horses, cattle, deer,

buffalo and other animals, occurring in epizoötic form and having a very great mortality—80 to 90 per cent. It is due to *Bacterium bovisepiticum*—an ovoid, nonmotile, organism of the cocco-bacilli group like that of chicken cholera and swine plague. It is thought to enter the body through abrasions of the skin or digestive mucous membrane and arises more often in swampy localities and in the spring.

Symptoms.—These are commonly divided into three groups—the cutaneous, pectoral and intestinal—although they are variously combined and may all occur in the same individual. More often the cutaneous form terminates in the intestinal. The symptoms are generally due to serous and bloody extravasations into various parts, as into the subcutaneous, submucous and subserous tissues, and into the glands, muscles and viscera.

The cutaneous symptoms are more frequent. Swelling of the face, submaxillary region (glands), neck, dewlap and lower limbs distort the appearance. The swelling is board-like, hot and tender and does not pit. The tongue is swollen, purple, and mucous folds may be seen on its sides as it protrudes from the mouth. Dyspnea and suffocation may occur from swelling of the mucous membrane of the respiratory tract. The nasal membrane is brownish red and covered with petechiae and there is a bloody discharge from the nose. Salivation, stomatitis and disinclination to eat together with high fever are seen. Death commonly ends in the intestinal form with colic, the animal getting up and down and groaning and having dysentery with much tenesmus and passage of casts of the bowel and mucus. The pectoral form resembles pneumonia and is sometimes seen alone. Death occurs in from six hours to as many days and rarely the disease does not terminate until many weeks.

Diagnosis.—External swellings are seen in anthrax, blackleg and malignant edema. In anthrax the spleen is swollen, the blood is tarry and non-coagulable post mortem; malignant edema usually starts from a wound and the swellings crepitate and often have a

fetid discharge; blackleg occurs among young animals generally and the swellings crepitate. From contagious pleuropneumonia the disease may be distinguished because of absence of the swellings and dysenteric symptoms. Also while nervous symptoms sometimes occur in cerebro-spinal meningitis, as staggering gait, trembling and a wild-eyed appearance, the local swellings are absent and paralyses.

Prevention.—No successful treatment is known, so that we must at present content ourselves with preventive measures. These include segregation of the sick and separation of new cases as often as they occur, with transference of the well to new corrals—if possible—whenever new cases are found.

Animal should be killed as soon as the diagnosis is certain and their bodies buried six feet deep and covered with quicklime. The premises occupied by the sick must be thoroughly cleaned and disinfected (p. 282).

Hemorrhage.

Certain general measures are useful in serious hemorrhage which can not be immediately arrested by surgical means. Quietude is particularly desirable, both of the patient and of the affected part. This may be secured by the use of opium and is specially useful in hemoptysis and intestinal bleeding.

The injection of normal salt solution (one level teaspoonful of sodium chloride to the pint of sterile water at 105° F.) into a vein or under the skin, is indicated in every case of serious loss of blood as soon as all means are taken to stop the hemorrhage.

Increasing the coagulability of the blood is also beneficial when the tendency to recurring hemorrhage exists. Thus, white gelatin, ℥vi; calcium chloride, ℥ii; and water ad Oii may be used in enema, at body heat, after the bowel has been washed with a cleansing soap-suds injection. Of this solution ℥10–16 are suitable for horses; ℥ 1½ for smaller animals, and repeated every five hours till

effective. This same solution may be injected deep under the skin, providing the gelatin has been sterilized by boiling the solution one hour. While its action is thus made more certain and rapid, there is some danger of producing abscess at the site of injection. When hemorrhage can be attacked by direct application to its source, adrenalin is preëminently the best hemostatic agent—apart from surgery.

The subcutaneous injection of fresh serum—serum less than two weeks old—has recently been found the most efficient agent to arrest persistent hemorrhage where surgical means are not suitable. Horse and rabbit serum are most appropriate. Bovine serum appears to be toxic for most other animals and humans. Serum may be obtained by incision of the jugular vein in the horse under aseptic precautions and introduction of a canula into the vein. The blood is withdrawn into a sterile vessel. The vessel is kept covered on ice for 12 hours and the serum is then simply poured off from the clot.

The blood must not at any time be agitated as then the serum will not be clear. Serum contains some body which tends to increase the coagulability of blood, when the serum is fresh. Antidiphtheretic serum might be used, but it has to be kept at least six weeks before it is used so as to determine its freedom from tetanus infection through animal inoculation. When serum is injected subcutaneously it may be given at frequent intervals, if desired, but these intervals must not be longer than ten days, or an animal may be killed owing to increasing sensitiveness (anaphylaxis). The dose of serum for small animals would be about 2 to 4 drams; for large animals about 4 ounces.

GASTRIC AND INTESTINAL HEMORRHAGE.—These may be caused by foreign bodies; parasites (bots, tape-worm, etc.); ulcers; new growths; external violence; dysentery; enteritis; obstruction to the venous circulation in heart, lung and liver diseases; general

disorders (purpura, anthrax, septicemia), and piles (in swine and dogs; occasionally in horses and cattle).

Symptoms.—In hematemesis dark blood is sometimes vomited. This is pathognomonic, but if the blood is not vomited it passes through the bowels and is indistinguishable from that derived from the intestines. In bleeding from the bowels (enterorrhagia) the blood is usually black and tarry-looking and escapes with the feces. If bright red, the hemorrhage is usually from the rectum or lower bowel.

Treatment.—The application of hot blankets externally, ice water internally and bandaging the limbs is desirable. In hematemesis, adrenalin by mouth (℥ss for horses; ℥ss-i for dogs, of the 1 to 1,000 solution) is probably the most successful remedy. Monsel's solution or salt in pill (H., ℥i; D., gr. iii) may be repeated each fifteen minutes for one hour, if adrenalin does not relieve. Tannic acid, hamamelis and ergot (by the mouth or subcutaneously) are also suitable hemostatics.

Tannic acid with opium, or Monsel's salt, as advised for hematemesis, are as valuable in enterorrhagia. If the bleeding is slight, then turpentine in emulsion with acacia is useful (H., ℥ss; D., ℥x). If bleeding takes place from the rectum, local applications are most efficient as enemata—1 pint for large animals; ℥ii-iv for small patients. Among these we can commend the following: adrenalin (℥ss of the 1-1,000 solution in 1 pint of cold water), Monsel's salt or alum (℥iii to Oi of either) or tannic acid (℥v to Oi).

NOSE-BLEED—EPISTAXIS.—This symptom may be caused by injuries to the nose, intense inflammation of the mucous membrane, septal varicosities, angioma, ulcer, polypus or new-growths, violent exertion, sneezing, passive congestion of heart or lung disease, cerebral congestion, blood disease—hemophilia, purpura, leukemia, and anthrax and glanders. In dogs a parasite (*Uncinaria trigo-*

nocephalus) leads indirectly to nose-bleed, and this—especially if enzoötic—should call attention to the disease.

Bleeding usually occurs from one nostril and is not accompanied by cough or frothiness as in hemoptysis.

Treatment.—Injection with a syringe or from a tunnel and rubber tubing of adrenalin in normal salt solution (1 to 5,000), or packing of the nasal cavity with gauze soaked in the same, is most efficient. The packing should be removed in twenty-four hours. When this is unobtainable the use of vinegar diluted with two parts of water may be tried, or tinc. of ferric chloride or a concentrated solution of tannic acid or Monsel's solution. Insufflation of dried alum or tannic acid is less efficient than packing the nostril. In slight trickling hemorrhage, hamamelis or turpentine may be given internally. Gelatin and calcium chloride (as above) are indicated in conditions of disordered blood.

HEMORRHAGE FROM THE LUNGS—HEMOPTYSIS.—This occurs in the horse following violent exertion, and during glanders (ulceration in larynx and bronchi) and congestion of the lungs. In cattle, as in man, tuberculosis is the most frequent cause. Parasites (*S. armatus*), new-growths, aneurism and foreign bodies are also occasional sources.

Symptoms.—The blood appears frothy and bright-red, from the nose and mouth, and is accompanied by difficult breathing and cough, and signs often exist in the lungs.

Treatment.—Quietude is secured by chloral and sodium bromide (H., \mathfrak{z} i of each; D., chloral, gr. v to x, with bromide, gr. x to xx), or morphine under the skin. Gallic acid may be given by the mouth (H., \mathfrak{z} ii; D., gr. x) every fifteen minutes during the hemoptysis and then every four hours. Inhalation of Monsel's solution (\mathfrak{z} ss to Oii) is of some service.

To obviate a recurrence, calcium chloride (H., \mathfrak{z} ii; D., gr. ii) may be given in solution every two hours, or the mixture with gelatin (noted above) may be used in enema. Complete rest for the

patient after hemoptysis is essential to avoid the occurrence of pneumonia, and tinc. of aconite (H., $\mathfrak{m}x1$; D., $\mathfrak{m}v-x$) may be administered thrice daily to depress the circulation.

Ice poultices applied to the side of the chest during the hemorrhage are most effective hemostatic agents, and ice applied to the scrotum and vulva is said to also have a similar influence through reflex action.

POST-PARTUM HEMORRHAGE.—FLOODING.—(See p. 209).

Hernia.

UMBILICAL AND VENTRAL.—The symptoms of hernia in general may be briefly summarized as follows: A soft swelling (usually at special sites, as the umbilicus, inguinal canal or scrotum), which ordinarily will disappear on pressure, unless the hernia is strangulated or incarcerated; on auscultation, gurgling sounds may be heard, and, on percussion, tympany may be elicited, if a loop of bowel is present; the edges of the ring or opening into the belly may be felt; and finally, if the hernia is strangulated, there will be severe colic and constipation, and, in dogs and pigs, vomiting.

Umbilical hernia is more commonly seen in the new-born. In many cases recovery occurs spontaneously within a few weeks without treatment of any kind—especially in calves and pigs.

Palliative Treatment.—A pad of felt may be held over the hernial protrusion by a belt of webbing about the body, and the belt kept in place by a strap stretching to a collar about the neck and a crouper under the tail. This method may be sufficient in the young until nature has closed the opening. Various measures have been used to cause inflammation, exudation and swelling about the hernial orifice with the idea of blocking it. These are often failures and are by no means free from danger. In case violent skin irritants are used, necrosis of tissue and escape of the bowels externally may ensue (mineral acids, etc.), and in the case of the injection of

irritants, phlegmonous inflammation, peritonitis and death may eventuate.

Firing and cantharidal blistering about the skin of the hernial protrusion is the simplest and safest; or blistering with an ointment of yellow chromate of potash (1-8) or of calcium dichromate (1-8) on three occasions a week apart. Among the injections into the subcutaneous tissue (at four points equidistant about the ring) are concentrated sterile solution of common salt (3ii at each point), or ten per cent. solution of zinc chloride (using m vii at each point). Recently, melted paraffin has been injected about the ring to fill it up and prevent hernia.

Among the cruder surgical forms of treatment which have the virtue of simplicity and avoid sepsis of the abdomen are those in which clamps are placed on the skin. This is accomplished by throwing the patient on his back and pulling the skin and hernial sac upwards in a vertical direction. One must be sure, however, that the hernial contents are not included. Then clamps are placed on the neck of the skin pouch, as close to the belly wall as possible, and tightly enough to produce adhesive inflammation of the sac without causing necrosis and sloughing of the parts. The clamps may be held in place by a ligature fastened to the skin. After a number of days the clamp may be removed and if necessary replaced.

Metal skewers are sometimes pushed through the subcutaneous tissue on either side of the ring and held together over the hernial protrusion by cords attached to their ends. Sepsis may thus be occasioned, however. These methods aim at preventing hernia by the adhesion of the peritoneal surfaces of the sac. In the aponeurotic structure of the belly lies the chief strength of the wall. This can only be taken advantage of by open operation and coaptation of the aponeurotic margins.

All methods in which reliance is placed upon adhesive inflammation of the surfaces of the sac are merely palliative and un-

certain as compared with the results of radical operation, as follows :

Operation for Umbilical Hernia.—The necessary preliminaries include starving the patient for twelve hours, free catharsis, shaving and strict antisepsis of the skin (see Wounds, p. —) and anesthesia. With the animal in the dorsal position the skin is incised transversely over the sac. The sac is isolated and freed from surrounding tissue all about its neck where it joins the aponeurosis. If the contents are reducible, reduction may be done and the sac ligated by stout chromic cat-gut or silk as close to the ring as possible. Otherwise the sac is incised, adhesions are broken, and omentum is ligated in sections and cut off level with the hernial ring. The bowel is pushed back into the belly. It may be necessary to nick the ring on either side to replace the bowel. The whole sac is cut off close to the ring. The ring is closed by overlapping of its anterior and posterior borders. A needle threaded with stout sterile silk is entered from without in, about two inches in front of the anterior margin of the ring, and brought out through the ring. A mattress stitch is taken in the edge of the posterior border of the ring about $\frac{1}{4}$ inch back of its margin. The needle is brought back through the hernial opening under the anterior margin of the ring in the abdominal cavity and is made to emerge about $\frac{1}{3}$ inch from its point of entrance. Usually three such stitches are used. On pulling them tight and tying them the posterior border of the ring is drawn forward under the anterior border. The free flap or margin of the anterior border of the ring is finally fastened by continuous chromic gut suture to the surface of the aponeurosis. The skin wound is sutured with silkworm gut. Antiseptic gauze, adhesive plaster and a band about the body complete the operation.

When suturing is difficult (in bringing together the edges of a large ring), packing needles, eight inches long, have been used to transfix the margins. Above these a clamp may be applied. Horseshoe nails with bent points may replace the needles to prevent the clamp from coming off till it sloughs away. These will be rarely

required, as the operation above described is superior to all others and generally feasible.

Ventral herniæ, occurring in any part of the belly from traumatism, may be treated by compression by felt pad and band about the body, or by operations similar to those employed for the cure of umbilical hernia. Large herniæ are often incurable. In operations for the cure of ventral herniæ it is well to overlap the aponeurotic covering for an inch or two to secure firmer union.

INGUINAL AND SCROTAL HERNIA.—Inguinal hernia occurs more commonly in entire animals, although it sometimes is seen in castrated animals and in females. Congenital hernia is frequent in young pigs and in them the covering of the inguinal or scrotal form is tunica vaginalis. In adults the sac of the inguinal hernia is a separate protrusion of peritoneum. The application of a truss is of no service in inguinal or scrotal hernia.

In colic in animals the possibility of strangulated inguinal hernia should always be kept in mind and the hernia should be sought for. In large animals the two internal inguinal rings should be examined per rectum and compared. In strangulated inguinal hernia reduction may be accomplished by throwing the animal in the dorsal position and then pushing the contents of the hernia into the external ring, with one hand on the scrotum, while the other in the rectum drags back the bowel through the internal ring. Anesthesia assists taxis, but on no account should any violence be used, and if reduction seems impossible open operation should be done without any prolonged efforts at reduction. If reduction is successful a clamp may be placed over the skin of the half of the scrotum, corresponding to the side of the hernia, and as close to the belly as possible. This may be done in the case of either gelding or stallion. The scrotum is enclosed by the clamp until it sloughs away.

The radical operation for inguinal hernia is the most effective and surgical. The use of clamps is unsurgical, in that the result is uncertain and not under the control of the operator, and infection

and recurrence of the hernia are not improbable. In the radical operation, which is a necessity in strangulated, inguinal hernia, the preliminary steps include shaving and making aseptic the parts, casting the animal in the dorsal position and the use of anesthesia, with chloroform or ether, or locally by the injection of 1 per cent. cocaine solution. A long skin incision is made over the protrusion in the direction of the inguinal canal down to the peritoneal sac covering the hernia. The sac must then be isolated by blunt dissection. If the contents of the sac are reducible, reduction may be done without opening the sac. The sac and the spermatic cord are then ligated with stout, chromic catgut, or sterile silk, close to the internal ring and cut away. If the hernia is not reducible, the sac is incised, adhesions are broken, and omentum ligated in sections and cut away.

In strangulated hernia it is now necessary to nick the edge of the internal ring with a blunt, curved bistoury, or a wide, blunt-pointed director, in order to replace the bowel. The director is introduced within the belly through the ring and the margin of the internal ring is incised by the herniotome in a direction forwards and outwards, to avoid the posterior abdominal artery. Several small nicks are better than one larger incision.

If the bowel is gangrenous from pressure, then resection and anastomosis of the gut offer the only hope. Otherwise the bowel is thoroughly irrigated with sterile, normal salt solution (sodium chloride, 5i to Oi) and is returned into the belly. Ligature of the sac and cord close to the internal ring is then done. The sac is cut away below the ligature.

In any case, the testicle and cord should be removed in the radical operation in entire animals, whether the sac is opened or not. The covered operation for castration and a clam may be used, but ligature as described and proper closure of the inguinal canal are more certain in effecting a permanent cure. It is well to suture the margins of the internal ring with chromic gut, to close the

wound of the canal in layers, and to overlap the aponeurotic structure to secure firmer union. The skin is closed with silkworm gut sutures. Drainage may be left in the lower angle of the wound.

In some cases of strangulated inguinal hernia, after the sac has been opened, the ring incised, and the hernia reduced, nothing further has been done and a good recovery has ensued. While such treatment may be life-saving at the time, there is apt to be a recurrence of the hernia and it is not recommended unless the condition of the patient is so poor as to contraindicate a proper ligation of the sac and repair of the ring.

Hog Cholera—Swine Fever.

There are three, distinct, infectious diseases of swine which are often confounded and we will therefore include them under this one head.

Hog Cholera or Swine Fever is much the most important and is the cause of the chief mortality in swine in the United States and is the only disease of the three common in Great Britain.

It is caused by an invisible microörganism, not yet isolated, which is found in the blood and escapes in the urine and feces of the sick.

Hog cholera is communicated to healthy swine by the urine and feces of infected animals in various ways: while swine are being transported in cars, stock-yards and roads; by infected manure brought to the habitations of healthy swine in running streams or on the feet of animals and men; by contact of normal swine with those recovering from hog cholera; by contact with animals recently exposed to hog cholera, and by exposure to animals having the vague chronic form of hog cholera.

Two forms of hog cholera are seen: The acute—in which the animal has fever and displays dulness, tendency to lie and disinclination to rise, conjunctivitis with gluing of the eyelids together by discharge, and watery diarrhea. Death may ensue in a few days.

In the chronic form there is general malaise, cough on moving, anorexia, emaciation, weakness—especially in the hind legs, conjunctivitis, and more or less diarrhea.

Autopsy.—Petechiae are found in the lungs, heart, kidneys and on the serous coat of the intestines. Swelling and congestion of the lymph nodes occur. In the chronic cases elevated ulcers, the “button ulcers” on account of their button-like appearance, are found in the large intestine up to the size of a quarter dollar. Pneumonia is not a common complication. The mortality is 70 to 80 per cent.

SWINE PLAGUE OR CONTAGIOUS PNEUMONIA OF SWINE is often considered a wholly distinct disease. It is, however, probably an infection with the invisible organism of hog cholera mixed with a special infecting bacterium simulating the bacterium of septicemia of rabbits. This latter organism was formerly thought to be the sole source of the disease.

Contagious Swine Pneumonia is not common in the United States and is rarely met with in England, but is epizootic on the continent of Europe. The symptoms may be very acute, with death in a few hours, or acute or chronic, and consists chiefly in those common to pneumonia and enteritis (cough, labored breathing, fever, diarrhea, etc.), together with an eruption of erythema, vesicles or wheals. It is very fatal.

SWINE ERYSIPELAS.—MAL ROUGE.—This disease is also due to a specific bacillus resembling that of septicemia of mice. On the Continent it is reckoned very contagious, but in England inoculation experiments and practice appear to show it is not. The germ is thought to enter the body through the mouth from infected flesh, feces or stagnant water. It is characterized by weakness, dulness, paraplegia, and the appearance of bright-red, brown-red or purple spots and vesicles on the skin, and diarrhea with death in a few days with labored breathing and edema of the lungs. Hemorrhagic gastro-enteritis, nephritis, swelling of spleen, and especially endocarditis with mitral vegetations, are found post mortem.

Swine Erysipelas, it is said, can be distinguished from Swine Plague by the inoculation of a pigeon and guinea-pig. If the guinea-pig dies and the pigeon is unharmed we may conclude it is a case of swine plague, and vice versa.

Diagnosis.—Hog cholera is the only one of these diseases common to the United States. While food poisoning, tuberculosis and anthrax may cause confusion in the diagnosis of hog cholera, yet the history, symptoms, and post mortem should make the diagnosis clear. Anthrax is rare in hogs and follows the disease in horses, cattle or sheep. It occurs as gloss-anthrax and the tongue and throat are much swollen and bloody froth issues from the mouth. Tuberculosis is usually of slow onset, not often enzoötic, and the autopsy shows caseous foci. Diarrhea from improper food is arrested by changing the diet.

Treatment.—As in most infectious diseases, where there is no specific cure, the prophylaxis is of chief import. This can only be made generally effective when enforced by law. Prophylaxis embraces the following measures: Inspection, notification of outbreaks, disinfection of infected premises (p. 282), supervision of live and dead animals in markets, in transit and in possession of dealers.

Animals suspected, or “in contacts” and newly bought animals should be isolated for one month before being turned into a herd of healthy swine. Animals recovered from hog cholera should not be returned among healthy animals until washed with 2 per cent compound cresol solution after isolation for three months. Infected feed troughs and litter should be burned, manure mixed with quicklime, and the premises cleaned and the ground covered with quicklime. Dead animals should be burned or deeply buried.

As aids to the general resistance of animals against the disease there should be general cleanliness of the pens and frequent cleansing of feed troughs and disinfection of them with the cresol solution noted above. Warm, dry, sleeping quarters and pure drinking water are desirable.

The U. S. Agricultural Department recommends the following to fortify the hog against hog cholera. (We should not be inclined to place much confidence in its efficacy were it not advised by so good an authority) : Wood charcoal, sulphur, sodium sulphate and black antimony, each 1 lb., with sodium chloride, bicarbonate and hyposulphite, each 2 lbs. Dose, 1 tablespoon, heaping full, on the feed to each 200 lbs. live weight.

The use of emetics, cathartics, antiseptics (as calomel, 3i) and antipyretics are of little value as curative agents. Pasteur's vaccine of attenuated bacilli has been used to immunize swine against erysipelas, but causes some deaths (mortality 1 to 4 per cent.), will not immunize all, and the period of immunity lasts for but a year or thereabouts.

The serum made by the U. S. Bureau of Animal Industry and recently by some states is of the greatest prophylactic value.

Hog cholera serum is made by hyperimmunizing immune hogs (those who have recovered from the disease) by injections of blood from hogs sick with hog cholera. Then a week or so after this treatment the hyperimmunized hog is repeatedly bled and the serum from this blood, mixed with 5 per cent. of carbolic acid, is employed. It is given subcutaneously by two methods: 1. The simultaneous method, where 20 c.c. are injected at the same time with a small quantity of blood from an animal sick with hog cholera. This produces a lasting immunity. 2. The same dose of serum is injected alone which gives a transient immunity of several weeks, unless the animal is soon after exposed to hog cholera, when the immunity becomes persistent, as in the first case. The serum alone then is particularly useful for healthy animals in a herd in which hog cholera already exists. This method of immunizing protects 75 to 90 per cent of animals thus treated and may serve to eradicate the disease. Hog cholera immunizing serum is not supplied by the U. S. Government but may be procured by ap-

plying to the State agricultural colleges or State veterinarians of some of the States.

Hydrothorax.

Occurs in all animals; more often dogs. The condition of dropsy of the pleural cavity is more frequently bilateral, but sometimes unilateral, and then more often right-sided from pressure of a dilated right auricle on the root of the lung (man). It is wholly a secondary condition and due to disease of the heart, kidneys, or blood (in most cases), especially to valvular disease.

Symptoms.—Dyspnea calls attention to it. There is dulness in the chest on percussion, which changes with the position of patient; the respiratory murmur is absent, but râles may occur above the area of effusion. To distinguish it from chronic pleurisy, one has the absence of acute history, and, on aspirating the fluid in hydrothorax, it will be found clear, under 1016 in specific gravity, and containing less than 3 per cent. of albumin; while the presence of cardiac, renal or hemic disease will account for the hydrothorax.

Treatment is directed to the dropsy itself and also to the primary cause. A comparatively dry diet is advisable. For dogs, elaterin (gr. iii in pill) every hour, until watery discharge from bowels produced. Or:

℞	
Hydrargyri chloridi mitis	gr. vi
Pulveris scillae	gr. xii
Pulveris digitalis	gr. xii
M. et fiat pil. No. xii.	
Sig. One pill thrice daily.	

In large animals:

℞	
Fluidextracti digitalis	℥i
Fluidextracti scillae	℥i
Spiritus aetheris nitrosi	℥viii
Potassii citratis	℥vi
Aquae ad	Oi
M. Sig. Four tablespoonfuls at dose in water three times daily	

In the horse, aloes with concentrated solution of Epsom salts; in cattle, a concentrated solution of Epsom salts and common salt, may be used to remove fluid from the system. In addition to digitalis, strychnine sulphate (H. & C., gr. i-ii; D., gr. 1/120-1/30) may be given, and strophanthus (H., tincture, ℥ss; D., ℥x) used to replace digitalis. Smart counter irritation over the sides of the chest with mustard, mixed up with water into a paste, may be repeatedly applied, but not so as to produce vesication. When dyspnea is great and the effusion is so great as to threaten life, aspiration may be aseptically done. This is, however, not otherwise desirable, as infection may occur, and the effusion tends to recur.

Impaction of the Rumen in Cattle or Sheep.

There are various causes: insufficiency of water; diet consisting too largely of soft food, as beet pulp, brewers' grains, etc., without sufficient dry, coarse fodder to sustain rumination; sudden change from dry fodder to rich pasture; animals escaping from stall and overeating grain or rich food.

Symptoms.—The animal loses appetite and rumination, and there are restlessness and colic. The signs leading us to make a diagnosis are: gaseous distension of rumen and feeling of unusual resistance on deep pressure in left flank over the rumen, in addition to the absence of peristaltic murmurs and sounds in this region. If a surfeit of green food is the source of trouble the course may be very rapid with much tympany obscuring the impaction.

Treatment.—If tympany is marked, the treatment will be chiefly directed to that condition: puncture, followed by light diet for some days with the use of daily doses of Glauber's salts and linseed oil, and fluidextract of nux vomica (C., ℥ii; Sh., ℥xxx) thrice daily (see p. 260). Eserine, gr. i, and pilocarpine, gr. ii, may be used to induce rapid catharsis, if given subcutaneously to cattle.

In the less urgent and more chronic cases, fluidextract of nux

vomica may be given thrice daily; salts and linseed oil, once or twice daily; and sloppy food, as bran mash with linseed tea. Gastrotony is indicated in such cases, when they do not yield to medical treatment, except in old cows and those with a high temperature (Moussu), but not more than two-thirds of the contents of the rumen should be removed. This operation is also demanded in the acute cases of impaction of the rumen with serious tympany.

Impaction of Omasum or Third Stomach in Cattle, More Rarely in Sheep or Goats—Dry Murrain—Fardel Bound—Stomach or Grass Staggers.

The causes are very similar to impaction of the rumen, *i. e.*, dry fodder without sufficient water; sudden change from dry to green food with fermentation, toxemia, inhibition of movements of the stomach, delirium and convulsions. The first three stomachs do not secrete fluids and are dependent on saliva and ingested liquids. Hence febrile diseases inhibit salivary secretion and cause the food to become dry and caked in the folds of the third stomach. Impaction of the omasum is also one of the results of lead poisoning.

Symptoms.—There are differing degrees of severity dependent upon the cause. Three types are noted by Moussu. There is that following fever or inflammation with loss of rumination, slight tympanites, and unusual resistance over the rumen and omasum. Other digestive disturbances include constipation, with feces streaked with mucus and blood, alternating with diarrhea. Malnutrition is indicated by cold extremities and rough coat. The disease may drag on indefinitely with gradual decline. When the condition is more marked the animal is down, lying on the left side with its nose in the right flank. The breathing is quickened and there is a grunting expiration but no signs of lung lesions. On the other hand, the appetite is poor, rumination impaired or lost, constipation alternating with diarrhea and the symptoms noted above referring to the digestive organs, especially the feeling of resistance

in right flank. Emaciation occurs, and death within two weeks, with paralysis of the hind limbs and stupor, convulsions and delirium, is not uncommon.

The third type is the most acute and suggests an omasitis. There are tenderness and fulness in the right flank and absence of peristaltic sounds in this region. The animal, in addition to the symptoms seen in the other types, becomes wild-eyed and rushes about in a blind, unconscious state, doing much damage to itself in consequence of running into all sorts of objects.

Spontaneous recovery is accompanied by profuse diarrhea, the feces at first showing evidence of having been compressed by their shiny, flattened surface. Appetite, rumination and peristalsis reappear and tympany disappears.

Treatment.—This consists in attempts to open the bowels. Epsom and common salts may be given twice daily accompanied by a copious supply of liquid, as two or three pails of linseed tea daily. Eserine, gr. i, and pilocarpine, gr. iii, may be given under the skin to cause rapid catharsis. Enemata are also of service. Fluidextract of nux vomica (C., ℥ii thrice daily) aids the action of the cathartics, and croton oil (C., ℥xx) may be used with the salts, if there is not active inflammation of the omasum. Ice should be applied to the poll with head symptoms. When the bowels have moved freely, the diet should consist largely of sloppy food with plenty of water and salt, and the nux vomica should be continued during convalescence.

Impotence (see p. 143).

Indigestion (Acute and Chronic).

IN THE HORSE.—This includes acute and chronic gastric and intestinal catarrh, impaction of the stomach, etc. Lacking the finer methods of gastric analysis of human practice, an exact diagnosis of gastric disorders is impossible; this would be especially valuable in chronic forms. The symptoms of acute gastric catarrh are loss of appetite, yawning, dry mouth followed by one covered

with glairy mucus, coated tongue, feces hard and containing undigested food, occasional vomiting with or without colic; of intestinal catarrh are diarrhea, borborygmus and slight flatulence. The diarrhea may not be present in case the small intestine is the seat, but the feces will be covered with mucus, contain undigested food, and jaundice is often present. Fever is slight in both the gastric and intestinal forms, in most cases. With high fever and colic, see Gastro-enteritis (p. 90).

Treatment is symptomatic. In impaction of the stomach with eructations, retching, pain and distention over the stomach, the use of the stomach tube is the most effective measures. With flatulence and fermentation in stomach and intestine a cathartic should be given, as aloes, 4 drams; with calomel, $\frac{1}{2}$ dram in ball. If there be much pain, see Colic (p. 54).

Intestinal antiseptics are not of great value, but a ball containing 4 drams of lysol may be given twice daily. A powder consisting of nux vomica, sodium bicarbonate and ginger (2 drams of first with 4 drams of two latter) will tend to improve the digestive functions, after the first symptoms are relieved.

The use of diluted hydrochloric acid, 1 dram, with 2 drams of fluidextract of nux vomica, may also be used to stimulate the gastric functions.

Intestinal catarrh with diarrhea is combated with \mathfrak{z} ss of calomel in a pint of linseed oil. Following this, opium in some form is indicated—as powdered opium and tannin, each \mathfrak{z} ii in ball twice daily; or laudanum and tinc. camphor, each \mathfrak{z} i-ii, with 1 dram of tinc. capsici.

If the irritation is in the lower bowel, with escape of much mucus and straining, high enemata twice daily of normal salt solution (one level teaspoonful of salt to pint), or a 1 per cent tannin solution, may be used.

The diet is of chief importance in all digestive troubles. Fasting is in order at first, for 24 hours or so, and then a little green

food, and easily digestible substances, as steamed or cracked oats, chopped hay and gruels. In diarrhea cooked wheat or barley flour gruel with milk, or roasted or cracked oats and a little chopped hay may be allowed. The drinking water must not be cold. Walking exercise and good grooming and warm clothing are beneficial in gastric indigestion. Rest is imperative in diarrhea, and warm covering.

CHRONIC INDIGESTION, caused by chronic catarrh of the stomach and bowels, is shown by anorexia, pasty, coated tongue, constipation and liability to colic, dizziness (stomach staggers), and dulness, when the stomach is chiefly at fault. With involvement of the intestines, there are constipation often alternating with diarrhea, tucked-up or tympanitic belly, malnutrition with staring coat, anemia, and weakness and sweating on slight provocation. Undigested food is often present in the feces. Fever is absent in either form of chronic indigestion.

Treatment.—The condition of the teeth should be attended to. Feeding, if possible, should be at three hour intervals, five meals daily, of oats 2 parts; bran, 1 part; and malted barley, 1 part; boiled, scalded or steamed and allowed to stand twelve hours. To this should be added salt and a little green fodder, unless diarrhea is present. Cut hay is also permissible. For drugs we may use either hydrochloric acid or alkalies.

Not being able to discover the state of the gastric secretion, as is always done in human practice, treatment becomes mere guesswork. However, alkalies are usually more successful. Sodium bicarbonate and ginger, each ʒss , with powdered nux vomica, 1 dram, may be given on the feed thrice daily. Carlsbad salts are serviceable when constipation is marked; 1 ounce on the feed 3 times a day. Daily soap-suds enemata are also effective in constipation. With diarrhea, copper sulphate in dram doses on the feed is beneficial, as a tonic and astringent, and may be combined with opium if necessary. When the discharges have a putrid odor an intestinal

antiseptic, as lysol in half-ounce doses daily, may be given in ball.

ACUTE GASTRITIS OF CATTLE, RUMENITIS, RETICULITIS, OMASITIS, ABOMASITIS.—This refers more properly to acute inflammation of the abomasum, or true stomach, which is the most susceptible of the compartments to irritants, but may be applied to inflammation of all the compartments. Gastritis is caused by irritants, as very hot or cold water, fermented or spoiled food, over-feeding, toxic plants, and is secondary to acute infections. Differentiation from indigestion depends chiefly on the existence of fever and marked local tenderness with loss of appetite, rumination, and peristalsis over the inflamed organ; slight tympanites and thirst. When the abomasum is the seat there is more often colic, moaning, and the flatus has an onion-like odor. Localized tenderness on pressure depends on the compartment chiefly affected—over the left lower abdominal region when the seat is the rumen; if the reticulum, the under part of belly just behind the sternum; if the omasum, on the lower half of the belly directly behind the ribs on the right side (along the free border of the right, false ribs; above and to the right of the reticulum); if of the abomasum, the tenderness, beginning at the cartilages of the false ribs on the right, continues along the lower abdominal segment.

Treatment.—This consists in removing the cause and favoring rest of the organ, with first local soothing and then stimulating remedies. A fly blister may be applied over the affected stomach and venesection (2–4 qts.), if fever is high and symptoms very acute in abomasitis. Rapidly acting cathartics, as eserine, gr. i, with pilocarpine, gr. ii to iii, may be given under the skin. The diet is of chief importance—linseed tea, cooked gruels of cereals, oatmeal, barley, etc., milk, and bran mashes, with a little hay to stimulate rumination. Daily doses of Glauber's or Carlsbad salts, with enemata, should be used to empty the digestive tract. During convalescence nux vomica is in order, one to two drams of the powder or fluidextract twice daily on the food.

INDIGESTION IN CATTLE (CHRONIC).—The treatment of chronic indigestion in animals is of necessity crude. This follows because we have not the means of making a precise diagnosis. In human medicine no practitioner would think of making a positive diagnosis in such conditions, by means of symptoms alone, although at a great advantage in having the patient's feeling to guide him. In humans, the size and position of the stomach is determined by inflation with air; and the state of the secretion and movements, by inspection and analysis of the gastric contents. To attempt exact diagnosis of the various forms of chronic indigestion by means of objective symptoms alone, and treatment based on the same, is, then, an impossible task in man or animals.

Nevertheless, Moussu, by special study and observation of indigestion in cattle has formulated certain symptoms as more or less characteristic of the different forms of functional disturbances of the stomach. It must not be forgotten that these disturbances are not uncommonly combined, however, which would then render diagnosis by symptomatology absolutely out of the question.

One must first determine whether the indigestion is functional or organic, or, if functional, whether it is secondary to organic disease, as tuberculosis of neighboring organs, malignant growths, echinococcus cyst, renal disorders, or to pregnancy. If functional, then there are two chief types—disturbances of secretion (abomasum), with either hyper- or hypo-secretion of HCl, and disturbances of movements of the gastric compartments. The latter usually takes the form of motor insufficiency or lack of peristalsis with dilatation from loss of tone. The same disturbances are seen in organic diseases, however, as hypersecretion of HCl in ulcer of the stomach in cattle, etc. Chronic indigestion in cattle, in whatever form, is commonly associated with tympany.

According to Moussu, in simple motor insufficiency of the gastric compartments, there is chronic tympany alone—without either

diarrhea or constipation, and in such cases the fluidextract of nuxvomica (3i-ii), and either Glauber's or Carlsbad salts (two table-spoonfuls on the feed) may be given thrice daily.'

Constipation with mucus-coated feces, associated with tympanites, points toward excess of HCl secretion of abomasum (hyperchlorhydria). This will be treated by the use of the salts, as recommended in motor insufficiency, together with sodium bicarbonate (3ss) one to two hours after eating.

Chronic tympanites accompanied with diarrhea, Moussu thinks significant of insufficient HCl secretion of abomasum (hypochlorhydria), and this state is remedied by giving diluted HCl in the drinking water twice daily, beginning with one dram and increasing gradually to three. Nux vomica and common salt on the feed both stimulate HCl secretion and are indicated.

Chronic indigestion due to ulcer of the abomasum in cattle can not be positively differentiated from other forms of dyspepsia unless hemorrhage occurs causing the feces to become black and tarry looking.

Treatment is hardly worth while because of the chance of long sickness and damage done by resulting cicatrices. A fluid diet is the main object of treatment, as gruels with milk. Sodium bicarbonate may be given to neutralize the excess of HCl secretion.

INDIGESTION IN CALVES—MILK INDIGESTION—ABOMASAL INDIGESTION.—This is more often seen in hand-fed calves owing to cold, germ-laden milk fed in dirty utensils. Improper feeding of the mothers and sucklings at too long intervals may cause indigestion in sucklings. The abomasum is the site, as it is the only active stomach in the first weeks of life. Vomiting, tenderness and distension over the lower right side of belly, colic, poor appetite and later bowel infection with diarrhea are characteristic. It is a well known fact among farmers that the milk of some Jerseys and Guernseys is too rich for their calves and may cause their death after a few days' suckling. Milk containing more than 4.5 per

cent. fat is often too rich and the calves of cows giving such milk must be provided with another mother or receive the milk diluted with water. Diarrhea is common in these cases. Feeding meal as an addition to skim-milk at a too early period before the salivary and pancreatic ferments are fully secreted will lead to indigestion and diarrhea.

Treatment.—Give only warm, fresh, clean milk, or, if skim-milk used from a creamery, it should be scalded. Calves do not do so well on sterilized milk for a long period. Administer $\frac{1}{2}$ ounce of Glauber's salts and feed lightly with half each of scalded milk and water until digestion is restored. The feeding utensils must be scalded after each feeding and the intervals of feeding regular. (See *Enteritis in Calves.*)

ACUTE INDIGESTION IN SWINE—ACUTE GASTRITIS IN SWINE.

—*Causation.*—Ingestion of irritants, as indigestible objects, poisons, paint, alkalies from hotel washings, decomposing swill, parasites, and secondary to infectious diseases, etc.

Symptoms.—The patients are in pain, grunt with distress and stand with the back hunched, are dull and do not eat. The belly is tender, and vomiting, diarrhea or constipation may be present.

Treatment.—The indications are to empty the digestive tract and give proper food thereafter. Five grains each of calomel and tartar emetic, or 20 grains of ipecac with 5 grains of calomel, may be given rolled in a piece of meat. Diarrhea is a natural remedy, but, if it continues, bismuth subnitrate one-half dram, or chalk two drams, may be given three times daily with the food. This should be of a soothing character, as boiled milk or buttermilk, boiled gruels or linseed tea. The feeding utensils, trough and pen must be thoroughly cleaned and proper diet for the future enforced.

ACUTE INDIGESTION OF DOGS—ACUTE GASTRO-INTESTINAL CATARRH.—This condition is caused by overloading of the stomach, due to infrequent meals, to swallowing of foreign bodies, as bones, and to worms, especially in puppies, and to indigestible and putrid

food. Vomiting is the chief symptom and if much catarrh is present, fever, pain, thirst, loss of appetite and tenderness on pressure over the stomach exist. The common bile duct may be occluded by mucus and inflammatory swelling, with jaundice. If the intestines are the main seat of catarrh, then diarrhea, of a slimy, bilious or even bloody character, is the principal feature—together with fever.

Treatment.—If the animal is confined and allowed but a small amount of water at frequent intervals, and completely starved, this will often suffice for a cure. Vomiting may be encouraged by giving $\frac{1}{2}$ to 1 teaspoonful of fluidextract of ipecac. If emesis is prolonged, bismuth subnitrate (gr. xx–xxx) with cerium oxalate (gr. iii) may be prescribed in capsules every few hours. Potassium bromide (ʒss–i) with chloral hydrate (gr. x–xxx) are very efficient, given by rectum in a few ounces of boiled starch solution, to stop vomiting. Diarrhea may be checked by administering a moderate dose of castor oil (ʒi–ii), and then prescribing bismuth in capsules with salol (gr. v) or carbolic acid (gr. i) every few hours, if there be much intestinal fermentation. Opium and camphor (each gr. ss) with lead acetate (gr. i) in pill three times daily are most effective in arresting diarrhea after a cathartic is given. Enemata are often useful (especially where there is much straining), as tannic acid in 1 per cent. aqueous solution.

Diet is of first importance. After starving until vomiting ceases, milk and lime water, equal parts, or a little scraped raw beef may be allowed. In diarrhea, boiled milk and boiled rice form perhaps the best diet. Loss of appetite after an attack may be combated with tincture of gentian and tinc. cinchona co. and tinc. of nux vomica (each ℥xx) thrice daily in water.

Impotence (Sexual).

This may be considered under three heads.

I. LOSS OF SEXUAL DESIRE IN THE MALE AND FEMALE.—

Such general causes as either insufficient or over feeding, or lack of exercise, or overwork may account for the condition. Any depressing disease may induce loss of sexual desire. In the male, excessive copulation at an early age may result in loss of sexual vigor. Stallions sometimes display a repugnance for multipara and show a corresponding preference for virgin mares and for those of certain colors, *i. e.*, psychical impotence.

2. ORGANIC IMPOTENCE.—Malformations, growths, and disease of the male and female genital organs may render copulation physically impossible. Paralytic impotence may result from disease of the brain and cord and is exhibited in the male by loss of erection and atrophy of the testes.

3. IRRITABLE IMPOTENCE.—This is due to over-excitability of the prostatic urethra and reflex centres, with premature ejaculation in the male. Generally results from masturbation or excessive copulation.

The treatment of loss of sexual desire consists in adjusting the diet and exercise to fit the case, and in avoiding causes, as early and excessive copulation, which favor impotence. General disease must be cared for, and tonics, as iron and arsenic, given in anemia and debility. Genito-urinary irritants are sometimes used to stimulate sexual desire—in females about the time of heat—as cantharides, savin, ginger, pepper, etc. Cantharides and strychnine and phosphorus are the most effective remedies. The tincture of cantharides and fluidextract of nux vomica (each ℥ii) may be combined to advantage and given well diluted twice daily. Surgery may remedy some of the causes of organic impotence, but the paralytic form is usually incurable. The irritable variety is treated in human medicine by cold sounds and local applications to the prostatic urethra. The prevention of masturbation and too frequent copulation, with attention to general hygiene, are effective in veterinary practice. (See *Sterility*, p. 234.)

Influenza—Pink Eye (Epizootic in Horses, Mules and Asses).

This disease is characterized by the animal being "off his feed," by fever, rapid pulse, congested mucous membranes of eyes and nose. The conjunctiva and schneiderian membrane are often of an orange tinge and muco-purulent discharge occurs from both. There is a short cough, weakness, depression; the patient stands with head down and often swelling of the legs and emaciation are seen. The mortality is slight. The complications are many, as bronchitis, pneumonia, cardiac weakness, head symptoms, gastro-intestinal inflammation, laminitis, etc., and may be treated according to the method described under the name of the complication in separate sections in this book.

Treatment.—The disease being self-limited, and no specific being known for combating its special microorganism, treatment must necessarily be symptomatic. Treatment of the general condition consists in affording good air and nourishing, laxative diet, as bran mashes with plenty of salt, boiled oats, and—if the patient will take it—skimmed milk to the amount of several gallons daily. Antipyretics are inadvisable, unless there is hyperpyrexia, but a cool atmosphere (30° to 40° F.) is desirable in both lowering temperature and serving as a nervous stimulant. Blanketing should not be too heavy, but the limbs should be snugly bandaged to prevent the edema commonly arising from heart and vasomotor weakness. Strychnine (gr. i in solution), dropped on the tongue from a two dram vial, and rubbing with camphor or turpentine and oil, also assist in preventing edema.

Steaming with compound tinc. of benzoin, or other antiseptic, and the application of a stimulating liniment and bandage of the throat will prove of service with catarrh of the upper air passages. When laryngitis is evidenced by noisy and difficult breathing, a smart cantharidal blister should be applied over the larynx.

A weak heart, as shown by feeble and rapid pulse, should be stimulated by strychnine every three hours, as above, or by digitalis,

strophanthus, or camphor. Alcohol has been generally used for this purpose, but most late researches seem to show that it is not a heart stimulant but acts as a nervous sedative and may be of service as a food in acute disease.

When the mucous membranes present an icteric hue it is wise to administer linseed oil (1 pint) as a laxative and give sodium bicarbonate (ʒss) on the food, or in solution by the mouth, thrice daily. If keratitis and iritis threaten, treatment must be pursued as recommended under these disorders.

Recently good results have been reported from the use of polyvalent antistreptococcic serum as a prophylactic (10 c. c.) in influenza.

The patient should be isolated if possible and a beginning of the disease may be suspected when an animal exposed to influenza shows a rise of temperature. Communication of the disorder by means of utensils, attendants, etc., should be avoided. Disinfection of the premises should be practiced after recovery of the patient (p. 282).

Iritis.

This occurs from trauma, in the course of acute rheumatism and other infections, as distemper and influenza; in periodic ophthalmia; as an extension of inflammation in ulcer of the cornea, and in the sympathetic form when the other eye has suffered injury.

Symptoms.—The chief signs and symptoms are pain in eye and impaired vision; inflammation of the conjunctiva about the cornea; pupils contracted and reacting sluggishly to light; change in color (dull or rusty) of the iris; slight opacity of the cornea and pupil; and tension of the eyeball normal. Examine by throwing light into the eye through a lens. The instillation of a one per cent. atropine solution into the eye usually causes irregular dilatation of the pupil, owing to adhesions at points to the lens capsule. In serous iritis, minute grayish-yellow dots are seen on inner surface of the cornea.

Treatment.—Confine the animal in darkened quarters. Give a brisk purge. Apply hot fomentations for half hour's duration three times daily to affected eye. Two or three leeches placed on the temple will produce local abstraction of blood and relieve the congestion. A one per cent. atropine solution should be dropped into the eye four to six times daily in the case of the large animals; one drop only of this strength should be used in the small animals, and at less frequent intervals to avoid poisoning. Atropine prevents adhesions of the pupil to the lens.

Internally, full doses of sodium salicylate with potassium iodide are of benefit (of each, H., ℥ss ; D., gr. v-x, thrice daily). With increased tension of the eyeball and threatened glaucoma, pilocarpine may be given internally (H., gr. ii-iii; D., gr. $\frac{1}{6}$, thrice daily).

Sympathetic iritis in its early stage calls for enucleation of the other eye—providing the other eye is useless for vision.

Iridectomy may be indicated following an attack of iritis to remedy an occluded pupil or adhesions of the iris to lens capsule (posterior synechia).

Jaundice (Catarrhal). Gastro-Duodenal Catarrh. Cholangitis.

This form of jaundice occurs most commonly in dogs and horses and must be distinguished from jaundice due to serious organic diseases of the liver. It is due generally to gastro-duodenitis, so that it is preceded in most cases in dogs by vomiting. It may arise in horses as a complication of influenza and other infections. Icteric ocular conjunctivæ, and mucous membranes, light-colored feces and dark-colored urine (showing yellow foam on shaking) are characteristic of this and other forms of jaundice.

Recovery in a few weeks is the rule in horses; in dogs a fatal result is not uncommon.

Jaundice is produced by obstruction of the common bile duct near its outlet in the duodenum through catarrh of the duct, causing

swelling of the mucosa and plugging with mucus. The catarrhal condition is then an extension from that existing in the duodenum. It is possible that some of the other larger biliary ducts suffer also from the catarrhal process. In some cases swelling of the head of the pancreas may occlude the bile duct.

Treatment consists in allaying the catarrhal condition by the use of warm, moist compresses over the liver, and by measures addressed to the local catarrh of the duodenum.

In the dog, a few grains of calomel may be given at the start, to clear the bowel of fermenting ingesta, and bismuth and sodium bicarbonate (each gr. x) may be administered thrice daily in capsules. The diet should be without fat, as skim-milk and lime water, lean meat, broths and bread. Massage over the region of the gall bladder may assist escape of the bile into the duodenum, and the use of cold enemata is thought to be useful in stimulating reflexly the peristalsis of the gall bladder and ducts.

° In the horse, the diet should be of easily digestible, laxative food, as green fodder, carrots, boiled potatoes, steamed, cracked oats. Artificial Carlsbad salts (3i-ii) should be placed on the food thrice daily. The salts tend to dissolve mucus and relieve the congestion about the obstructed duct. Water should be given freely.

Keratitis, Ulcer, Abscess and Opacity of the Cornea.

Keratitis may occur in all animals and commonly is secondary to conjunctivitis or is favored by trauma, debility, autoinfection from the digestive tract or altered nerve supply. In any case, infection with cocci of various kinds is the immediate exciting cause. With severe forms, suppuration and abscess, which usually break down into an external ulcer, or more rarely into the anterior chamber (hypopyon), anterior staphyloma, or resulting corneal opacity, are to be feared.

Symptoms.—Corneal haziness, surrounding congestion of the conjunctiva, photophobia, blepharospasm, lachrimation, and con-

tracted pupils are commonly present in keratitis. Abscess in the substance of the cornea, ulceration, and escape of pus in the anterior chamber (hypopyon) may follow, or, with necrosis of the cornea, extensive ulceration or wounds, the cornea gives way and a protrusion occurs from the surface of the eyeball. This is of an irregular, bluish-white color, often containing tortuous veins, and is composed of the remains of the cornea, new-made connective tissue and iris, and is known as anterior staphyloma. It may be partial, protruding from the margin; or total, involving the whole cornea. Examination of the eye by throwing a beam of light upon it through a lens in a darkened place (oblique illumination) will aid in determining haziness of the cornea, loss of substance (ulcer), abscess, etc.

Treatment.—In acute keratitis treatment should be begun with a smart purge (H., calomel, ℥i; aloes, ℥vi; D., 2 to 3 compound cathartic pills), and quinine in liberal doses (H. & C., ℥ss; D., gr. iii) thrice daily.

Attention to hygiene is of much importance where debility is the predisposing factor. The irritation may be relieved by bandaging a gauze compress over the eye, soaked in a solution containing extract of opium, gr. 20, and boric acid, ℥iss, in water to make viii. The patient should be kept in darkness if photophobia is marked.

The most important drug is atropine (gr. i–iv to ℥i) which may be added to a 2 per cent boric acid solution and dropped in the eye four times daily. The stronger solution should be used with much photophobia and lachrimation. Not over one minim at an instillation in the case of the small animals. One or two grains of holocaine hydrochlorate may be added to the atropine solution to advantage in allaying irritation, or may be used without the atropine in boric acid solution, if atropine does not agree. At night ointment of yellow oxide of mercury (gr. viii to ℥i) should be rubbed on the inner surface of the eyelids. In case of spreading ulcer of the cornea, the above treatment should be followed, and the care-

ful application of pure phenol on the tip of a toothpick (about which have been wrapped a few strands of absorbent cotton) to the cocainized eye will usually limit its extension. Immediately following this the eye should be flooded with normal salt solution (5i to Oi). Paracentesis of the cornea, to liberate pus from it or the anterior chamber, is generally not to be undertaken.

Opacities of the cornea differ in degree from slight cloudiness (nebulæ and maculæ) to opaque spots (leucomata). When recent and slight, recovery is more likely to occur. After a year the opacity will be permanent. Daily massage with the yellow oxide of mercury ointment and the instillation of a five per cent. solution of dionin thrice daily are useful in recent cases. Blowing calomel into the eye, once in three days, may be tried if the mercury ointment is unsuccessful. If the opacity obscures the pupil iridectomy is indicated.

In partial staphyloma, bandaging with slight pressure on the eyeball and cutting off the protrusion may succeed in preventing its extension.

Iridectomy may be indicated. In total anterior staphyloma, enucleation of the eye is in order.

Laminitis in Horses and Cattle.

In the horse acute laminitis is commonly caused by concussion, over-exertion, acute indigestion, and bad shoeing,—as by paring away too much of the hoof, or too high calks. It is usually bilateral but is seen in one foot when the animal has had to stand on it owing to lameness of the opposing limb. To obviate this, the shoe of the sound leg should be removed and the patient kept on soft ground, or in slings.

Symptoms.—When in both fore feet, there is great lameness and difficulty in movement. The fore feet are outstretched and are hot and painful on tapping the soles. In many cases the animal may refuse to stand. If the hind feet are attacked the animal

stands with all four feet bunched under him. In cattle, the patient often refuses to stand; if standing, when all four feet are affected, the animal assumes a posture similar to that in rising; when the fore feet are attacked, the patient kneels in front; while in the case of the hind feet being inflamed, all four feet are held together. The feet, especially the inner claws, are hot and sensitive to percussion. In both the horse and cow the temperature is high and the pulse rapid.

Treatment.—In the case of the horse the shoes should be at once removed and the horn on the soles of the affected feet thinned. The animal should then be put in a box stall well bedded with cut straw. In very severe cases casting or slinging the animal may be done, to take weight off the feet, but this is not generally necessary. A prolonged foot-bath, the patient standing for several hours at a time in a tub of hot water, changed frequently, is the most effective measure in the writer's experience. This requires much care and trouble, however. In the interval between the foot-baths the affected feet may be poulticed with flaxseed and bran. The action of cold is sometimes equally useful, applied by causing the animal to stand in ice water; or a poultice made with cracked ice and bran may be used. An enema and a pint of linseed oil are advisable at the onset, although powerful purges are to be avoided. In very severe cases, bleeding from the jugular, digital veins, or the toe of the foot, may be done with good results. In less sthenic cases, tincture of aconite (3i) may be given on the tongue every two hours to the larger animals, until the pulse is reduced in frequency. The application of mustard paste to the chest will also cause a revulsion of blood away from the feet. After subsidence of the heat and tenderness in the feet, a thick, wide, rocker, bar-shoe should be placed on the hoofs, and exercise in a soft, moist pasture encouraged, beginning with half an hour daily and increasing the period. At the same time a fly blister should be applied about the

coronets of the affected feet. If lameness is persistent, neurectomy may be indicated.

In cattle, the general treatment—and that applied to the feet—is similar to that for the horse. A pound or two of Glauber's salts should be given at the onset, instead of oil. If separation of the claw occurs, the foot must be dressed with a thick pad of tow and Peruvian balsam and later tar. Chronic lameness would lead one to recommend slaughter of the animal.

Laryngitis (Acute, Chronic and Membranous).—Edema of the Glottis.

ACUTE LARYNGITIS.—Occurs in all animals, but chiefly in dogs and horses. Caused by exposure to cold, irritants, infection and spread of catarrh from nose and pharynx. Occasionally appears epizootically in horses.

Symptoms.—Fever, dry cough, brought on instantly by pressure on larynx. Noisy, difficult breathing in bad cases. These are the chief symptoms, with absence of trouble in other parts of the respiratory tract, and râles heard on auscultating the larynx.

Treatment.—The animal should be kept quiet in well ventilated surroundings. Local treatment is useful, as the application of cold, moist compresses to the throat, covered with oil silk, or the use of a thick coating of antiphlogistine; or turpentine and sweet oil, equal parts, and bandaging; or, in severe cases, a mustard paste or cantharidal blister. In addition, steaming with antiseptic solutions, as two per cent. carbolic acid solution, is beneficial.

Internally, a mixture containing tinc. of aconite (ʒi for horses; ʒ v-x for dogs), and spiritus aetheris nitrosi (ʒi horses; ʒ xx dogs) may be given three times daily, for fever. Laryngeal spasm and cough are relieved by opium, *e. g.*, morphine, gr. i for horses; codeine sulphate, gr. ss for dogs; given thrice daily. If cough continues the following prescription is useful for dogs: \mathfrak{R} Ammon.

chlorid., ℥ii; syr. scillae, ℥i; spts. aether. nitrosi, ℥i; syr. tolu, ℥i; elix. simplic. ad ℥iv. misce. Sig. teas. thrice daily.

EDEMA OF THE GLOTTIS may be caused by acute laryngitis (with noisy and difficult breathing, cyanosis, coughing, sweating, protruding eyeballs, etc.), and will probably prove rapidly fatal unless tracheotomy is done.

CHRONIC LARYNGITIS.—Occurs chiefly in horses and dogs in spring and fall, although all animals are liable. Characterized by a chronic, dry cough. There are fits of coughing during which the dog chokes and vomits, especially at night. In horses, the head is outstretched and cough is accompanied with some dyspnea. The Larynx is very sensitive to pressure. Between attacks the general condition is good. The disease is very persistent.

Treatment is chiefly local. Wet compresses with waterproof covering may be used about the throat, or counter-irritation with stimulating liniment (sweet oil and turpentine, equal parts), or antiphlogistine.

In dogs, local applications to the laryngeal mucous membrane of a two per cent. solution of zinc chloride or silver nitrate, once daily, may be made with cotton on a human laryngeal applicator, and are most effective. Inhalation of co. tinc. of benzoin and vin. ipecac (each ℥ss to 1 quart of water) is useful. Also insufflation of bismuth and orthoform, equal parts, may be made with a powder-blower. The direct application to the larynx is most difficult and most effective.

In the horse, injections into the larynx through the crico-tracheal ligament with a curved hollow needle have yielded the best results. One-half per cent. solutions of lead acetate or alum are used. Keeping the bowels active is of much importance. One dram of ammonium chloride with an ounce or so of Carlsbad salts may be sprinkled on the feed three times daily, in the case of the larger animals.

MEMBRANOUS LARYNGITIS (Laryngeal Croup, Diphtheretic

Laryngitis).—Affects chiefly cattle; less often horses and cats; occasionally other animals. Probably due to a mixed infection of cocci. Sometimes it is enzoötic. May be secondary to similar affection of pharynx or trachea and bronchii, or complication of infectious diseases. Not due to germ of true diphtheria of man, or communicable to or from him.

Symptoms.—Fever, chills and, in twenty-four to forty-eight hours, attacks of noisy, whistling, difficult breathing and suffocation, with cough. Larynx very sensitive to pressure. Conjunctivitis and nasal catarrh occur. If death does not ensue membranous deposits are expelled from the larynx during cough, after a few days.

Treatment.—Bleeding may be done or tartar emetic given (3ii–iii) in severe cases and in strong animals. Inhalations of lime water are useful. Hot poultices, constantly changed, or sinapisms, should be applied to the throat. Potassium iodide (H., 3i t. i. d.), is said to be of benefit. Laxatives and a soft and nutritious diet of mashes, green food and milk are desirable. Tracheotomy done early is imperative in cases with threatened suffocation. In dogs and cats, emesis, with dram doses of syrup of ipecac, should be secured.

Leukemia — Pseudo Leukemia — Lympho-Sarcoma — Hodgkin's Disease.

Leukemia is a disease in which there is great increase in the leukocytes, the proportion of white corpuscles to red being from 1–50 or even 1–10, instead of the normal relation of 1 white to 350 red corpuscles. The disease is comparatively rare, but has been seen in horses, cattle, dogs, cats and swine. It is generally fatal, although it may continue for months or years. There are two forms—the spleno-medullary, in which there is hyperplasia of the spleen and red bone marrow; and the lymphatic, in which the lymph nodes are enlarged generally, or in certain regions.

Symptoms.—The symptoms resemble those of pernicious

anemia, with sometimes splenic tumor and sometimes glandular enlargements, and bleeding from mucous membranes and diarrhea are common. A diagnosis can only be made by microscopic examination of the fresh blood. The presence of large neutrophilic myelocytes is characteristic of the spleno-medullary form, while the polymorphonuclear and lymphocytes are absolutely increased but relatively diminished. In the lymphatic form, the lymphocytes predominate and the leucocytosis is not so great.

In pseudo-leukemia, lympho-sarcoma, or Hodgkin's disease, there is general or local enlargement of the lymph nodes but no leukocytosis. It has been seen in dogs and occasionally in horses.

Treatment.—Since the etiology of both leukemia and pseudo-leukemia is unknown and both diseases commonly are fatal, treatment in animals should not be attempted unless experimentally. The same treatment (arsenic) recommended for pernicious anemia is applicable in either form of leukemia, and in human medicine this use of arsenic has caused great prolongation of the patient's life and even rarely appeared to cure leukemia. In dogs, the use of Fowler's solution may be pushed up to $\frac{1}{2}$ dram thrice daily by gradually increasing it from a dose of 5 minims. The treatment otherwise as regards diet, general care, etc., is the same as for anemia, although diarrhea and hemorrhages may demand especial medication. In human practice the use of the X-ray has given the best results in either form of leukemia.

Lice—Pediculosis—Phtheiriiasis.

Lip-and-Leg Ulceration—Necrobacillosis. (See p. 291.)

Liver Rot—Distomatosis—Liver Fluke Disease.

The parasite or fluke worm is one of two species; the *Distoma* (or *Fasciola*) *hepaticum* and *D. lanceolatum*, of the Order Trematodes (fluke worms). This order, with that of the Cestoda (tape worms) constitute the only two parasitic groups of the Plathelminthes (flat worms).

The fluke worm attacks sheep, cattle, goats, other animals and

man. The embryo is ingested by sheep commonly in the late fall and symptoms begin a month or so later. The parasites enter the biliary ducts from the duodenum and live chiefly in the liver, discharging ova at various times which escape in the feces. After a year the parasite leaves the liver but is destroyed in the large intestines. It occasionally wanders into other parts of the body. Lambs and yearlings are most commonly attacked and the disease is enzoötic. It is characterized by anemia and secondary infection owing to the effect of the parasites. Loss of appetite, flesh and strength, with possibly slight jaundice and enlargement of liver (early stage); dropsy and general exhaustion, with diarrhea or constipation, are seen. Diagnosis is only positive by finding parasites post mortem in the liver, or, in the feces the ova may be seen with a microscope during life. Very fatal in sheep; much less so in cattle.

Treatment.—The treatment is wholly preventive. Salt should be given patients liberally. Lime and salts, or copperas (250–400 lbs. to acre), may be sprinkled on the pastures from May to August. The embryos are ingested in water or eaten while encysted on grass. A small snail ($1/5$ in. long) is the intermediary host and wet grounds are its home. Draining pastures is the chief desideratum. Infested animals should be slaughtered and their livers burned. If the pastures are greatly infested they must be given up and high, dry pastures employed. Overstocking leads to close grazing and greater chance of the animals ingesting the embryos at the lower part of the grass. The manure of infested animals must be disinfected with lime.

Louping Ill.

This disease attacks sheep and more often lambs in spring. It begins with twitching and trembling of the muscles and fits, in which the animal falls and may then leap into the air. Paralysis follows, paraplegia more often, but also of the fore legs, and the

neck is often drawn to one side. Abscesses may form in the joints and elsewhere.

Louping ill is enzoötic and due to the invasion of the blood by bacteria conveyed to sheep by the common grass tick (*Ixodes redivius*) which lives on tall grass and rushes in damp places. No cure is known and treatment is wholly preventive. Diseased sheep should be isolated and killed. The rest of the flock should be dipped as for scab (see p. 168). Wet pastures must be drained and long grass and rushes avoided.

Lumbar Prurigo—Nibblers—Trotters—Trembling.

This is a disease peculiar to sheep, which is somewhat akin to Louping Ill. It is characterized by trembling when the animal is touched, and by walking in a peculiar way (trotting) with feet raised high, like horse with stringhalt. Then the animals are seized with incontrollable desire to rub and bite their hind quarters so that the skin is bared (nibblers), the gait is uncertain, and the animals waste, have paraplegia and die. No curative treatment is known, but diseased animals should be slaughtered early and not bred from.

Lymphangitis in the Horse.

Lymphangitis often appears suddenly in one or both hind legs, and occasionally in a fore leg. It was formerly thought to depend upon a surfeited state of the system, but is a local infection, with cocci probably, due to some unseen focus, or to abrasions of the skin, as occur in scratches. It is a cellulitis or lymphangitis or both combined, and is often described as inflammatory edema or phlegmon. Being a surgical and local affection, the treatment should be chiefly local.

Symptoms.—It begins with local heat, swelling and lameness in a limb, so that often the animal stands on three legs. Enlarged inguinal and brachial glands, corded lymphatics, and general swell-

ing and edema of the limb are seen. Rarely is the infection of the suppurating variety. General symptoms, as fever, rapid pulse, malaise and anorexia, exist. It is to be recognized that lymphangitis and cellulitis may occur in the course of any local infection and of some general ones (glanders), but this disorder is peculiar in that lymphangitis apparently happens idiopathically.

Treatment.—The most important treatment consists in rest and the application of hot antiseptic solutions to the limb. While hot fomentations are useful, it goes without saying that the constant application of hot antiseptics is more useful. This end may be accomplished by the employment of woolen cloths soaked in hot lysol or creolin (two per cent. solution), and covered with a rubber cloth, and bandaged, so as to include the whole limb. This application should be frequently changed at first, to secure the effect of heat. Half an ordinary physic ball and one dram of calomel may be given at the onset, and the diet should be laxative, as of mashes and green fodder. To reduce the fever, tincture of aconite (3i) and sweet spirit of nitre (3ii) may be given every two hours. Venesection may be used in very acute cases in robust animals, abstracting 4–6 quarts from the jugular vein. This is, however, rarely advisable and is not in consonance with the modern idea of the etiology. More often milk and alcohol are of service in weakened subjects. With the subsidence of acute symptoms, measures to reduce the swelling should be resorted to, such as rubbing with equal parts of oil of turpentine and sweet oil, dry bandaging the whole limb from below, and gentle exercise. Internally, potassium iodide, in 2-dram doses, may be given twice daily and a few ounces of Carlsbad salts placed on the food.

CHRONIC LYMPHANGITIS may follow the acute form or occur independently. It affects the lower part of the limb and the swelling and edema are obstinate and a deposition of fibrous tissues leads to great indurated and sclerotic enlargement after a time (elephantiasis). This condition is very rebellious to curative means.

The use of intermittent, elastic pressure, as by the application of a flannel bandage cut on the bias over padding of oakum, each night, and the employment of alternate bathing in hot and cold water, massage, and walking exercise are the most efficient measures in the earlier stages.

MYCOTIC, OR EPIZOOTIC, OR AFRICAN LYMPHANGITIS OF HORSES, BENIGN, PSEUDO- OR JAPANESE FARCY.—Mycotic lymphangitis exists in many parts of the United States and in our insular possessions, although first discovered in the United States by Pearson in Pennsylvania in 1907. The disease is infectious but does not cause widespread outbreaks, so that it is not strictly epizootic in character. It is due to a yeast-like fungus—*Saccharomyces* (*Cryptococcus*) *farciminosis*—which occurs as ovoid bodies, pointed at both ends, or rounded at one pole and pointed at the other, highly refractile, and having a double contour. They may be readily seen in fresh smears with a power of 400 or 500. The fungus stains with the Gram method, or that of Claudius with 1 per cent. methyl violet for two minutes; wash; place in one-half saturated solution of picric acid for thirty seconds; decolorize in chloroform; treat with xylol and mount in Canada balsam. Agar tubes inoculated with infected pus show growth in about ten days. The skin is the starting point of infection through abrasions, wounds, and insect bites. The period of incubation is from several weeks to three or more months.

Symptoms.—Enlarged lymph nodes and corded lymphatics, with general swelling or stocking of the limb, appear on one or both hind legs. The enlarged lymph nodes vary in size from a bean to a hen's egg. The fore limbs, neck, shoulder, rump, scrotum and udder are less frequent seats of the disease. The glandular swellings are first hard but later soften and break down into abscess and finally ulcers, discharging yellow, creamy pus and filled with exuberant or fungoid granulations. Abscess formation may occur also in the connective tissue and bones and pyemia conditions

and pneumonia may complicate. The mortality is said to be about 10 per cent. The general symptoms are usually slight with little fever or anorexia.

Farcy is the disease to be chiefly differentiated. In true farcy the ulcers have overhanging, ragged edges and gray, gangrenous bases and a discharge like olive oil in appearance and egg white in consistence. The red, protruding granulations, yellow pus and inverted edges of the pseudo-farcy ulcer are in marked contrast to the above. If, as, however, sometimes occurs, there are also nodules and ulcers in the nostrils and swollen submaxillary glands, then the diagnosis must rest upon the finding of saccharomyces in the pus and the absence of glanders bacilli and the reaction to mallein.

Treatment.—The saccharomyces are very resistant to antiseptics and therefore resort must be had to the knife or actual cautery. In case the focus is limited to a small area, removal with the knife alone, or supplemented with the cautery, is indicated; that is, the whole area of lymphatics and nodes must be destroyed. Abscess cavities should be incised and curetted and cauterized. The later treatment is conducted as in the case of any suppurating wound with antiseptic irrigations and dressings. Several months are required for complete recovery. Diseased animals should be isolated and all harness, utensils, etc., which have been in contact with diseased animals must be cleaned and disinfected, together with the premises occupied by the sick; 3 per cent. formalin or 5 per cent. solutions of chlorinated lime may be used.

Maladie du Coit—Dourine—Vesicular Exanthema.

Maladie du coit is a chronic infectious disease of stallions and mares, the specific germ being transmitted from one to the other at the time of coition. The development is insidious—from a week to two months. The genital organs, inguinal glands and lymphatics, central nervous system and peripheral nerves are particularly involved in an inflammatory process produced by the specific organ-

ism. In the stallion, swelling of the penis (with vesicles, ulcers and erythema and paraphymosis of the organ), urethral discharge, strangury and swelling of inguinal glands are seen, although only the discharge and strangury may be present. In mares, there is swelling of the vulva, udder and thighs, the animal acts as in "heat," with frequent micturition; the clitoris is swollen, and the vagina congested and the seat of vesicles, papules and ulcers, and is covered with secretion which flows on the neighboring parts.

The local symptoms disappear and general symptoms occur after weeks or months, when weakness and paraplegia, with great emaciation, ensue. An urticarial eruption, intense pruritus, conjunctivitis, and nasal discharge are often present. The animal falls, and dies in cachexia with decubitus, septicemia or hypostatic pneumonia after a period of many months or years. The mortality is about 70 per cent.

A distinct infection, communicated generally by copulation, is seen in many animals—horses, cattle, dogs, sheep, goats and swine—and closely resembles the local condition of the genital organs in dourine. It has been called a benign form of the latter, but is due to another germ and is a wholly separate disease. The incubation is usually not longer than a week and the disease lasts from a week to a month, and may be distinguished from dourine in lacking the development of the secondary symptoms of paralysis, and in affecting other animals than horses. It is characterized by the appearance of a vesicular eruption on the genitals of the male and female and otherwise presenting a condition similar to the local lesions in dourine, and is called Vesicular Exanthema.

Treatment.—The local treatment of dourine and severe vesicular exanthema is practically the same. In the early stages, the use of antiseptics and heat is advisable. Irrigation with hot solutions of boric acid (saturated), corrosive sublimate (1-2,000) or lysol or creolin (2 per cent.) should be made several times daily. For females, vaginal injections of the lysol solution are best. The

local application twice daily of a 5 per cent. argyrol solution to the penis or vagina after cleansing may prove abortive. Great swelling is reduced by constant hot fomentation with a simple antiseptic solution (as saturated boric solution), or incisions, if necessary. Later, astringent applications are indicated, as 1 per cent solution of zinc sulphate or acetate, and externally black wash may be used. Ulcerations should be treated with 10 per cent. silver nitrate solution occasionally. Sloppy food and abundant fluid should be offered in the beginning.

In dourine, tonics, as iron and arsenic, with nourishing food, which may well include eggs and milk, should be given. Fibrin was formerly prescribed, but probably only acted as a concentrated food. Mercury and iodides are advised on the supposed analogy of the disease with syphilis, which supposition is without any sufficient basis.* Often months of treatment are required to cure dourine and three years should elapse before a stallion may be used for service. Mild cases of the vesicular exanthema may be treated expectantly.

Malignant Catarrhal Fever in Cattle.

While probably infectious this disease is rarely communicated by contact of well animals with the sick. It is, however, often persistent in a stable, may be enzoötic, and attacks more commonly the young in spring. The disease is characterized by rigors, dulness, weakness, fever, and acute catarrh, with discharge from the eyes, mouth and vagina. Croupous deposits are sometimes seen in the nose and are coughed up. The accessory sinus's are the seat of purulent inflammation which leads often to loss of horns. There is great swelling of the eyes and various degrees of implication of the eyeball. Colic, constipation followed by diarrhoea, with croupous membranes, sometimes occur. Severe strangury and hematuria; head symptoms, with frenzy and convulsions, are complications.

* The Wassermann reaction will settle the question of the syphilitic origin of dourine.

Eruption about the feet with loss of hoofs occasionally is seen. Mortality from 50–90 per cent.

Treatment.—The treatment is very unsatisfactory and only symptomatic. Prevention in the way of clean, dry, well-ventilated stables and the removal of infected soil under cow stalls is important. Isolation of the sick and disinfection of discharges are advisable. No specific is known. The internal use of creolin in 2-dram doses twice daily in a pint of milk is said to be useful. Also irrigation of the nasal chambers with a 2 per cent. solution of lysol. Steaming, bathing the eyes with cold water and treatment as for conjunctivitis; alcohol, good feeding with milk and gruels, cold to head with head symptoms, enemata or oil for constipation, and other measures directed to special symptoms as they arise, constitute the treatment.

The discharge from eyes and nose is greater and contagion less than in rinderpest, and in the latter the horns are not lost.

Mammitis—Mastitis—Garget.

Inflammation of the udder occurs from infection through the teat or abrasions of the teat, through over-activity and distension of the gland, and as a result of general infection. It occurs during lactation unless traumatic.

Acute mastitis has two forms: Primary, affecting gland tissue, known, if mild, as catarrhal; if severe, as parenchymatous. If the connective tissue is involved the inflammation spreads to surrounding parts and we have the interstitial form.

Symptoms.—The udder becomes hot, swollen, tender and reddened, in one or more quarters, and there is more or less fever and general disturbance. If the interstitial form predominates there is apt to be higher fever and the tissues surrounding the udder are swollen, tender and pit on pressure. In severe cases the gland becomes of a dusky hue, and suppuration, and rarely gangrene and death, ensue. The milk is variously altered and may be thin, blue, and contain curds, or be bloody and fetid. It is unfit for food of

man or beast. There is also a contagious mammitis due to a specific streptococcus. In this form curding of the milk on standing is first noticed, although local and general symptoms of mastitis are wanting. Later a hard nodule gradually develops above the teat and the milk becomes thin and blue, and as the gland is turned into fibrous tissue, the milk changes to a yellow, fetid, acid fluid. Acute mammitis frequently results in a chronic form, with persistent sup-puration, or else atrophy and induration with loss of lactation in the quarters or quarter affected, eventuate. The bacteriology of mastitis includes infection with colon bacillus, streptococci, staphylococci, and *B. necrophorus*. Among chronic infections of the gland are tuberculosis, actinomycosis and botryomycosis. These possess particular importance because of possibility of transmission to man in the milk.

Treatment.—In the stage of congestion, frequent milking—every hour—and massage of the udder, with a full dose of Glauber's and common salt and light diet, are in order. Frequent cleansing of the udder and teats with soap and water and saturated boric acid solution and attention to abrasions of the teats are essential. The application of cracked ice in a bag, or a thick coating of anti-phlogistine, and support of the udder by bandage and wide web of sacking over the body, will have a tendency to abort the inflammation in the early stages. Equal parts of mercury and belladonna ointment, rubbed well into the gland several times daily, may be of value in the beginning of mastitis—providing the animals are prevented from licking the ointment. When inflammation appears certain, and there is high fever, bleeding from the jugular gives relief.

The most important and novel mode of treatment, in the parenchymatous form, is that of irrigation of the interior of the gland. This, however, must be done by the surgeon himself. After emptying the gland of milk and thorough cleansing, about a pint of warm 3 per cent. borax solution may be injected through a

sterile milking tube into each quarter of the udder. The injection should be made slowly and carefully, and after gentle manipulation of the gland the solution should be removed in about fifteen minutes. If suppuration threatens, then the application of 10 per cent. biniodide of mercury ointment will hasten suppuration.

The presence of the interstitial form, with its surrounding zone of inflammatory edema, will lead us to secure drainage of the swollen area in the belly and perineum by punctures. These may best be done by the actual cautery in points so placed as to avoid the veins. A 10 per cent. boric acid ointment should then be applied. Suppuration calls for incision and drainage, and, if very extensive or if gangrene occur, removal of the udder in part, or as a whole, is in order.

The chronic form offers great danger of human infection if milk containing pus and cocci is ingested by man. Cows with suppurating chronic mammitis should be made ready for the butcher. Removal of the teats with scissors aids drainage and has been done to facilitate fattening.

Contagious mammitis is prevented by having a separate milker for diseased cows and by segregation of the patients until well. In mild cases intramammary injections of boric acid (4 per cent.) may be effectual; in more severe, 1/10 to 1/2 per cent. solutions of sodium fluoride are said by Moussu to be most efficient.

Food and water must be restricted during active mammitis to limit the function of the gland. Prevention of the disease is attained by general cleanliness of the barn and animal by the use of proper stalls, so that the animal's udders are not stepped upon; and by treatment of all abrasions of the teats.

Mange—Acariasis—Scabies—Itch—Scab.

Mange is produced by an order of animal parasites—Acarina, mites or ticks. Three genera are recognized, as (1) sarcoptes, or burrowing mites, which burrow under the epidermis, feed, and

propagate in the lower layers of the skin; (2) dermatodectes, or sucking mites, which live on the outer surface of the skin, prick it and suck up serum and lymph; (3) symbiotes, or scale-eating mites, which live on the surface of the skin of the extremities and feed on epidermis. The sarcoptes can only be seen with a hand lens; the others possibly with the naked eye, but to better advantage with a magnifying glass. The different species attack different parts of the body. Thus the sarcoptes attack the head and parts least covered by hair; the dermatodectes inhabit protected regions, as the inside of the thigh, root of the mane and tail, sheath, and under the jaw; while the symbiotes affect extremities of the body, as the feet (horses and sheep), the root of the tail (cattle), external auditory canal (dog). Sarcoptic mange is transmissible to man from animals, and from one species of animal to another, also from man to animals. The other varieties of mange are not. The symptoms of mange are intense itching with rubbing, biting, scratching, stamping (on feet), especially at night and after overheating of the body, with the appearance on the skin of redness, papules, vesicles, pustules, weeping, bloody or suppurating surface, thickening of the integument, roughened, matted, and falling hair, with alopecia. The disease may simulate eczema or other skin lesions, but the intense itching, the tendency for the disease to attack other animals, the locality affected characteristic of the variety of mange, and finally, the positive discovery of the parasite by microscopic examination, are diagnostic evidences.

Preventive measures consist in isolation of infected animals; in disinfection of the premises and everything coming in contact with the patients, as coverings, brushes and other cleaning utensils; in destruction of bedding; in changing the customary pastures and routes; and in burning the hair clipped from patients. Disinfection is done as for any contagious disease (see p. 282).

MANGE IN THE HORSE.—This is comparatively rare. *Sarcoptes scabiei* attacking the head, neck, shoulders and spreading to

rest of body. *Dermatodectes communis* infesting inside of thighs, root of mane and tail, sheath, etc. *Symbiotes equi* seen on the feet and pasterns. Sarcoptic variety most common.

Treatment.—Clip the hair. Soften scabs by the application of oil or glycerin containing 5 per cent. of creolin or lysol. Apply a thick lather of green soap and leave it on over night. When this is washed off the special mange cure may be used. Of these there are a host, including antiseptics and alkalies. Both are inimical to mites, and the latter tend to soften and remove crusts, etc. The remedy must be thoroughly rubbed with a brush into the affected parts and when rubbed off by the animal reapply for a period of a week. Then wash off and repeat the treatment two or three times. It is sometimes advisable to alternate remedies in difficult cases. Following are effective: *Picis liquidae*, ℥ i, sulphuris, ℥ i, *sapo. mollis*, ℥ ii, alcohol ℥ ii; or, creolini, ℥ i, *sapo. mollis*, ℥ i, alcohol, ℥ viii (Fröhner). For less general disease an ointment is serviceable, as *olei staphisagriae*, ℥ ss, sulphuris, ℥ ii, *hydrargyri ammoniati*, gr. xv, *adipis benzoinati*, ad. ℥ i. In addition, sulphur ointment (equal parts sulphur and lard), balsam of Peru, and 3 per cent. aqueous solutions of lysol and creolin are effective. In the dermatodectic and symbiotic mange milder remedies will suffice, as Peruvian balsam, carbolic soap, or creolini, ℥ iii, glycerini, ℥ iv.

MANGE IN DOGS.—This is one of the commonest skin diseases. It is of two types—the sarcoptic (*S. squamiferus*) and follicular. The sarcoptic, which responds much more readily to treatment, unless the disease is widespread, is apt to begin on the head but also attacks the chest, belly, elbows, root of tail and paws, and may spread over the whole body. It is characterized by the appearance of red spots on the skin followed by papules, vesicles or pustules, and either presents a weeping or dry, scaly surface or crusts. The itching is intense and the skin becomes thick and wrinkled. It must be distinguished from follicular mange and eczema. Eczema differs

from mange in being more easily cured, in not being contagious, and in the absence of sarcoptes in the skin.

Follicular mange is caused by the *Dermodex folliculorum* (var. *canis*), which invades the sebaceous glands and hair follicles and is very difficult to eradicate. It is prone to attack the head, neck and limbs, and spreads over the body. There is a form in which only bald spots with scaliness about the eyes is seen, but usually it begins with erythema and the formation of papules and pustules with the secretion of pus. The skin becomes much thickened and roughened with wart-like nodules from which pus and sebaceous matter may be squeezed, or there may be infection with suppurating surfaces and great swelling about the head. Itching is not so marked as in sarcoptic mange. When the disease is extensive it is incurable.

MANGE IN SHEEP.—See *Scab*.

Treatment.—Either form of canine mange is communicable to man (scabies), and isolation of the dog is essential to prevent its spread to other canines. The use of a muzzle and clipping of the hair over the affected areas are necessary. In sarcoptic mange, Peruvian balsam may be rubbed daily into the diseased skin, or the following may be used: Balsami peruviani, ℥i, ung. sulphuris, ℥vii; or picis liquidæ, ℥i, sapo. mollis, ℥i, alcohol, ℥iv, gives excellent results. Hosts of remedies have been tried in follicular mange, but weeks or months are required for a cure, and even then only in cases of limited extent. The most satisfactory remedies include the following: The use of a bath, containing $\frac{1}{2}$ of 1 per cent. potassium sulphuret, for fifteen minutes daily, followed by rubbing into the skin of pure Peruvian balsam. Creolin is used in various forms, as: ℞ Creolini, ℥ 50, adipis lanæ hydrosi, ℥ii, as inunction; or creolin in bath (2 per cent.), with local application of equal parts of creolin and alcohol. In either case the local applications should be made once or twice daily. The employment of this prescription has yielded good results when applied daily (Hunting): ℞ Creosoti, ℥ii,

liquor. potassae, ℥iv, olei olivæ, ℥iiss. The squeezing of pus from all pustules, as soon as they appear, is an important part of the treatment in evacuating the mites. The mites may be discovered by a magnifying glass in this pus, or in scrapings of the skin in the scaly form.

Recently the daily injection of a 2 per cent. carbolic acid solution through a fine needle about and in the pustules has been used and cures have been reported after two weeks of this treatment.

Masturbation—Onanism.

This bad habit may be cured by enforcing proper exercise, or work, and light diet; by punishment (it is reported that a stallion was cured by being made to stand two hours daily in cold water for two weeks); by permitting a proper amount of coition; and, finally, if all else fail, by performing castration. Dogs and rams and, less commonly, bulls and stallions are afflicted with this habit.

Metritis, Acute and Chronic.

Acute metritis is commonly due to traumatism and infection during or after parturition. It begins as an endometritis; metritis and perimetritis are sequels. There may be loss of appetite and flesh and vaginal discharge. The speculum is essential to make a diagnosis. Local inflammation and erosion of the cervix (Endocervicitis) occur first; the womb is enlarged and tender in metritis proper, and fixed by inflammatory exudate, so as not to be freely movable, in perimetritis. The condition differs from puerperal fever, or septic metritis, in being unaccompanied by high fever or symptoms of general infection. Acute metritis often becomes chronic. In either form there may be contraction of the os with retention of secretion in the womb.

Treatment.—This is purely local and requires considerable time and professional care, so that the expense usually contraindicates it. The animal may, however, recover spontaneously at

pasture. Otherwise, local irrigation of the cervix with hot 1 per cent. lysol solution and application of Churchill's tincture of iodine, or light application of the actual cautery to the lacerated and eroded os, may be done. Dilatation of the cervix, when it is contracted, and gentle curetting of its endometrium, followed by loose packing with iodoform gauze, are also indicated. Daily warm lysol (1 per cent.) injections should follow any operative measures.

Muscular Rheumatism—Myalgia.

This is a painful condition of the muscles and also of their fasciae and periosteal attachments. It is commonly caused by exposure to cold and dampness, and by toxins, and is difficult to separate clinically from muscle strain or bruise. It is pathologically ascribed to interstitial myositis or neuralgia of sensory nerves. All animals are affected, but it is more frequent in horses, cattle and dogs.

Symptoms.—General stiffness in movement and soreness of the affected muscle on pressure and movement, and shifting of lameness suddenly from one part to another. The shoulder and lumbar region are common seats. The affected muscles feel hard and tense to the touch. General symptoms are often absent though some fever may be present.

Treatment.—The treatment is general and local. General treatment consists in warm covering and rest of the affected part; in the use of a cathartic and the internal administration of some salicylic and iodide preparation. A physic ball, Glauber's salts and one to three compound cathartic pills may be given respectively to horse, cow and dog. Sodium salicylate is administered to horses and cattle in solution thrice daily in half-ounce doses. To dogs it may be given in capsules in five to ten grain doses three times daily, or, better, as the synthetic substitute, aspirin, in the same manner and dose. Sodium iodide and sodium salicylate may well be combined for dogs, gr. v of each in capsule; for large animals, ℥ss of

each in solution thrice daily. The iodide is particularly useful in chronic cases.

Externally, thorough rubbing of the part with methyl salicylate or chloroform liniment is useful and gauze soaked in the former and covered with oil silk may be bandaged to advantage over the part. Heat is one of the best remedies. This may be applied by hot blankets covered with a rubber sheet and dry blanket, or by laying a flannel over the affected region and ironing the part with a hot flat-iron. The injection of sterile water into the painful muscle is sometimes useful (3ss for dogs; ʒi for large animals) in one or two points. Puncture of the painful muscles by sterile needles (acupuncture) has been found to give immediate relief in some cases and the use of sterile water injections accomplishes as much and more.

Veratrine is employed by the Germans (gr. $\frac{1}{4}$ to $1\frac{1}{2}$ in ℥ 15-30 of alcohol, for horses) injected into the muscle in shoulder lameness of rheumatic origin. Its use should be followed by walking exercise.

Chronic cases of myalgia should receive tonic treatment (cod-liver oil), and attention to the general hygiene and massage, with some good liniment, and moderate exercise aid recovery.

Nasal Catarrh (Chronic)—Chronic Rhinitis, in Horses.

This affection may be primary and follow the acute form. The nasal discharge is usually from both nostrils and varies in character and may be putrid. The pathology varies from swelling and hypertrophy of the nasal mucous membrane with obstruction of the passages, and superficial ulceration of the septum, to atrophy and ulcerative conditions of the membranes and bones with foul discharge.

Treatment consists in local application of cleansing, antiseptic and astringent solutions made in various ways: by means of an atomizer through the nostrils, by the use of a fountain syringe and

rubber tube in the nostrils, by trephining the chambers above, and by a flexible stomach tube introduced through the posterior nasal openings.

A good cleansing solution consists of sodium bicarbonate and bborate, of each 3iiss to the pint of water. An antiseptic douche of value is a $\frac{1}{2}$ to 1 per cent. solution of creolin. Astringent applications include 1 per cent. tannic acid solution, 1-3 per cent. alum solution, 1-2 per cent. copper sulphate solution, and 1-2 per cent. zinc sulphate solution. These may be changed each two weeks as their efficacy wanes. Hygienic treatment is valuable and embraces fresh air or outdoor life, with feeding on the ground to secure drainage, good food, and bitter tonics and iron. Isolation is advisable, as a positive diagnosis is often impossible.

Secondary chronic rhinitis is more common and is due to glanders, disease of the accessory sinus's, catarrh of the guttural pouches, tumors, parasites, alveolar abscess, etc. Without a careful local examination with a rhinoscope, diagnosis is mere guesswork. The use of mallein will settle the diagnosis of glanders. Discharge from one nostril argues against primary, chronic rhinitis.

Nephritis.

ACUTE.—Acute nephritis occurs in all animals, more commonly in horses, cattle, and dogs. The elimination of toxins and bacteria by the kidneys in the course of acute infectious diseases is probably the most frequent cause of acute inflammation of these organs. In pregnancy the occurrence of albuminuria is frequent and indicates an autointoxication which may be associated with renal congestion or nephritis. Cold alone is rarely a sole cause of nephritis, but during infectious diseases it is a powerful predisposing factor. Irritant drugs, as turpentine, cantharides; raw potatoes or cotton seed meal in excess, moldy and fermented food, mineral poisons, trauma, parasites, filaria in the blood, *Eustrongylus gigas*; and hemoglobinemia of horses; may lead to acute nephritis.

Symptoms.—The disease is impossible to diagnose by symptoms alone. Suggestive symptoms are the passage of small quantities of urine which is often dark or pink, and thicker and more turbid than usual; an arching or stiffness of the back with disinclination to move and stiff, straddling or staggering gait behind, with tenderness over the kidneys on pressure; loss of appetite; edema of dependant parts and ascites; and finally vomiting (in dogs), staggering, stupor, mania or convulsions (uremia).

Albuminuria and casts are confirmatory of nephritis, but these are sometimes absent in the disease, and again may be present in the absence of acute nephritis. The abnormal color and scanty amount of urine with high specific gravity (at first), in the course of an acute infection, are of more value than a chemical and microscopic examination of the urine for diagnosis.

Treatment.—Prevention is to be attempted by the avoidance of draughts and the use of warm covering on animals with acute infections; by restriction of diet and securing activity of the bowels and skin by enforcing complete rest in these diseases. Absolutely to withhold both food and drink for the first few days is of prime importance in acute nephritis to rest the kidneys. Afterwards the diet should be sloppy—milk for dogs; green food and mashes for large animals, with milk. A strong purge—an aloes ball for a horse, Glauber's salts for cattle, compound jalap powder (3ss-i) for dogs—should be given at the very beginning. Hot blankets over the whole body, or a warm pack or sheepskin over the loins, are beneficial. Drugs are not of much value and all irritants—turpentine, saltpetre, etc.—should be avoided. Marked hematuria may be treated with fluidextract of ergot (H., ʒi; D., ʒi), thrice daily. To increase elimination through the saliva and skin, pilocarpine hydrochloride (H., gr. ii; C., gr. vii; D., gr. 1/15 to 1/8) may be injected under the skin in single doses as required. To offset the danger of pulmonary edema and depression of the heart

caused by pilocarpine it is wise to combine it with strychnine sulphate (H., gr. ii; D., gr. 1/60 to gr. 1/20).

Digitalis may be given in the later stages as a diuretic and heart stimulant— \mathfrak{z} i of the fluidextract each six hours for large patients; fifteen minims of the tincture for dogs, combined with potassium acetate (H., \mathfrak{z} i; D., gr. xv) in solution. In convalescence, the tincture of ferric chloride (H. and C., \mathfrak{z} i; D., \mathfrak{m}_{xx-xxx}) is of value.

Uremia is best prevented and combated with cathartics, venesection, followed by enteroclysis (see p. 287), and the use of chloral hydrate and sodium bromide by the mouth or rectum, and chloroform by inhalation in convulsions.

CHRONIC NEPHRITIS.—Chronic nephritis occurs occasionally in all animals. Its etiology is uncertain, but it may follow the acute form, and is thought to be also caused by the various acute infections, by autointoxications and repeated pregnancies (including both of two latter causes), continued suppuration in the lower urinary tract and elsewhere, tuberculosis and atheroma. It generally develops insidiously and is first shown by anorexia, general weakness and emaciation, sometimes colic, edema in dependant parts, hypertrophy of the heart with palpitation, dyspnea, bronchitis and edema of the lungs, and finally uremia with convulsions, and coma. Examination of the urine for the presence of albumen, casts and fat will alone make a positive diagnosis possible. The amount and character of the urine will depend upon whether the parenchymatous (large white kidney) or interstitial (contracted kidney) forms predominate. The enlarged kidney may be palpated per rectum in cattle and tenderness in the loins elicited.

Treatment is unsatisfactory, as a fatal ending will generally occur sooner or later. Large doses of iron are useful and the tincture of the chloride has a diuretic action and may be administered with an equal amount of sweet spirit of nitre three times daily (H., \mathfrak{z} i; D., \mathfrak{m}_{xxx}). If dropsy is present, digitalis is essen-

tial, together with purgatives, as recommended for acute nephritis. If the pulse is hard, with high vascular tension, nitroglycerin may be prescribed thrice daily (H., ʒi; D., ʒi-v of the spirit). The animal should be protected from cold and common salt should be withheld if edema or dropsy is present. A milk diet is useful for dogs.

Uremic symptoms must be treated by a strong purge, pilocarpine, hot external applications and nerve sedatives, as recommended under acute nephritis.

SUPPURATIVE NEPHRITIS.—PYELO - NEPHRITIS.—PYELITIS.—These lesions of the kidney are considered together, as it is very difficult to separate them in practice, and their treatment is identical. Infection of the kidney arises more commonly from below—although it does occur from the blood through elimination of bacteria in many infectious disorders—and, in cows and mares, from the vagina following septic, parturient states. A special bacillus causes pyelo-nephritis in the cow, but those of the colon group often infect the kidney from the rectum (per vaginam). Ascending infection in cystitis, stone in the kidney or ureter, general septic conditions, trauma, tuberculosis, glanders, septic emboli, parasites (*E. gigas*) and retention of urine, may all lead to any of the forms of suppuration of the kidney.

Symptoms.—The symptoms—most common in cattle—include loss of appetite, emaciation, cessation of rumination, colic and fever, while more special features are frequent micturition, and the passage of foul, bloody or slimy urine of low specific gravity with blood and pus on the root of the tail. Urination is often painful and the cow shows a disinclination to arise or move and is tender on pressure over the kidneys. Examination per rectum offers the most conclusive evidence if the kidneys and ureters are found enlarged and tender. The urine is albuminous, much more so than in cystitis, and the microscope shows an abundance of pus, more or less blood and bacteria. There is often a coincident vaginal discharge show-

ing past puerperal infection. In uncomplicated pyelitis in carnivora the urine remains acid (it is alkaline usually in cystitis).

Treatment.—In human medicine intractable pyelitis may often be treated most satisfactorily by nephrotomy or nephrectomy, and sometimes by washing the pelvis of the kidney through the ureter. In veterinary practice, although the kidney may be removed by laparotomy, yet economy requires the slaughter of the animal (cows) when the condition is sufficiently good or when the patient can be fattened. An abundance of water is desirable and patients can be made to drink by placing an excess of salt in the food, while the use of enemata (one teaspoonful of salt to one pint) will increase the flow of urine and help wash out the kidneys. Spirit of nitrous ether and potassium acetate may be given in the early stages thrice daily, of each: C., $\mathfrak{z}\text{i}$; D., $\mathfrak{z}\text{ss}$. Urinary antiseptics are of most service, and of these three are preëminent—hexamethylenamine, benzoate of soda and sandalwood oil. The first and last are very expensive for large animals. With an alkaline urine sodium benzoate is beneficial given in the drinking water (C., $\mathfrak{z}\text{iii}$ daily), but it is probable that hexamethylenamine would be more curative, given in two-dram doses daily to large patients or one-gram daily for dogs in the drinking water. If the urine is acid, as in dogs, salol is very efficient in capsules (D., gr. v thrice daily). In chronic suppurative conditions of the kidney the stimulating diuretics are of value, as sandalwood oil (D., $\mathfrak{m}\text{x}$ in capsules) or buchu (C., fluidextract, $\mathfrak{z}\text{i}$; D., $\mathfrak{z}\text{ss}$), given thrice daily. Strychnine sulphate (C., gr. ii on the tongue) with tincture of chloride of iron (C., $\mathfrak{z}\text{i}$) are useful as general tonics. The bovine patient should be isolated to avoid infection of parturient cows. Where the cause can be removed by treatment the prognosis is good, but this is not generally the case.

Nervous Palpitation of the Heart.

This condition is a functional disturbance due to over-exertion, excitement, digestive disturbances and “nervousness.” The action

of the heart is so violent that its pulsations shake the body and may be seen and even heard by bystanders; also, there is great disturbance of rhythm. In the human, it differs from palpitation of organic disease in that the patient is fearfully conscious of the disturbed heart's action, whereas in organic disease a similar disturbance of the heart the patient is unconscious of. The same appears to apply in veterinary medicine, as the patient shows fear by great restlessness, trembling, and sweating. The heart sounds are loud, the pulse small and irregular, and the throbbing of the chest walls is synchronous with the pulse. Organic disease must be ruled out by absence of murmurs (anemic murmurs may be present), hypertrophy and symptoms of heart failure. Palpitation is more common in horses and dogs.

Treatment.—Morphine may be given under the skin (H., gr. v–viii; D., gr. $\frac{1}{8}$ to $\frac{1}{2}$) in severe cases. Antispasmodics, as spirit of chloroform and compound spirit of ether, may relieve the palpitation (H., \mathfrak{z} i–ii; D., \mathfrak{z} ss–i). Chloral with bromides can be used (H., chloral and sodium bromide, of each, \mathfrak{z} i; D., chloral, gr. v–xv; sodium bromide, gr. x–xxx). Where over-exertion or asthenia are etiological factors, or arrhythmia is marked, tincture of digitalis and aconite are of service (H., of each, \mathfrak{z} i; D., tinc. aconite, \mathfrak{m} v; tinc. digitalis, \mathfrak{m} iii), given thrice daily. The administration of iron and nux vomica is of value when anemia is present (H., pulv. ferrous sulphate and nux vomica, of each \mathfrak{z} i, thrice daily on the feed). If digestive disturbance is suspected, a purge is in order and restriction of food.

Orchitis—Epididymo-Orchitis.

Acute inflammation of the testes alone, or of the testes and epididymis, may occur in entire males of any species of domestic animals. Among the more common causes of the condition are urethritis, trauma and tuberculosis. The disease may be readily recognized by the swelling, tenderness and heat in the testicle.

Treatment.—Support and compression of the testicle by the use of a suspensory bandage, after the testicle has been well covered with a thick padding of sheet wadding, are of most benefit. At the same time the application of cracked ice in a bag, or hot flaxseed poultices, antiphlogistine, or lead and opium wash are of service in abating inflammation. One of these (preferably poultices), should be applied to the scrotum before the application of the bandage used to support the testicles. At the same time a smart purge should be administered; the animal must be kept confined; and the diet limited to gruels, mashes, and soft diet, as green fodder, in the case of herbivora.

After the acute symptoms have subsided, the scrotum may be touched lightly with the actual cautery at 10 or 12 points every few days and an ointment of guaiacol (10 per cent.), or ichthyol (20 per cent.), or equal parts of blue and belladonna ointment, may be rubbed into the scrotum once daily. If there is much fluid in the scrotum, aseptic aspiration may be performed.

In case of large hematoma of the tunica vaginalis, the treatment consists in applying hot and cold water alternately to stimulate absorption.

If the case goes on to abscess it will be necessary to open the tunic, stitch it to the skin of the scrotum and drain. The cavity should be wiped out with pure carbolic acid. Castration will cure the condition more speedily.

In tuberculosis of the testis the condition may either be acute or chronic—more often the latter. There is enlargement and a nodular condition of the epididymis, and perhaps testis, and a tendency to break down with abscess and sinus formation. Tuberculous disease of the prostate, bladder or kidney, or other parts, is frequent. Therefore examination of the prostate per rectum and of the urine is of value.

Castration should be done, and outdoor life and good feeding are indicated.

Oestrus Larvae in Accessory Sinus's of Sheep—False Sturdy or Gid—Gad-Fly Vertigo.

The larvae of *Oestrus ovis* or gad-fly in the nasal cavities and root of horn give rise to coryza, conjunctivitis, sneezing, snorting, and swinging, shaking and rubbing the head. In severe cases there is vertigo and the animals may stagger, fall and have convulsions resembling sturdy, but symptoms referable to the nose are absent in sturdy.

Treatment is very unsatisfactory. The use of tar rubbed on nose to prevent entrance of gad-flies, and the insufflation of sneezing powders or injection of antiseptic solutions to expel and kill larvae, are all impossible to carry out successfully. In severe cases trephining on either side of median line between the eyes and removal of larvae with forceps and irrigation with 2 per cent. lysol solution, or destruction by injection of a little benzine and water (Moussu), may be done. Early slaughter is sometimes more economical.

Osteoarthritis Deformans—Ossifying Periostitis—Exostosis—Spavin—Ringbone—Splint in the Horse.

These various conditions are considered together for the sake of convenience and on account of their similarity of pathology. By the older authorities the term exostosis was used to describe splint, spavin and ringbone. But exostosis does not properly express the pathological processes involved, and only partially informs us of the end-results.

In splint—and in ringbone and spavin when the articular surfaces of the pastern, pedal, and tarsal joints are not implicated—the lesions are properly described by the term “chronic ossifying periostitis” due to chronic inflammation of the periosteum with the formation of a bony outgrowth. Constant irritation of the periosteum through strains of the ligaments in the region is frequently caused by faulty position of the feet, as by the use of high-heeled shoes.

On the other hand, when the articular surfaces of the tarsal pastern and pedal joints are involved, we have to do with a chronic inflammation beginning in the shaft of the bone near the joint and extending to the articular surfaces of the joint—hence the name osteoarthritis. A destructive and regenerating process go on at the same time. In the bone we have a rarefying (and often condensing) ostitis; the inflammation extending to the periosteum, there follows a productive inflammation of new bone about the joint, deforming it (hence the deformans), and ultimately leading to external ankylosis. In the meanwhile the articular cartilage degenerates and becomes eroded, while in other places proliferation of bone and internal ankylosis of the joint are apt to result. Ringbone, invading either the fetlock, pastern or pedal joints, represents the same processes.

Ringbone and spavin, then (when not involving the articular surfaces), together with splint, are properly described under the name Chronic Ossifying Periostitis. Ringbone and spavin (when involving the articular surfaces) are correctly classified as Chronic Osteoarthritis Deformans.

SPAVIN.—The symptoms of spavin, as lameness and stiffness, with sometimes sudden flexion (like stringhalt), and tumor on the inner surface of the hock, are well known. Sometimes when tumor is absent, in so-called occult spavin, diagnosis must be made by exclusion. Local heat and inflammatory signs are occasionally seen.

Treatment.—The treatment of spavin is successful in relieving lameness in over 50 per cent. of cases, especially in young animals. Firing the internal face of the hock in 15 to 20 points and the immediate application of a cantharidal ointment (1 to 8) constitute the most successful treatment when followed by a rest in the stable of six weeks. Cunean tenotomy, done over the seat of the spavin and followed by firing and blistering, is sometimes successful when the latter treatment has failed. Periosteotomy has been followed by good results. A transverse incision is made across the middle of

the lower part of the inner surface of the hock, after the skin has been shaved and made aseptic. From this point scissors are passed upward along two lines forward and backward subcutaneously, like the arms of a V. Along these tracts a bistoury is passed, cutting the periosteum to the bone. Rest, preferably in slings, should follow for four to six weeks. In very acute cases, rest and the application of cold compresses over the hock should be made. A shoe must be adapted to the case. When the animal rests on the toe, a high heel should be applied.

Anterior tibial neurectomy is occasionally done for the relief of lameness in spavin, but the results are not generally successful. It should be a last resort. The tendency to spavin is inherited and ought therefore to be avoided by not using spavined animals to breed from. The same remarks apply to ringbone.

RINGBONE.—The same treatment in a general way also applies to ringbone. Diagnosis is made by exclusion and by the positive evidence of heat and tenderness about the pastern or pedal joint, and later by tumor. Firing with points, blistering with cantharidal ointment (1-8), and rest for four weeks or so, will cure many cases in young subjects. The application of a low-heeled bar shoe for ringbone on the fore leg, and of a high-heeled shoe when on the hind limb, is also advisable. A cold swab about the pasterns in the stable is desirable. Sending the patient to pasture after treatment will give the best results. Neurectomy is to be only used as a last resort.

SPLINTS.—Splint only causes lameness in young animals in its active stage of development, unless it interferes with the play of tendons or interferes with the joint. The diagnosis of the lameness must be made by the absence of other lesions and the presence of local heat and tenderness about the splint bones and, later, circumscribed swelling. Sometimes splint occurs behind, but there rarely causes lameness. The tapping of the cannon bone with a percussor may locate tenderness. If the lameness is not very great the appli-

cation to the splint of red mercuric biniodide ointment (1-8-10) every third day, until vesication occurs and the hair begins to drop, is indicated while the animal is being worked.

Splints often disappear, the exostosis being absorbed. In cases with marked lameness, firing in points at two places, with the application afterwards of cantharidal ointment (1-6) and rest for several weeks, are in order. If lameness is not then relieved the animal should be sent to pasture. In acute cases periosteotomy may be of much benefit. A tranverse incision below the splint on the cocaineized, shaved and aseptic part is made. Then a vertical incision through the periosteum over the splint is done, and the part bandaged, and the animal kept at rest for ten days. If the splint interferes with the tendon, or is struck by the opposite leg, it may be chiselled away under aseptic precautions. Otherwise necrosis of the bone may ensue. A boot applied over the splint should, however, first be used in the case of striking of the splint.

Median neurectomy is rarely required and should only be used as a last resort.

In sore shins, seen in young race-horses with diffuse, tender swelling of the front of the cannon bone, recovery takes place on blistering and rest.

**Osteomalacia — Osteoporosis — Fragilitas Ossium — Osteoclastia —
Osseous Cachexia.**

Under this head is included that constitutional disease of horses, cattle, pigs, sheep, goats and dogs characterized by softening, fragility and deformity of bones in adult animals, accompanied by changes in structure in which absence of lime salts is most notable. A great deal of confusion in terms has arisen, since the same condition has been described under different names, as above, by various authors. In the disease under discussion—owing to the lack of lime salts—the bones become softened and the medullary canal enlarged, and, in case only an outer bony shell exists, fracture

occurs on the slightest provocation. This condition gives the names "fragilitas ossium" or "osteoclastia" to the disease, but bone brittleness may occur in atrophy of old age, in rickets, and in rarefying osteitis of other conditions, as spavin and ringbone. Then, at other stages of the disease under consideration, the bones become wholly soft and deformity occurs, as seen in the face of horses and sometimes in the pelvis of cows. Finally, owing to rarefying osteitis and the disappearance of lime salts from the shafts of the bones, they assume a spongy appearance—hence the name osteoporosis.

To avoid, therefore, the confusion caused by such a variety of terms we prefer to use the word osteomalacia, which properly includes the various pathological conditions to which these separate names have been given.

The immediate exciting cause of the disease is unknown. It is apparently favored, however, by several known causes. Thus animals living on soils deficient in lime salts, or on food grown on them, appear to suffer, and the disease is thus frequently enzoötic. But, on the other hand, in horses, the disease has been seen in animals which were fed with most excellent food. In cattle, pregnancy and lactation seem to be most important factors, as in the human. Damp surroundings, poor hygiene and poor food predispose.

Symptoms.—Four phases of the disease are apparent: 1. In the preliminary stage there are general indisposition, debility, capricious or depraved appetite (cattle), and harsh, rough coat and poor condition. These symptoms are naturally insufficient to enable one to make a diagnosis. 2. There are pain, swelling, heat and tenderness of the joints and disinclination to move. Cattle often lie for 24 hours at a time. Horses go lame and stumble. Emaciation, anorexia and fever are present. 3. Fractures, and perhaps deformity—owing to bending of the softened bones—occur. In ordinary movements, as in trotting, bones suddenly break. A horse in falling may break every rib on one side. In cattle, the pelvis,

femur and tibia chiefly suffer; in horses, the bones of the fore limbs. There is little tendency to union. 4. Softening of the bones is seen, more especially in the flat bones of the head. This happens often in the horse and pig. The face becomes much deformed, the jaw and facial bones are enlarged and tender, and mastication becomes difficult. The course of the disease is slow,—one to three months—and increasing emaciation, cachexia, and decubitus foreshadow the end. Fractures frequently lead to speedy destruction of the patient. Early treatment often proves curative.

Treatment.—The use of commercial, phosphatic fertilizers and bone meal on soils has proved a preventive means in the case of cattle. The employment of food brought from regions where the disease is unknown is desirable. Such foods as corn, oats, oil or cottonseed cake, beans, rice, peas, bran and green clover and alfalfa are particularly valuable. It is well to change the pasture and water supply if possible. Phosphorus is the most successful medicine. One-half grain may be given thrice daily to large animals dissolved in a few ounces of cottonseed oil. Cod-liver oil is advised but is too expensive. A powder of bone meal and precipitated calcium phosphate (each, C., ʒi; Sh. and Sw., ʒii), together with powdered nux vomica and ferrous sulphate (each, C., ʒii; Sh. and Sw., gr. xx) may be given on the food thrice daily. Arsenic and quinine have also been recommended. The local treatment of the painful joints is not of much worth, but liniment of turpentine may be applied. There is a curious causative relation between pregnancy and lactation and osteomalacia, so that if cows are not bred and milking is stopped, recovery is greatly facilitated. Ovariectomy accomplishes the same result. Pica is relieved by subcutaneous injection of apomorphine hydrochloride once a week (C., gr. ii).

Bossi has recently produced osteomalacia and phosphaturia in sheep by the removal of one suprarenal gland. Conversely he has cured osteomalacia in the human by intramuscular injections of 1-1,000 solution of adrenalin in doses of $\frac{1}{2}$ to 1 c. c. This de-

serves trial in veterinary practice. Adrenalin is very expensive, however.

Paralysis.

This term of course merely stands for a symptom of innumerable lesions of the nervous system—cerebral, spinal and peripheral. It may, however, be convenient to consider paralysis as a symptom in order to include a number of conditions not readily considered under separate heads. Paralysis we may subdivide into hemiplegia, paraplegia and local or peripheral paralysis.

HEMIPLEGIA, which is so common in human medicine, as a result of cerebral hemorrhage (apoplexy), embolism and thrombosis, is not frequent in veterinary medicine and responds but poorly to therapeutics (see Cerebral Hyperemia).

PARAPLEGIA, or paralysis of the posterior extremities, is quite common in veterinary medicine and is due to a bilateral lesion of the lower segment of the cord. It may be distinguished from cerebral trouble by the absence of head symptoms; by the presence of paralysis of the bladder and rectum; and by the fact that the lesion often extends along the cord (ascending paralysis). Paraplegia occurs in meningitis, myelitis, fracture, hemorrhage or tumor of the cord—in which case treatment is of little utility. But there are many cases in which the trouble has been described as reflex, supposedly due to disturbed circulation in the cord (hyperemia or anemia), in which recovery is hastened by therapeutic measures. In some of these cases it is, however, probable that an infectious lesion (myelitis) of the cord exists. Again, constipation may induce paraplegia by pressure on the sacral plexus. Thus obstinate constipation, intestinal worms, acute indigestion (impaction of the rumen in cattle, colic in horses), abnormal dentition, oestrus or heat in mares, nephritis, cystitis, and (in dogs) heart disease (disturbed spinal circulation; thrombosis or embolism of femoral arteries) may apparently induce paraplegia. Lumbago, or muscular rheumatism of the lumbar muscles in dogs, hemoglobinuria in

horses, and parturient apoplexy in cattle, are apparent examples of paraplegia, but the condition is only symptomatic of these conditions.

Treatment.—The treatment of paraplegia depends on its etiology. In general one should make a careful physical examination to eliminate nephritis, hemoglobinuria, cystitis, nephritis, heart disease and lumbago in dogs, etc., and treat any existing cause of so-called reflex paraplegia. In dogs with constipation, food should be withheld until the bowels are moved with enema and castor oil. Or, if there is vomiting and abdominal pain, give cerium exalate (gr. iii) and bismuth subnitrate (gr. xx), by mouth, and compound cathartic pills (i-iv), or calomel (gr. ii-v), and empty the rectum by enemata of oil, soap-suds, or by blunt curette. Lancing the gums in dentition-irritation; and treatment of causal diseases (see Puerperal Apoplexy, Indigestion—for impaction of rumen, Colic, Muscular Rheumatism, Nephritis, Cystitis, etc.) is indicated. The bowels and bladder should be regularly evacuated in all cases and hot fomentations applied to the loins. Later on, a fly blister rubbed into the lumbar region (except in nephritis or cystitis) and potassium iodide (H. and C., ʒii-iii; D., gr. x) may be given thrice daily to aid resolution of exudation in inflammatory disease of the cord, together with strychnine as a stimulant to the nervous system in any case (H. and C., gr. i-ii; D., gr. 1/120-1/30).

LOCAL PARALYSIS is commonly due to a peripheral neuritis from blows, injuries, pressure and, less often, to lead poisoning and infections. In the horse, paralysis of the lip and face (facial nerve) from pressure of a heavy bridle; of the shoulder (suprascapular nerve); of the extensors of the fore leg (radial nerve); of the gemelli and flexors of the foot (tibial nerve); of the extensors of the patella (crural nerve); of the adductors of the thigh (obturator nerve), etc., are not infrequent and recovery is not unusual. If contractility of the muscles to faradic current persists, the prognosis is good. In paralysis of the lip in horses, the lip hangs

powerless and there is salivation; while the animal dives his head deeper to drink, and gathers his food with the teeth instead of lips. Removal of halter to avoid pressure on face; deep trough and soft food; a blister of red iodide of mercury (1-8 in vaseline) along the course of the nerve in the masseter muscles, or repeated light cauterization with the Paquelin cautery—so as just to superficially mark the skin, without causing open wounds—are indicated. Potassium iodide in the dose of ℥ii may also be given thrice daily.

In neuritis, generally electricity is valuable from the first, and preferably the galvanic battery. If, however, the faradic current is borne, and will cause contraction of paralyzed muscles, it may be used. In using either current, one pole may be held, or fastened in place, over the root or proximal portion of the trunk, and the other over the peripheral area of the nerve. The strength of the current should be that readily borne by the human. Hair should be clipped from the area to be treated, and the surface wet with a solution of common salt. Repeated blistering with mild fly blister, or applications of mustard paste should be made along the course of the inflamed nerve, but not on the paralyzed peripheral area. Light searing of the surface with the thermocautery accomplishes immediately the same effect in a cleanly, absolutely controlled manner. These measures may be begun at once on the appearance of neuritis. In the more chronic stages, massage of the paralyzed muscles, with turpentine liniment, and the alternate use of hot and cold douches, are useful; while strychnine may be injected under the skin, in large and increasing doses, twice daily.

Parasites, Intestinal.

Class.—Plathelminthes. *Order.*—Cestoda. *Family.*—Taeniae or Tapeworms, Taeniasis. *Genus.*—Taenia.

Treatment for all kind of tapeworms in all animals generally includes starving twenty-four hours, the use of an anthelmintic, followed by a purge, and repetition of the dose if the drug is inef-

caused by the tapeworm. Examination of the feces for segments, or for ova with the microscope, will alone make the diagnosis positive. The administration of areca nut on the food (3iiss-ii), *i. e.*, mixed with bran or oats, constitutes the most ready treatment. This may be repeated at intervals of three days if not effective at first. The avoidance of infected pastures, the destruction of stable manure by quicklime or burning, and the application of 10 per cent. solution of copperas to pastures are prophylactic measures.

T. fimbriata attacks lambs in the Western U. S. Symptoms become appreciable in the fall when they fail to develop, become hide-bound and lag behind their fellows. They suffer from depraved appetite, limp, show malnutrition, and often act in an erratic way as if "locoed." Thymol may be given as a remedy (gr. xxx for lambs; 3iiss for sheep) suspended in milk and repeated on succeeding days if not successful at first.

CATTLE.—*T. expansa*, *T. alba*, and *T. denticulata*. The symptoms are those of digestive disorders and failing in flesh and strength. As compared with disease in dog, pig and lamb, taeniasis is rare. Tartar emetic (3iiss-iiss), or arsenous acid (gr. xv), may be given on the food once daily for two or three days and followed by 1 lb. of Glauber's salts.

HORSES.—*T. perfoliata*, most common; also *T. plicata* and *mamillana*. The existence of taeniasis in horses is rare and the treatment is the same as for round-worms (see below).

POULTRY.—*Taenia infundibuliformis* and nineteen other species. Exhibited by diarrhea, emaciation, ruffled feathers, fits, sleepiness and weakness. May be enzoötic and is very common. Autopsy will show taeniae in the bowels. Powdered areca nut given in pills, made by the use of butter, may be used in a daily dose of thirty grains, and repeated in three days, for good-sized fowls. The dose varies from gr. x to xlv for poultry of different weight. A cathartic is not usually necessary.

Class.—Nemathelminthes. Round-worms. *Order.*—Nematoda. *Family.*—Ascaridae. *Genus.*—Ascaris.

Round-worms do not require the intermediate host as do tape-worms but many multiply upon immediately reëntering the original host, although a period of development outside the body may intervene.

IN THE HORSE AND ASS.—*Ascaris megaloccephala*. The symptoms are as usual rather vague with occasional colic, diarrhea or constipation, and emaciation. Nervous symptoms sometimes predominate—as spasms, paraplegia and tetany.

Treatment.—An aloes ball containing two to four drams of tartar emetic; or tartar emetic in the same quantity given in three doses at three-hour intervals, and followed by an aloes ball, may be used. Oil of turpentine (℥iv), oleoresin of aspidium (℥i), and linseed oil (1 pint) forms a suitable mixture given at one dose. Also santonin, 4 drams in a pint of linseed oil, or 2 drams with 1 dram of calomel in ball, is employed. Preference is given to tartar emetic.

The administration of a course of tonic treatment with ferrous sulphate, ℥ii, and nux vomica, ℥i, on the food thrice daily, following the use of one of the anthelmintics recommended above, is advisable. All worms passed should be destroyed by burning.

IN THE DOG.—*A. marginata*; and in the Dog and Cat, *A. mystax*. Very common in puppies. Symptoms are varied, as vomiting, diarrhea, convulsions, poor development, worms in the vomitus or feces; sometimes sudden death occurs.

Treatment.—Santonin is one of the best remedies. It may be given in 1 ounce of castor oil (gr. iii–v–viii, adults; gr. ⅛ upwards, for puppies) once every third day for two or three times. Or in pill with calomel (gr. i–v), in the same manner. Areca nut, in the fluidextract, or capsules containing the powder, is frequently prescribed to advantage (℥ii–iv).

IN POULTRY.—*Ascarides* are common in hens, pigeons and geese.

Symptoms.—These are chiefly diarrhea, weakness, ruffled plumage, apathy and huddling in a corner. Hens take about 45 grains of areca nut in pills with butter; pigeons 15 grs., every third day.

Genus.—*Oxyuris*, Whip, Thread or Pin Worm.

IN THE HORSE.—*O. curvula*, *mastigodes* and *vivipara*. Thread-worms inhabit the large intestine and produce symptoms in the course of their passage through the rectum and anus. Itching and rubbing and the appearance of the worms about the anus, on feces, or of their ova about the anus, call attention to the disorder.

Treatment.—Rectal injections of a strong solution of common salt in water; of quassia (1 ounce to 1 pint of cold water); or of lime water; are commonly used, after the bowel has been well washed out with a soap-suds enema, and the same treatment continued once daily for a considerable period. But in addition it is well to give the same internal treatment as for the *ascaris* or larger round-worm noted above.

IN THE DOG, the *O. vermicularis* is the same species of thread worm as infests the human and for this reason there is danger of communication of the ova, especially in the case of children. The discharged parasites should always be destroyed. Itching about the anus may be relieved by 10 per cent. orthoform ointment.

The treatment is the same as in the horse.

STRONGYLIDAE.—*Family.*— *Genus.*—*Strongylus*.

IN THE HORSE.—*S. armatus* and *tetracanthus*. The mature *S. armatus* inhabits the large intestine and, the ova escaping, may be retaken by the horse in drinking water and the larvae may enter the blood vessels, causing thrombosis in various organs (see Colic, p. 58). *S. tetracanthus* remains encysted in the mucosa of the large intestine. Symptoms of dysentery and colic are the main ones, and the parasites may be found in the discharges and on the arm after rectal examination.

Treatment.—Oil of turpentine, given as recommended for ascarides, is one of the best remedies. Thymol (Horses, 3ii; Foals, 3i) is also an excellent agent given in ball coated with keratin after twelve hours of abstention from food, repeated each morning for four or five days, and followed by a physic ball of aloes.

IN THE DOG.—*S.* or *Uncinaria trigonocephalus*.—Hook-Worm Disease or *Uncinariasis*. This disease attacks dogs, and also man to a considerable extent in the tropical and subtropical U. S. The parasite ($\frac{1}{4}$ – $\frac{3}{4}$ in. long in caecum and small intestine) disturbs digestion, leads to autointoxication and withdraws blood from the bowel—hence the symptoms. These consist in colic, constipation alternating with diarrhea, weakness, wasting away, nosebleed and other hemorrhages, marked anemia, edema and often death after a long period. The disease is endemic among packs of dogs kept together and is thought to be conveyed by drinking water contaminated with larvae, or possibly enter through the skin as they do in man. Disinfection of the premises and utensils, after isolation of the sick, and the use of pure water are the important preventive measures.

Treatment.—Thymol (gr. v to xx) given in capsules hourly for three doses, after twenty-four hours of fasting, and followed by two compound cathartic pills, forms an effective mode of treatment. The oleoresin of aspidium is also efficient ($3\frac{1}{4}$ –i, after twenty-four hours' fast, repeated in one hour and followed in twelve hours by a dose of castor oil).

IN CATTLE, SHEEP, LAMBS AND GOATS.—Epizoötic diarrhea, wasting, with loss of strength and spirits, accompanied by high temperature and often associated with husk (*S. micrurus* and *filaria*), is the cause of much mortality among the above animals in many parts of the world. As many as eight different species of strongylus have been found and several species of hook-worms (*uncinaria*) in different epizoötics; the abomasum and intestines being the chief

seat of disease. The parasites may be discovered by examination of the scrapings of these parts with a low power lens.

Preventive treatment includes the destruction of the feces and litter by fire, the use of pure drinking water, the isolation of the sick, and the treatment of infected pastures with lime. Turpentine and thymol have proven the best anthelmintics. Oil of turpentine may be given to cattle in 4-ounce doses, in a pint of linseed oil, and thymol to sheep (lambs, ʒss; sheep ʒi-iss) in 1 per cent. watery solution of cold tar creosote.

A chronic, epizoötic condition (strongylosis) occurs in sheep due to several species of strongylus in the abomasum, often associated with tape and hook-worms in the bowels. This—like hook-worm disease in dogs—leads to loss of flesh, strength, appetite and spirits. The wool drops out and the animals die in the course of months of anemia and exhaustion, with fetid diarrhea toward the last. Ova are found in the feces and strongylides on scraping the mucosa of the abomasum. Treatment is comprised in isolation of the sick, treating pastures with copperas, 80 lbs. to acre in 10 per cent solution; good feeding, plenty of salt and the administration on bran once daily of 100 gr. of arca nut with 2 gr. of arsenic for each sheep for a period of five or six days.

GAPES.—This disease is caused by the *Strongylus* or *Syngamus trachealis*, which attacks hens, turkeys and other birds. The embryos live in the soil and may inhabit earth-worms and when taken up by birds lodge in the upper part of the trachea, where they develop into small, round worms.

The disease is shown by dulness, gaping, coughing, and ejection of the parasites. Suffocation is often produced, when the birds appear to gasp for air. Ova of the parasites appear in the feces. Treatment includes isolation of the sick and the burning of bodies of the dead.

By means of a feather dipped in turpentine some of the parasites may be removed from the trachea and others killed, or trach-

eotomy may facilitate the process. Injections of a few drops of turpentine or ether into the trachea may prove successful in killing the parasites. A 5 per cent. solution of sodium salicylate is also said to destroy the worms injected intratracheally. The henhouse, roosts, premises and drinking utensils must be thoroughly cleaned and disinfected, while the sick are quarantined elsewhere.

Pediculosis—Phtheiriasis—Lice.

The various species of animals are attacked by two kinds of lice—the pediculi (or haematopini) or blood-suckers, and the trichodectes or epidermis-eaters. There are also special species of these insects which attack the several species of our domestic animals. Thus in cattle *P. eurysternus* and *tenuirostris* infest the poll particularly; in the horse, *P. equi* is seen along the back and root of the tail; *P. suis* is found on the back and armpits, inside of thighs, and about the eyes and ears in swine; and *P. piliferus* attacks dogs. The aged, and poorly cared for in the way of diet and cleanliness, are more often infested. The existence of lice is suggested by the scratching and biting which they lead to in our patients, by the location of the itching and signs of dermatitis in these locations with loss of hair and sometimes a greasy secretion on the skin of unpleasant odor, scaliness, and the occurrence of nits or eggs glued to the hair.

The localities affected by lice are in general the poll and along the crest of the neck, back and root of the tail and extremities. Cattle are most often attacked, although all animals are susceptible.

Treatment.—The hair on the patients should be clipped in long-standing cases and the hair should be burned. After isolation of the patients the premises should be cleaned thoroughly, washed with 5 per cent. solution of potassium hydroxide and disinfected by burning sulphur (see p. 282). The skin must be first washed with green soap and water and the special parasiticide applied and re-applied three times at weekly intervals to kill the new generations of lice, which hatch from the egg in about six days. In dogs the

eggs may be removed with a fine tooth-comb after the application of a parasiticide. The following agents are most successful:—Kerosene, which may be used night and morning for two days and then removed by soap and water. In dogs, the tincture of staphisagria or oil of anise in alcohol (1-10). $\frac{1}{2}$ to 1 per cent. solution of corrosive sublimate is also efficient in dogs, if the hair is dried before the animals have a chance to lick off the application. Innumerable other remedies are advocated, as 1 to 5 per cent. decoctions of tobacco, 5 per cent. creolin, lysol or carbolic acid solution, equal parts, or benzine and sweet oil, blue ointment, stavesacre seeds and soft or green soap, each 1 part; water 40 parts, boiled twenty minutes. Also the numerous dips for sheep (see p. 228).

General cleanliness with care of the skin and good feeding are to a considerable extent preventive measures.

Pericarditis, Acute.

Acute pericarditis is not uncommon in cattle and goats from the ingestion of sharp bodies (as needles, pins, nails, etc.), and may be recognized by symptoms at first suggesting indigestion—as dullness, loss of appetite and rumination and tympanites—and later those characteristic of the disease proper. As the treatment is nil, except slaughter for beef, this form will not be further discussed.

In horses and dogs acute pericarditis is generally caused by acute infections, as acute rheumatism, pneumonia, pleurisy, puerperal septicemia; by traumatism, as broken ribs, gunshot; and also by extension of inflammation from the heart, lungs, and pleura (endocarditis, pneumonia, empyema, pleuritis); rarely by penetration of ingested foreign bodies.

Symptoms.—The general symptoms include fever, dyspnea, jugular pulsations, and rapid, irregular pulse, at first strong and later weak. The local signs are tumultuous heart-beat and a to-and-fro friction rub, synchronous with the heart's beats are heard, and often felt, over the centre of the cardiac area. Effusion follows

and the heart's pulsations become feeble to hearing, touch and vision. The area of cardiac dulness extends upward and backward. Irregular, feeble pulse, dyspnea and cyanosis, muffled, imperceptible heart-beats ensue.

Treatment.—The use of an ice-bag over the heart and morphine and atropine under the skin (H., morphine gr. v, atropine, gr. i; D., morphine, gr. $\frac{1}{8}$ – $\frac{1}{4}$, atropine gr. $\frac{1}{150}$) are indicated in the first stage to quiet the heart. Tincture of aconite may be used for this purpose, particularly if there is much fever (H., ζ i; D., η v–x), and repeated every few hours until the pulse is lowered. When the pulse begins to weaken, as the disease proceeds, whisky or aromatic spirit of ammonia are useful (of either, H. ζ ii; D. ζ i, frequently repeated); while strychnine should be given under the skin (H., gr i; D., gr. $\frac{1}{60}$ – $\frac{1}{30}$). Digitalis does not act well in fever or when there is so much pressure on the heart. When the effusion, dyspnea and cyanosis are marked, puncture of the pericardium is in order. The skin is incised over the anterior edge of the fifth or sixth rib about four inches above the lower border of the breast, in the horse; and puncture is done with a trochar and canula. Great care must be used to avoid wounding the heart. To promote absorption, when paracentesis is not done, the application of repeated fly blisters over the heart and the use of sodium iodide internally (H., ζ iii; D., x thrice daily) are most effective measures. Absolute rest is requisite throughout and an easily digestible and laxative diet.

Periodic Ophthalmia in Horses.

This disease pathologically appears to be a periodic, infectious, irido-choroiditis. The exact cause of the disease is still supposititious, however. Heredity strongly predisposes in the offspring of parents subject to the disease. It is more apt to occur in animals with weakened vitality, and damp or wet environment seems to especially favor the disorder. Under improved surroundings and hygiene it is not nearly so frequent as formerly.

Symptoms.—An attack is apt to occur at night. There are signs of pretty general inflammation of one eye. Photophobia; lachrimation; retracted eyeball; pericorneal congestion; dull and dusty colored iris; contracted, sluggish pupil; haziness of the cornea and lens, increased tension of the eyeball; and turbidity of the aqueous humor; are prominent symptoms. Fever and its usual accompaniments are also present. After ten days or two weeks partial recovery ensues, but a recurrence is the rule, and after five to eight attacks permanent blindness results.

The other eye is sooner or later involved. Between attacks the eye is retracted and seems smaller than its mate, a wrinkling of the upper lid and eyebrow and an abrupt bend in the line of the eyebrow may be seen.

Lachrimation, a bluish ring about the cornea, contracted pupil, opacity of the cornea or lens, and discoloration of the iris, may also occur in the interval. Blindness is caused by cataract and tension, which destroys the sight by pressure on the retina.

There is, unfortunately, no means of curing periodic ophthalmia now known, or of preventing the recurrence of attacks when they have once begun. The avoidance of breeding from diseased animals and general good hygiene may secure prophylaxis.

Treatment.—The treatment of an attack is entirely symptomatic. A darkened stall, light, laxative food of bran mashes are indicated. Sodium salicylate, in 2-dram doses thrice daily, is thought to be of service. Iridectomy is useful when the tension of the eyeball is much increased. During convalescence the administration of bitters, as nux vomica (3ii), with ferrous sulphate (3i), on the food thrice daily is of benefit.

Peritonitis.

ACUTE.—Acute peritonitis occurs in all animals. The chief fact to keep in mind is that peritonitis is almost invariably secondary to some local inflammation, injury or lesion in the belly or

pelvis. It is an infection produced more commonly by streptococci, staphylococci and bacillus coli. Inflammations, ulcerations, and perforations of the intra-abdominal organs lead to peritonitis. Foreign bodies, worms and obstructions in the bowels may also induce it. A common source of peritonitis is infection from the female genital organs following parturient sepsis. Wounds, blows and operations upon the belly frequently eventuate in peritonitis. Infection of the liver, spleen, gall or urinary bladder, and kidney often terminate in this disease. The treatment should then be directed rather to the source of peritonitis, than to the disease itself, as very little can be done in a curative way for well marked peritonitis. In human practice the treatment of peritonitis is almost wholly surgical. The focus of infection is removed (appendix, repair of perforations, removal of ileus, etc.) and the peritoneum is drained. This, unfortunately, can not be successfully done in the larger animals but should be attempted in dogs. It is difficult to diagnose peritonitis in the large animals. Persistent colic, with belly tenderness on palpation, rapid, wiry pulse, nausea and vomiting (more especially in dogs), arrest of all digestive functions, with tympanites or ascites, great apathy and progressively increasing weakness, are the chief symptoms. While there is usually high fever, it may be absent. If at the same time a local lesion is present in the belly which would account for peritonitis, the diagnosis is assured.

Treatment.—The main attempt in medical treatment is to quiet pain and peristalsis and enable nature to shut off the local source of infection in the belly by protective lymph,—after attempting to remove any possible source of infection (strangulated hernia, wounds, puerperal sepsis, ileus, etc.) by surgery. For this reason, cathartics are contraindicated. Large doses of opium (H. and C., ℥iii–iv; D., gr. ii–x), laudanum (℥ii–iv), or morphine under the skin (H., gr. v–x; D., gr. $\frac{1}{4}$ to $\frac{1}{2}$), and repeated often enough to subdue pain and slow the respirations to below normal, are essential. All food by the mouth should be withheld. The bowels should be moved

only by enemata and rectal feeding should be employed (see p. 280). Water may be allowed by mouth and normal salt solution should be given per rectum between times of feeding. Hot turpentine stupes are also beneficial. Abdominal distension may be abated by the use of oil of turpentine (H., ζ iv; D., ζ ss) or emulsion of asafetida (H., Oss; D. ζ ii) in enemata of warm water.

CHRONIC.—The treatment of chronic peritonitis depends upon its cause. The causes embrace extension of inflammation from abdominal and pelvic viscera, tuberculosis, new growths, traumatism, etc.

Symptoms.—Ascites (see p. 26), and sometimes intermittent colic, and tenderness on palpation of the belly, are observed. Anemia, cachexia and general failure in condition is progressive.

There is also a dry form of chronic peritonitis (where the belly becomes a mass of adhesions) which is difficult of diagnosis and in which treatment is of no avail. Repeated blisters applied in various spots over the belly, and the use of tonics, stimulants and diuretics, as tinct. of ferric chloride, with spirit of nitrous ether, each ζ i, fluidextract of digitalis, ζ ss, oil of juniper, ζ i, given in water three times daily is of service in cases with ascites in the larger animals. Potassium iodide (ζ iii) may be given thrice daily in solution, if the above mixture is unsuccessful. The food should be very nourishing. When the cause is probably of an incurable nature, treatment is of course useless, but in localized peritonitis from extension of pelvic inflammation in females, and in that due to traumatism, and in horses in cases in which the cause is undiscoverable, recovery is not rare.

Pharyngitis—Angina—Sore Throat.

Most frequent in horses, dogs and pigs; less so in cattle and cats; rare in sheep and birds, except pseudo-membranous form.

Diagnosis is made by inspection in dogs and cats; in other animals by symptoms.

Symptoms.—In larger animals the chief symptoms are diffi-

culty in swallowing, with return of fluids through the nose. Masticated food and mucus falls from the mouth. Cough, nasal discharge, and swelling of the lower parotid and inter-maxillary region occur. Complications are laryngitis, edema of glottis, abscess of glands about pharynx, pneumonia, etc.

Treatment.—In enzoötic cases isolate the sick. Good ventilation and surroundings, and soft or liquid food are essential. Gruels, mashs, cooked roots, milk, and green food for large animals. Milk, gruels, and soups for smaller patients. Drenches are dangerous in leading to foreign-body-pneumonia from entrance into larynx.

Tincture of aconite, given hourly undiluted on the tongue, is a useful remedy to combat fever, etc. (℥x for horses, and ℥i for dogs, continued until physiological effect noted). An electuary, given twice daily, containing kermes mineral and potassium chlorate, of each ʒii, is beneficial for the large animals. Externally, cold applications, hot fomentations, ice or hot poultices, stimulating liniments and blisters are variously used. While continuous cold or hot applications are most effective, they are difficult to secure, and a wet compress about the throat, covered with oil silk, or camphor liniment, with $\frac{1}{4}$ part of oil of turpentine, and bandaging, are most useful in mild cases.

Antiphlogistine, spread on thickly and changed each twelve hours, is also useful applied under the throat from ear to ear, after the hair has been shaved. When abscess threatens, hot poultices changed often, or a cantharidal blister, may be employed.

Fever is allayed by the use of cold enemata and a cool stable; constipation by a laxative diet, a few ounces of carron oil or Glauber's salts on the feed of the larger animals, and enemata.

Inhalations of 2 per cent. solution of carbolic acid, or other form of medicated steam, are of service when the nasal cavities are specially involved. The nostrils should be kept clean and greased with vaseline.

Abscess about the pharynx calls for incision of the skin, and exploration by blunt dissection with the director or finger. Severe dyspnea demands immediate tracheotomy. The direct application of an 8 per cent solution of silver nitrate, or glycerite of tannin, may be made to the pharynx in dogs twice daily; or $\frac{1}{2}$ dram of glycerin, containing $\mathfrak{m}v$ of tinc. of ferric chloride, may be given by the mouth hourly, while wet compresses or antiphlogistine are applied to the throat. Swine are apt to die of suffocation and should be given a smart fly blister, from ear to ear, and receive an emetic of veratrum album or ipecac (of either, gr. 30 in food). True follicular tonsillitis—as seen in man—and the pseudo-membranous pharyngitis occur in swine.

Pleurisy and Empyema.

ACUTE PLEURISY may occur in all animals and is usually unilateral. Acute primary or idiopathic pleurisy has been taught to be generally due to exposure to cold, but, while cold may predispose, the immediate cause must be bacterial. It has come to be known in human medicine that most cases (80–98 per cent.) of primary pleurisy (formerly attributed to cold) are due to tuberculosis, although rapid and complete recovery is the rule. The same may apply to many cases in veterinary practice. On the other hand, pleurisy often originates from extension of infection in the neighborhood, and becomes secondary to pneumonia (pneumococcus pleurisy) of various kinds; from pulmonary gangrene or growths; from disease of the pericardium; mediastinum; gullet; peritoneum; and from injuries of the chest (broken rib); and caries of ribs, sternum and vertebrae. In general infections the pleurisy may originate from the same bacterial cause, as in parturient and other septicemia; pyemia (streptococcus pleurisy); in articular rheumatism; glanders; and very often in tuberculosis.

Symptoms.—The symptoms of acute pleurisy are briefly: chills; fever; pain in chest, shown in movements or in pressure on the

affected side; rapid, abdominal respiration; dry cough; widening, flattening or bulging of the intercostal spaces; displacement of the heart-apex, especially in left-sided pleurisy; and sometimes increased girth of affected side, with much effusion. Among the chief signs are: At the onset, friction rubs on auscultation, and, as the effusion appears, feeble or absent respiratory sounds in the lower, and intensified sounds in the upper, part of chest. On percussion, the note is flat up to a horizontal line—representing the upper border of the exudate—and above this there is sometimes a tympanitic note. This line changes in accordance with the upper margin of the fluid as the patient changes position. Bronchial breathing is occasionally heard over the area of effusion but is not characteristic. Doubt as to diagnosis may be solved by exploratory, aseptic puncture.

Treatment.—At the beginning, venesection may give relief in some cases with much dyspnea, and four to six quarts may be removed from the jugular. This measure is not commonly indicated. High fever and pain are relieved by the use of phenacetin (H., ʒi; D., gr. x) and the application of repeated hot blankets, and mustard rubbed into the chest, followed by the application of a rubber sheet and dry blanket. With much pain, morphine under the skin, or laudanum (ʒii in a pint of linseed oil for the horse), may be substituted for phenacetin.

With the approach of effusion, it is well to employ measures to increase the elimination of fluid and lessen its entrance into the body. Thus to the horse we give one dram of calomel (in ball) with four drams of aloes; to dogs, 5 to 10 gr. of calomel in capsule. Thrice daily, we may give a mixture of fluidextract of digitalis (ʒi), oil of juniper (ʒi), and acetate of potash (ʒi) in water to horses; to dogs, calomel (gr. ss), squills and digitalis (each gr. i) in pills. At this time a wet blanket and waterproof covering over the chest keeps up a mild hyperemia of the surface and may be reinforced by occasional applications of mustard paste.

A dry diet, with an allowance of a minimum of water, is de-

sirable. If the effusion is large, or persists for several weeks, no hesitancy must be felt as to removal of the effusion by puncture. There is practically no danger when it is done aseptically and much damage accrues to the lung by long continued effusion. In the horse, puncture by a sterile trochar and canula is done in the 8th or 9th intercostal space at the anterior margin of the rib (to avoid the artery) and a few inches above the lower border of the lung. The hair must be clipped off this area and the dry skin thoroughly painted with tincture of iodine. The instruments should be boiled. All the fluid should not be removed if weakness of the pulse or violent coughing occur, and the removal of the fluid should be slow. The puncture may be covered with plaster or collodion, and it is wise to incise the skin and not puncture directly under the incision—but to one side. Following puncture, or in the later stages of pleurisy, the administration of potassium iodide (H., ʒii; D., gr. x, twice daily), together with tincture of ferric chloride (H. & C., ʒi; D., ʒx), and bitters—as fluidextract of nux vomica (H. & C., ʒi; D., ʒi-ii)—promote recovery. The food must be highly nutritious; milk and eggs to large animals, and bovine and beef juice with milk and meat for dogs, are indicated.

CHRONIC PLEURISY.—In chronic pleurisy with effusion the treatment is practically as outlined above, and, in the dry form, treatment is unavailing (tuberculosis).

EMPHYEMA, or purulent pleurisy, following various general infections—as pneumonia, tuberculosis, and injury of the chest with local infection—always demands immediate operation. The persistence of chills and fever and the character of the aspirated fluid enables one to make a diagnosis.

Puncture is rarely sufficient, but there must be resected a portion of one or more ribs to facilitate drainage. Cure is attained by obliteration of the suppurating cavity and adhesion of the pulmonary and parietal pleural surfaces. In selecting the site for operation one must choose the lowest point to secure efficient drain-

age. An incision is made directly over the rib and the rib is then denuded of periosteum by an elevator and three inches or so of rib removed by bone forceps, without penetrating the pleura. The pleura is then incised and the incision extended with the hand. Care must be taken in denuding the rib not to injure the artery just behind the rib. Partial general anesthesia is required for the operation and all adhesions of the lung to the pleura must be broken with the hands. Under partial anesthesia, coughing causes expansion of the lung, whereas if much hemorrhage occurs complete anesthesia will induce collapse of the lung and arrest of bleeding. If the lung can thus be made to expand by breaking all adhesions it will not be necessary to resect more of the ribs than is necessary for manipulation, as the expanding lung will fill the pus cavity. The wound is closed, save for a large drainage tube, and irrigation is unwise, except with foul effusion, and then 1-2,000 permanganate solution may be employed.

Incision and drainage may cure some recent cases without rib resection.

Pleuro-Pneumonia of Cattle.

This is an infectious disease often beginning sporadically but becoming enzoötic or epizoötic. It is transmitted from animal to animal, supposedly, through the expired air for some distance, and also by means of attendants, utensils, infected premises, etc. Infection is spread by mild cases which have apparently recovered, and also by convalescents, as the infection may persist over a year in a patient. The loss from deaths and imperfect recoveries is from 50 to 70 per cent. Incubation period lasts from three to six weeks and the development of the disease is often insidious with increasing cough and diminishing appetite, rumination and lactation, and tenderness on pressure over the ribs, while the temperature is generally above 102° and as high as 104° F. This may last for a month and some apparently recover. The more active stage supervenes

with symptoms and signs of pleuro-pneumonia and lasts a few days or weeks. A correct diagnosis can rarely be made without a history of prevalence of the disease or autopsy.

Treatment is unsuccessful and thorough eradication of the disorder can only be accomplished by slaughter of the sick and exposed animals. The most thorough cleaning and disinfection of the premises and contents are also required, as the infection persists for over a year in an infected barn. (See p. 282).

Pneumonia.

1. **CROUPOUS OR LOBAR PNEUMONIA.**—Most common in horses, affecting the anterior lower part of lung, and on one side usually. Seen also in cattle and dogs. Due to special infection and therefore runs a regular course and is self-limited. Characterized by high fever, rapid pulse and respiration (20–60), cough, dulness, rusty nasal discharge, crepitant râles, bronchial breathing, dulness on percussion, followed by moist râles and rapid fall of fever in about six days. Often complicated with pleurisy.

2. **BRONCHO, CATARRHAL OR LOBULAR PNEUMONIA.**—Occurs in isolated, disseminated patches from extension of capillary bronchitis, in many cases, and seen in the young, as dogs, lambs, calves, pigs, in the course of many infections (as distemper). It is that form caused by worms in sheep, pigs and calves. Also it is due to the aspiration of ingesta into the lungs (foreign body pneumonia) following the giving of drenches improperly or to animals unable to swallow readily, as in brain disease, acute pharyngitis, parturient paresis, etc. Also to the entrance of foreign bodies from the pericardium in cattle. In foreign body pneumonia gangrene of the lung with foul breath and evidences of cavities are seen. Broncho-pneumonia does not run the regular course of lobar pneumonia and the signs occur in small areas of lung and are more difficult to detect. With cough, high fever and rapid breathing it should be suspected, especially following bronchitis.

3. INTERSTITIAL PNEUMONIA.—This is a sequel of either form of acute pneumonia and occurs from many other causes. It is chronic and due to the production of fibrous connective tissue in the lungs.

Treatment.—The general treatment of a typical case of croupous pneumonia varies with the stage. At the onset, in case there is much dyspnea with full pulse, venesection (H., four to six quarts) may give relief, but is only rarely indicated. Tincture of aconite (H., ʒi; D., ℥ii-v) may be given more often in this stage, to reduce the rapidity and bounding character of the pulse; a few doses are usually sufficient, but are contraindicated with influenza or depressed condition of the patient and never except at the onset. Proper food and surroundings are most important. An abundance of cool, fresh air is a vital matter in stimulating the respiratory centres and preventing toxemia. In human medicine the treatment of pneumonia outdoors is gaining many adherents, even in the coldest weather and among children. Cold air or climate does not contraindicate outdoor treatment, then, providing the animal is sufficiently covered and protected from wet and winds, and it takes the place of cold applications to the chest, as antipyretic measures in human practice (ice-bags), which are not easily made to horses. The legs should be well bandaged after rubbing with mild mustard paste. The diet should be laxative: H., grain, hay, with roots, grass and bran mashes, and eggs and milk if animals will not eat well; dogs will be given milk and broths and a little meat. If pain is great, as shown by rapid, difficult breathing, the frequent application of hot cloths covered by a rubber sheet and blanket may be made. Such treatment would only be proper when conducted in a warm stable.

In the stage of hepatization, high fever demands attention. When over 104°–105° F. a single dose of antipyretic may be used (H., acetanilid, ʒii; with caffeine, ʒi), but is generally inadvisable as too depressing. Cold enemata, a cold atmosphere, and an ice-

bag bound over the heart are most serviceable; or the application of cold compresses over the chest, changed every ten minutes in warm weather. Failure of the pulse calls for stimulants, as whisky (H., ℥ii–iii); digitalis, fluidextract, (H., ℥i; D., tinc. ℥x–xx); strychnine (H., gr. i; D., gr. 1/120–1/130); camphor (H., ℥i, ball; D., ℥ss, of spirit in water); ammonium carbonate (H., ℥ii in ball; D., gr. v in solution); one or more of which may be used and repeated every few hours as indicated. The action of the kidneys is favored by sweet spirit of nitre (H., ℥i; D., ℥ss) given with whisky or in the drinking water. The bowels are kept open with enemata, or oil by the mouth.

As the crisis or stage of resolution comes on, with fall of fever, stimulants are particularly indicated. They should never be given until called for by a weak pulse. Overloading of the right heart, as shown by feeble pulse, marked pulsations of the jugulars and much cyanosis, is best relieved by venesection.

The intravenous or subcutaneous injection of normal salt solution in pneumonia has proved of considerable value in human practice in cases marked by great depression due to toxemia. The measure deserves trial in veterinary medicine.

During resolution, expectorants—especially in broncho-pneumonia—are indicated, as the ammonium compounds, recommended under bronchitis. During the whole course of broncho-pneumonia, stimulating treatment is indicated, with good feeding, as it usually arises in the course of exhausting infections.

In delayed resolution, sodium iodide is useful (H., ℥ii; D., gr. x thrice daily). Bitters, as gentian and nux vomica with whisky, are serviceable in sustaining the appetite in this stage.

Polyuria of Horses—Diabetes Insipidus.

Polyuria of horses generally follows the feeding of musty or moldy oats, bran, hay, fermented fodder or the habitual use of boiled food (Williams), and is apt to disappear with change of diet.

True diabetes insipidus, as seen in the human and occasionally in horses, is a specific chronic disease and not a mere symptom of other disorders. The exact nature of diabetes insipidus is unknown, but it is thought to be a vasomotor disturbance with dilatation of the renal vessels caused by reflex or direct irritation of the medullary centre, of the abdominal sympathetic ganglia, or local irritation of the kidneys. In the horse, the symptoms consist in the passage of a large amount of pale, acid urine (7 to 13 gallons daily), of low specific gravity (1001 to 1015), associated with colicky pains, great thirst, anorexia and weakness. This condition is more strictly a temporary diuresis or polyuria, but, if untreated, may result in a chronic condition or true diabetes insipidus, with much emaciation, exhaustion and even death. In the human, the disease may continue for a long period of years without any serious result.

Polyuria in horses is seen as a symptom in strangles, influenza, pleuro-pneumonia, glanders, leukemia, and disease of the brain. In the true or idiopathic diabetes insipidus of man there are no constant lesions to be found after death. Such cases rarely occur in horses. In the human, exposure to cold, fright, overexertion, inanition, functional nervous disorders, traumatism to the head, sunstroke, ingestion of large amounts of fluid, and convalescence from acute disease, are supposed to have some causal relation. Also brain disease (tumor, inflammation), or abdominal disorder (as peritonitis, tumor, aneurism) may produce polyuria, but this is not diabetes insipidus, but diuresis dependent upon irritation of the brain or kidney.

Treatment.—In the ordinary form in the horse, following the use of musty or moldy oats, a change of diet is the chief indication. Where sound food is not procurable, kiln-drying, steaming or boiling the moldy grain will kill the fungi and lessen the injury caused by the improper diet. This injury may consist in the influence of a toxin upon the central or local renal vasomotor system.

To eliminate the toxin, a cathartic is desirable and a physic ball, or bran mashes with a few ounces of Carlsbad salts in them may be given.

The disease seems to be cured by the prevention of the ingestion of an unusual amount of water. This may be accomplished directly by moderate restriction in the amount of water ingested and by giving agents to relieve thirst. If sodium bicarbonate is placed in the drinking water (as much as four ounces daily) it tends to alleviate thirst. Opium also has this effect and may be given in case thirst is extraordinary (laudanum, ζ i-ii, three times daily) but this is usually unnecessary if iodine is used.

Compound tincture of iodine (ζ ii in a quart of water twice daily), or potassium iodide (ζ ii in the drinking water thrice daily), have proved the most successful remedies and very probably both lessen thirst and aid in the elimination of the toxins which cause the trouble.

A third class of remedies are employed to overcome dilatation of the renal vessels; these include fluidextract of belladonna (ζ i) and ergot (ζ i), or gallic acid (ζ ii, thrice daily in solution); or solution of adrenalin chloride (ζ iv) in the drinking water three times daily. Tonics are indicated, especially those improving the tone of atonic kidneys. Powdered ferrous sulphate and nux vomica (of each, ζ i), with gr. iii of arsenous acid, may be given on the food thrice daily.

Post-Partum Hemorrhage—Flooding.

This is hemorrhage from the uterus or vagina, occurring more commonly in the parturient mare, cow, sow or bitch within twenty-four hours of delivery of the fetus. It is caused by relaxation induced by the presence of retained or lacerated placenta, membranes, blood clots, tumors, or by disease. Also by rupture and lacerations of the womb or birth canal and by inversion of the uterus. Separation of the placenta may occur through violence and lead to flooding before parturition.

Treatment.—Placental or membranous remains should be removed and contraction of the uterus stimulated by injection of sterile water at 120° F. When the uterus is freed from foreign contents the hypodermatic injection of ergotin (H. & C., 3ss-i; D., gr. ii-x) or fluidextract of ergot by mouth (H. & C., 3ss-i; D., 3ss-i) should be used and repeated every two hours if not at once effective. Raising the hind quarters of large animals is of benefit, and the application of tight strapping about the belly. The introduction of ice into the uterus is recommended but is less valuable than hot water.

Laceration of the uterus calls for packing of the wound with sterile gauze or suturing, and inversion demands replacement. The subcutaneous use of morphine, or laudanum by mouth, is of service in quieting the animal and preventing shock.

The introduction of sterile salt solution at 105°-110° F. (one level teaspoonful of common salt to the pint) into a vein, under the skin or by rectum, is always indicated in severe hemorrhage, together with the use of strychnine subcutaneously and strong alcoholic liquor by mouth. (See p. 287.)

Post-Partum Paralysis—Parturient Apoplexy—Milk Fever.

A disease peculiar to and very common in cows. It occurs more often in well-fed, heavy milkers which have borne several calves. The disease appears usually within twenty-four hours after calving, more rarely before, and even as late as a week to six months after parturition. The cause is not certainly known. Schmidt theorizes that a poison is formed in the udder owing to over-activity of its cells.

Symptoms.—The first noticeable signs are uneasiness with stamping of the hind legs, twitching of the muscles, dragging of the hind legs, staggering gait behind, and finally the animal falls and lies with the head against the side of the body. Consciousness is dulled or lost. The eyelids may not wink when the eye is touched,

the tongue is paralyzed, and the animal can not swallow. The movements of the digestive organs cease and tympany results. The feces are hard and often smeared with mucus or blood, and there is retention of urine. The pulse ranges from 60 to 120; the temperature from subnormal to 105° F. The extremities are cold.

Death commonly occurs within two or three days, rarely at later periods, from food or drink getting into the trachea and causing foreign-body pneumonia. Occasionally the paralysis persists a long time, but ordinarily recovery, when it takes place, is complete within a few days. Sometimes the symptoms are of a mild nature with weakness of the hind limbs, but no loss of deglutition or peristalsis, in which case recovery is the rule.

Preventive measures consist in exercise during pregnancy, withholding grain entirely, except bran mash and a little flaxseed meal during the latter six weeks of pregnancy, and the use of Glauber's salts to keep the bowels active. The after-birth should be removed soon after calving, if not expelled spontaneously, and 2 per cent. lysol douche used in the uterus.

Treatment.—The recently discovered curative treatment is perhaps the most brilliant in veterinary medicine. Over 90 per cent. of patients are now cured, whereas formerly almost the reverse was true. This curative treatment was first employed by Schmidt, who injected into each quarter of the udder about $\frac{1}{2}$ pint of a 1 per cent. sterile solution of potassium iodide. Kunsel then used a tank of compressed oxygen connected by six feet of rubber tubing to a sterile milking tube. The hands of the operator, and the udder of the patient, after being stripped of milk, should be thoroughly washed with soap and warm water and 2 per cent. lysol (compound cresol solution), and the milking tube boiled. The oxygen gas is permitted to distend each quarter of the udder by flowing through the tubing and milking tube into the teat. It has been found that sterile air may be used for inflating the udder and will act as satisfactorily as oxygen gas. Very convenient appliances are now sold,

consisting of a rubber bulb and tubing, a chamber containing sterile cotton through which the air is filtered, and a milking tube for introduction into the teat. If one of these is not at hand a bicycle pump may be employed to inflate the udder, air being forced through a wash bottle containing 5 per cent. carbolic acid into a rubber tube connected with a milking tube. The preparation for the use of either of these methods should be as advised above; removal of milk from the cow and cleansing of the hands and udder, and boiling of the milking tube for five minutes.

The milking tube is then introduced into one of the upper teats, as the cow is lying, and the air is allowed to flow into the teat until the corresponding quarter of the udder is tense and well distended. While pinching the teat, to prevent the escape of air, the milking tube is withdrawn and a strip of tape is bound about the lower part of the teat to retain the air. This is said to be unnecessary if the teat is compressed for a short time with the fingers, as the sphincter muscle will then prevent its escape. The same procedure is repeated in each of the remaining teats. The ligatures are removed in an hour or so.

No milk should be removed for twelve hours, nor should the udder be manipulated so that the air will escape, and it is well that the udder be only partially emptied for several days. Otherwise all the severity of the original condition may suddenly recur, when the inflation will have to be repeated. The rapid curative effect of inflation of the udder is wonderful, the patient often getting up and eating within a few hours.

The subcutaneous injection of $\frac{1}{2}$ grain of strychnine nitrate, the emptying of the bladder with the catheter, the bowels by enemata, and propping the patient up in a comfortable position should not be neglected, however. The therapeutic action resulting through distension of the udder by fluids or gases in this disease has not been satisfactorily accounted for. According to Schmidt's theory, the compression may lessen the blood supply and functional activity

of the udder. There is no parallel treatment for any other disease in veterinary or human medicine.

Prolapse of the Rectum, Uterus and Vagina.

PROLAPSE OF THE RECTUM.—This is more often seen in cattle, young pigs and dogs—rarely in horses. In the slighter degrees of prolapse, and when the bowel has not been severely injured, it may be returned after applying cold water or fluidextract of hamamelis, or other astringent, in water. The parts should be well greased with vaseline and gradually pushed back. If the hind quarters are raised and a gag is placed in the mouth, to prevent holding the breath and expulsive efforts, the operation may be facilitated. If reduction is impossible and only the mucous coat is prolapsed, the actual cautery may be applied in radiating lines to the prolapse and then return accomplished by burning through the sphincter at two points. This results in contraction in healing and prevents recurrence. So in prolapse of all the coats of the bowel, the bowel should be returned if possible and the actual cautery may be applied in lines parallel to the long axis of the bowel—and just within the anus—to produce contraction of the gut at this point and therefore to retard recurrence. The application of a pad and pressure over the anus, the administration of opium and restriction of food after the operation, aid recovery. These measures are more applicable for dogs, as general anesthesia and stretching of the sphincter are essential.

In severe prolapse of great size, and in prolapse in which the integrity of the bowel has suffered, one must empty the lower bowel by enema and push back any of the small intestine which may have come down. Amputation of the prolapsed lower bowel is now indicated. The bowel is amputated just outside the anus, but first, to prevent the proximal segment from slipping back in the belly as soon as amputation is done, one must tack the two layers of bowel together with sutures at two or three points in its circumference and just above the point selected for amputation. The cut ends of

the distal and proximal segments are then to be sutured together with chromic catgut or sterile silk passing through all coats of the gut. This condition is not uncommon in cattle following tympanites, and the writer has known of the operation being frequently done successfully by Western ranchmen on the range.

PROLAPSE OF UTERUS AND VAGINA.—This not rarely occurs in cattle following severe straining or forcible manipulations during parturition. After cleansing, disinfecting and replacing the parts, a recurrence may be prevented by the use of opium, elevation of the hind quarters and by the use of West's vulval clamp, or an extemporaneous truss, or wire suture passed through the lips of the vulva, the ends of the sutures being affixed to quills.

Prostatitis of the Entire Male—Seminal Vesiculitis.

Acute prostatitis is commonly unrecognized but may occur in the entire male of any species. It arises from extension of inflammation in urethritis or cystitis and may be caused by any condition leading to constant congestion of the prostate, as in frequent copulation or masturbation.

The symptoms suggest cystitis with frequent micturition, which may be painful and arrested in its progress owing to swelling of the prostatic urethra. The animal may groan, lift the hind limbs spasmodically, or rub the anus against some object or draw the anus along the ground. The urine is free from blood and pus and bladder elements, however (unless cystitis or urethritis are also present), and examination by the rectum reveals swelling and tenderness about the neck of the bladder in the prostatic region.

Treatment consists in giving frequent hot rectal injections and allowing the water to run out through a second tube placed beside the tube carrying the enema into the bowel. An active purge and a light diet of gruels and mashes for large animals, or milk for small patients, are indicated. The patient must be kept at rest, and internally a mixture of tincture of belladonna, potassium acetate and

sweet spirit of nitre, of each an ounce, may be given to the large patients thrice daily in water.

If there is much frequency and straining in micturition it is well to give morphine under the skin. If the prostate is so swollen as to block the urethra it may be necessary to pass a catheter. High fever and increasing swelling of the prostate would suggest abscess, which must be opened through the perineum, with catheter in the bladder and finger in the rectum as guides to prevent the surgeon from injuring either of these parts. Chronic prostatitis is best relieved by massage of the prostate through the rectum for a few minutes every three or four days.

Inflammation of the seminal vesicles is shown by much the same symptoms and is due to the same causes as prostatitis. A correct diagnosis can only be made by rectal examination. Then the seminal vesicles may be felt just forward of the prostate and on either side of the neck of the bladder. If acutely inflamed, they would give the impression of tense and tender swellings. The vesiculæ seminales may be chronically distended, owing to obstruction of their ejaculatory ducts, and in this case massage of these tumors will cause their contents to be emptied into the urethra with consequent discharge from the meatus. In bulls such a condition gives rise to symptoms similar to those described under prostatitis owing to pressure on the neck of the bladder, urethra, and neighboring parts.

It is probable that distension of the vesiculæ seminales is secondary to chronic inflammation of the vesicles, and obstruction of the ejaculatory ducts follows plugging of them with inflammatory products and altered semen. The treatment of acute seminal vesiculitis is the same as for acute prostatitis.

**Puerperal Fever—Parturient Fever—Parturient Septicemia—
Septic Metritis.**

This is a condition of local (in the female genital organs) and

general infection accompanying or following parturition in all domestic animals, but more commonly in carnivora and cows.

Causation.—Bacterial infection from within or without. Streptococci, colon bacilli and other purefactive organisms are the most frequent specific microorganisms. Retained after-birth or membranes are most often the cause in forming a nidus for the growth of germs. In hard labors the bruising and laceration of tissue may lead to absorption of necrosed tissue and fever without septicemia—that is, without the entrance of germs or their products into the circulation. This is sapremia and can be distinguished from septicemia by the fact of its occurring immediately following labor and being of a milder type. The introduction of germs by the attendant's hand is a most common cause. Infection from infected premises is a most important source of the disease. A dead fetus, pre-existing local infections of the pelvic organs, and absorption of colon bacilli into the circulation from the intestines, during parturition, are acknowledged etiological factors.

Symptoms.—Puerperal fever is recognized by the occurrence of fever within the first four days following labor, accompanied by signs of local infection of the vagina and uterus. There are swelling, redness, ulceration, diphtheretic patches, foul discharge, etc., in the vagina, and the womb is soft, not properly contracted, and very friable. There is much general depression and weakness, rapid pulse, loss of appetite and sometimes in virulent infections (colon bacilli) the temperature may be normal or subnormal. Colic, diarrhea or constipation, and nervous symptoms, as rigors, twitching of muscles, and stupor, are frequent. Puerperal fever is distinguished from the paralytic form by the existence of local inflammation of the genital organs and (usually) high fever. It is extremely fatal unless treated at the earliest stage.

Treatment.—1. Remove the local sources of infection and employ local antiseptic measures. 2. Maintain the strength of the patient.

The uterus should always be gently explored for placental or other remains, and if present they should be removed. Dilatation of the cervix by sounds is sometimes necessary in cows. The uterus may be wiped out with compound tincture of iodine. It is wise for the attendant to wear rubber gloves for protection of himself and patient against infection. The uterus should be irrigated twice daily with warm 1 per cent. lysol solution until the rectum-water comes away clear. A stiff catheter six feet long may be used for the larger animals, made sterile by soaking in 5 per cent. carbolic solution. The external genitals and vagina should always be cleansed before treating the uterus. Abrasions may be treated by dry boric acid. Large animals should stand with the hind quarters lowered while having uterine douches.

General treatment consists in the use of large amounts of alcohol (6 ounces for large animals), ergot to contract the womb, twice daily (fluidextract, ζ i, large animals; ζ ss-1, bitches); and saline cathartics for cows, linseed oil for mares, and castor oil for bitches are desirable.

The food should be very nourishing and grains, milk, eggs and meat juice are in order. The rectal injection of saline solution at 100° F., containing one level teaspoonful of common salt to the pint, is very efficient in all septic states. It should be given twice daily in as great amount as may be retained. (See page 287.) Intravenous infusion of similar sterile salt solutions (4 to 6 quarts for large animals) is also very valuable but requires expert attendance. Fluidextract of nux vomica or strychnine in full doses are indicated.

Prevention.—Isolation of animals about to abort, or to calve, is essential. When parturient fever appears it must be treated as a contagious disease and all means of spreading it prevented by cleanliness of attendants, patients, and premises, and avoidance of same utensils, sponges, attendants, food and water for sick and well animals. Thorough disinfection of premises, as for contagious

abortion (p. 282), and quarantine of the patient till all vaginal discharge ceases are final precautions.

Pulmonary Congestion and Edema.

Active pulmonary congestion may occur as a primary affection in the horse owing to violent exertion and exposure to extreme heat or cold. It is also caused by disease of the coronary vessels, and may be present in beginning pneumonia, and in bronchitis, pleurisy, and emphysema. Inhalation of irritating gases may produce it. In its most acute form, in the horse, there is great dyspnea and the animal fights for breath, the respiration is rapid (even 60-100), with harsh or diminished breath sounds; there may be hemoptysis, and on examination fine râles and perhaps dulness on percussion are discovered. The onset and course are rapid, recovery, pneumonia or death often occurring within twenty-four hours.

Edema is usually associated with, and caused by, pulmonary congestion and also occurs in kidney, heart and brain diseases, and in anemic and hydremic states. Dulness and large, moist râles in the posterior lower part of lungs are found.

Treatment.—With intense, sudden and intense dyspnea no agent is more life-saving than immediate venesection, with the removal of four to six quarts of blood (see p. 283) in the large animals. In addition, the external application of hot turpentine stupes, or mustard paste and hot blankets, is of great service, if frequently renewed and aided by bandaging of the legs. When edema is associated, the use of a powerful cathartic is indicated, together with treatment appropriate to the primary cause.

Passive pulmonary congestion is secondary to weakened heart action in heart disease or debilitating disease, in prolonged decubitus and apoplexy, and is characterized by dulness, and râles in the more dependent parts of the lungs in these conditions.

The treatment should be directed toward overcoming the

primary condition, and includes the use of digitalis, strychnine, and heart stimulants.

Purpura Hemorrhagica in the Horse.

This is a condition due to toxemia from various causes and more often to toxins produced by bacteria of infectious diseases, as influenza and strangles, septicemia, but is also seen in conditions of great debility, and apparently originates from poor hygiene and food and potassium iodide (in man) given in medicinal doses. The blood is altered and extravasations occur in various organs.

Symptoms.—Purple spots appear on the nasal mucosa, which swells and exudes a serous, bloody and often fetid discharge and frequently becomes ulcerated. Lumps as large as an apple occur on the limbs and lower part of trunk. Later, diffuse, hard, hot and tender swelling of the whole limbs and of the sheath, lower belly, breast and lips, with abrupt elevated borders, are seen. Vesicles, ulceration and gangrene are apt to follow on pressure. Walking is difficult. Breathing may become difficult through swelling of the nostrils or of the pharynx or larynx. The tongue may be purplish and petechiae may arise in the mouth. The conjunctivae are often swollen and show extravasations of blood. Intermittent colic and blood and mucus in the feces and hematuria are not uncommon. Fever (102° – 106° F.), rapid, soft pulse and debility are characteristic.

Treatment.—This is rather unsatisfactory, as about half the patients die. Medicinal treatment includes the use of remedies which increase the coagulability of the blood (gelatin and calcium chloride), those which tend to prevent hemorrhage by constricting the vessels (ergot, turpentine, adrenalin, etc.), those which are directed against bacterial sources of toxemia (as collargol and antistreptococcic serum), and those tending to improve the general health (arsenic, bitters and iron).

Calcium chloride may be given to advantage with gelatin by

the rectum after the bowel has been cleansed by enema. A solution containing gelatin to the amount of 6 per cent., and calcium chloride 1 per cent., is thus given to horses (in a dose of one pint) at the body temperature. Or gelatin may be given in solution *ad libitum* by the mouth in which calcium chloride is dissolved (calcium chloride $\frac{3}{4}$ ss at dose thrice daily). Turpentine is the most successful of the hemostatics and is administered (with one pint of milk) in ounce doses thrice daily to prevent hemorrhages from mucous membranes. In case this is not successful, adrenalin has of late been employed and there have been favorable reports upon its use in purpura hemorrhagica in the human. Four drams (1-1000 adrenalin solution) may be given in a pint of water by the mouth to the horse.

Collargol is indicated when purpura follows infections and it is best given intravenously ($\frac{3}{4}$ i in 5 per cent. aqueous solution), or, less effectively, per rectum. Antistreptococcic serum is indicated in streptococcic infection and also in other infections to stimulate phagocytosis. Good results have been reported from its use in veterinary practice; the dose is 20 to 50 c.c., and both it and collargol may be repeated once or more at intervals of twelve hours, if improvement does not follow the first dose.

But of chief value in this disease are good hygiene and food. An airy, light, dry and warm box-stall, and a ration of oats, roots, green food, hay and bran mashes, with milk and eggs if there is anorexia, are most serviceable. Mild laxatives only, as 1-2 pints of linseed oil, are permissible. During convalescence arsenous acid (gr. iii), iron (ferrous sulphate, $\frac{3}{4}$ i), and bitters (powdered nux vomica, $\frac{3}{4}$ i) should be placed on the food thrice daily. Swelling about the head and nostrils may be reduced by constant bathing with cold water. The appearance of sores, sloughing and ulcers demands ordinary surgical treatment. If the breathing becomes embarrassed tracheotomy is indicated. No halter or harness should be permitted on the animal for fear of pressure necrosis. The swellings of the

skin have been treated by incision and various local applications, but little good is accomplished and harm may result from surgical interference.

The remedies recommended for overcoming extravasation will be of most value in preventing the surface tumefactions.

Rabies in Animals—Hydrophobia in Man.

Rabies is more common in dogs, but all animals, except the adult pigeon, are susceptible to the disease. It attacks the wolf, skunk, jackal and fox. Rabies is probably due to a specific germ (the "Negri bodies," or protozoan parasites) and is almost always transmitted by inoculation of the saliva into a non-rabid animal by the bite of a rabid one. Flies and midges are said rarely to also convey the infection, probably by carrying the protozoa of rabies from the saliva of rabid animals to abrasions on the skin or mucous membranes of the non-rabid. The infective organism inhabits various parts of the patient but exists in greatest numbers in the nervous system and saliva of the rabid animal. Like tetanus, the germ spreads from the wound (caused by the bite) through the nerves and central nervous system, and not by means of the lymphatics and blood-vessels as in most infections. The organisms may remain for some time in the wound without spreading, after the infliction of the bite, and thus local destruction of the infection is specially desirable and may lengthen the period of incubation, if not preventing the disease, even if done at a late period. The period of incubation in dogs varies from a few days to several months—the average being twenty-five days. In man the disease appears usually in the second month after being bitten.

Symptoms in Dogs.—In the first stage the animal is altered in disposition and habits. He is sullen or very friendly, nervous, restless and often shuns the light and hides. He frequently licks and swallows all kinds of objects and is subject to vomiting. There is no fear of water, or difficulty in swallowing it in the early stage,

but later and in dumb rabies paralysis renders swallowing water impossible though the attempt is constantly made. In the second stage, the animal is apt to leave home and travel great distances, biting animals, man and inanimate objects, often returning to die. The voice is changed into a hoarse howl, the tail droops and the head is depressed with staring, glazed, injected eyes, and the animal is insensible to pain, persons and surroundings; the gait is unsteady, and the patient becomes emaciated and repulsive. Periods of excitement and biting occur in the presence of noises and animals, while alternating with exhaustion and quietness if the patient is not disturbed. The third stage is shown by exhaustion and paraplegia with paralysis of the lower jaw. The latter happens early in what is known as the dumb or paralytic form of rabies, and the lower jaw drops, the tongue is dry and covered with stringy mucus and there is inability to swallow, howl or bite. The end is invariably fatal in four to ten days. Foreign bodies are frequently found in the stomach after death.

When persons or animals have been bitten by a dog it is of the utmost consequence that a correct diagnosis be established. If the suspected animal is alive he should never be killed but kept in confinement for observation. If the suspected animal is dead, microscopic examination by an expert pathologist of the vagus ganglia of the suspected animal may immediately solve the diagnosis. The presence of Negri bodies in Ammon's horn and lesions in the gas-serian ganglion are pathognomonic. In order that the pathologist may determine the diagnosis in rabies the whole head or brain of the suspected patient may be sent on ice, or better, the brain may be sent wholly immersed in glycerine. A certain but slower method is by inoculation of a dog or rabbit with a bit of lumbar cord or medulla of the suspected animal (not less than gr. $\frac{1}{2}$) rubbed with a little sterile bouillon and injected under the dura mater of the brain, or, what is easier, into the anterior chamber of the eye after instillation of cocaine to render it painless. The period of incuba-

tion in the rabbit after inoculation of the brain is twelve to twenty-one days; in the dog, fourteen to seventeen days after injection into the eye.

When a case of rabies occurs in a locality all dogs should be muzzled for six months within a radius of twenty miles. Animals bitten by rabid dogs should be killed. Dogs found loose without muzzles should be impounded or, if this is impossible, shot. If persons are bitten by rabid animals the bites should be at once freely excised or thoroughly cauterized with strong nitric acid or a hot iron and receive antiseptic irrigation and applications. Such persons should then be sent to the nearest Pasteur institute for treatment or be treated at home by attenuated virus procured from the Pasteur institute in New York, or other large city, or from the Surgeon General by application of any public health officer to the U. S. Public Health and Marine Hospital Service at Washington, D. C. Treatment is performed by injecting daily for a period of fifteen to twenty-one days an attenuated virus of increasing intensity with short period of incubation, and is free from danger and successful in 99 per cent. of cases treated within a comparatively short time after receiving a bite from a rabid animal. It may be safe to wait for the result of inoculation experiments as above, before sending bitten persons for the Pasteur treatment, unless the bites have been inflicted on uncovered parts of the body. But if the clinical history and autopsy are extremely suggestive of rabies the writer has sent the bitten persons at once for treatment and has never had cause to regret his action. The discovery of Negri bodies should lead to immediate Pasteur treatment. No treatment is known which will cure rabies in animals, or the same disease in man (hydrophobia), when it has once appeared clinically.

Rachitis—Rickets.

A disease of all young animals—more common in pigs and dogs—and characterized by faulty nutrition, digestive disorders,

weakness of muscles and deformities of bones. Caused by unhygienic conditions, improper or insufficient food and impaired physique. When the animal is a suckling, rickets may be caused by disease or improper kind or insufficient amount of mother's food. This is seen in case of lambs and pigs, while foals and calves suffer by reason of disease or exhaustion of mothers. It is not always due to insufficiency of lime salts in food, as sometimes rickets develop on a ration containing all the necessary mineral salts. There appears to be an inability to assimilate mineral salts, from some cause not certainly known.

Symptoms.—The digestion is impaired, as shown by indigestion and symptoms of gastritis and enteritis with poor and irregular appetite. The patient is sluggish through weakness and tenderness of muscles, which are painful on movement. After a while enlargements and deformities of the joints occur with deformities of the shafts of the long bones. The spinal column is often bent to the side or downward, and the jaw in pigs and lambs may be misshapen so as to make mastication difficult. Growth is stunted. If much deformity exists it can not be removed. Otherwise prognosis is favorable.

Treatment.—In the case of sucklings, the mother's food should be improved in nitrogen, fat and salts. Cottonseed or linseed meal and beef meal may be added to a more generous diet of grain for the mother, or the young animal may be weaned and given—if herbivorous—rich milk, eggs, beef meal, milk, gruel of oatmeal and a tablespoonful of linseed meal in milk daily, or cod-liver oil. Carnivora may receive milk, strong broths, gruels with milk, juice squeezed from rare beef, cod-liver oil.

If anemic, the syrup of ferrous iodide is most useful; 15 drops for calves and foals, 2 to 5 minims for puppies. Phosphate of lime is a food and phosphorus stimulates the growth of bone. Phosphorated oil (U. S. P. 1890) may be given to foals and calves in dram doses twice daily—omitting it every other week—to puppies

in $\frac{1}{2}$ to 1 minim doses. The precipitated calcium phosphate is prescribed in dram doses for foals and calves three times daily. Cod-liver oil may be administered to advantage with syrup of ferrous iodide, or with lime as follows:

℞

Olei morrhuae	℥ii
Syrupi calcis lactophosphatis	
Liquoris calcis	aa ℥iv
M. (shake).	
Sig. Teas. for puppies; tablespoonful for foals and calves, twice daily, after meals.	

The hygiene is of greatest importance for cure. This includes constant grooming and cleanliness; good housing; and fresh, country air. Pigs must be removed from dark, unhealthy styes.

Ringworm—Tricophytosis—Tinea or Herpes Tonsurans.

Ringworm is a disease of the skin caused by the invasion of the hair shafts, hair follicles and epidermis with the vegetable fungus known as *Tinea tonsurans* or *Trichophyton tonsurans*. It attacks more commonly cattle and dogs, but also horses, pigs, sheep, goats, cats and poultry. The disease is capable of being transmitted from animals to man, and rarely from one species of animal to another; it is very contagious from one animal to another among the same species. It attacks especially sucking calves and young cows about the head, throat and neck; dogs are affected about the head and limbs; horses about the croup, flanks and under the area where the saddle rests.

The lesions present different appearances in the different animals and sometimes in the same animal. In a general way ringworm is characterized by the appearance of well-defined, slightly elevated, circular, bald spots, varying much in size and well dispersed, but sometimes becoming confluent. These spots are occasionally simply hairless patches, with the stumps of broken hairs

sticking up over them, or show more or less signs of inflammation. In dogs and horses the patches may be covered with grayish scales or crusts, while in cattle the asbestos-like scabs are often very thick and are underlaid by a purulent secretion. The spots increase by growth of the periphery while the disease disappears in the centre. Itching is moderate; much less than in eczema or mange.

Treatment.—Since the disease is transmitted by contact, patients should be isolated and the premises, clothing, bedding, harness, cleaning utensils, etc., used on patients, must be thoroughly disinfected and hair and crusts burned. The disease may be spread from one part of the body to another by grooming when the disease has once appeared. To begin treatment, the scabs or crusts must be softened with sweet oil and removed by washing with tar soap or green soap. Iodine is one of the best remedies. This may be used by simply painting spots with the tincture, or by daily inunction with a stiff brush of an ointment containing 1 dram of iodine to the ounce of goose grease. Moussu recommends for cattle the following prescription for local application, where the patches are small and well defined: acidi carbolici, tincturae iodi, chloralis, aaʒi. When the disease is generalized, thorough washing of the surface with green or tar soap and the application of the harmless boric acid (ʒii) in alcohol (ʒx) and ether (ʒiii) may be useful; salicylic acid in alcohol (1-10) is also efficient and not dangerous. Many other remedies are curative, as sulphur ointment, and 10 per cent. ointment of lysol, creolin and tar. Unguentum hydrargyri ammoniati is excellent in small areas. It is best to clip the hair about the patch and pull out that on the diseased area if this is feasible.

Roaring.

This affection is common to horses and rarely seen in cattle and dogs. Roaring is usually due to peripheral neuritis of the left recurrent laryngeal nerve, with left-sided paralysis of the

larynx, falling in of the arytenoid cartilage, and therefore obstruction to breathing.

The neuritis may be due to toxins arising in acute infections of the respiratory tract (pleuro-pneumonia, strangles, pharyngitis, laryngitis). Roaring may also be caused by obstructions, stenoses, new growths and thickening of the mucous membranes of the upper breathing passages.

The disease is chronic and exhibited by a whistling, roaring, wheezing or snoring sound occurring during, or directly after, exercise and associated with dyspnea. The left arytenoid cartilage yields more readily to manual pressure than its fellow and pressure gives rise to noisy breathings in advanced paralysis.

Treatment.—Roaring due to paralysis of the larynx is incurable by drugs and can only be relieved by arytenectomy. Following acute inflammation of the throat, the use of a cantharidal blister to the larynx, and sodium iodide (H., ʒii thrice daily), may be serviceable in thickening of the mucous membranes. The subcutaneous injection of strychnine sulphate (average dose gr. i) once daily into the region of the larynx is said to delay the onset of the paralysis in the early stage. Other causes of roaring must be attacked according to their nature.

Scab or Mange in Sheep.

This disease, caused by the *Dermatodectes* (or *Psoroptes*) *communis*, var. *ovis*, is of immense economic and medical importance on account of its widespread and common occurrence in sheep. The parasites attack the root of the tail, back, sides, neck and shoulders. The patients rub, scratch and bite themselves. The skin is variously inflamed with papules, pustules, crusts, with falling of the fleece in patches. One case may infect a whole flock. Lambs and yearlings are most susceptible.

Treatment.—In addition to isolation of the sick and disinfection of premises and objects which have come in contact with pa-

tients, it should be the rule to segregate sheep recently bought for some weeks. As a precautionary measure, a tobacco and lime dip is often used at stated intervals or to treat newly acquired animals, and may be used without shearing. Good pasturing and feeding also enables animals to withstand scab to a considerable degree. The application of remedies is usually by means of bath or dip. Sheep should be first shorn, if infested with scab, and crusts removed by the use of a bath with soft soap (1 lb. to 50 lbs. of water) aided by the brush. Immediately following this the curative dip may be used; unless arsenic is employed, when it is somewhat safer to wait for a week or more after shearing to avoid absorption through the abrasions caused by shearing. The danger of poisoning is very slight, however, as one ounce of the arsenic bath has been given to sheep daily for a week without any ill effect. No baths should be given until four hours after the last feeding, and the water should be heated to about 100° F. The bath or dip is to be repeated at the end of ten days, as it takes about this time for a new generation of mites to be produced. The animal should be kept in the bath two minutes by the watch and its head ducked under once, when using a sulphur dip. Pregnant ewes and rams have to be handled most carefully. When poisonous dips are used—as those containing arsenic, tobacco and creolin—it is customary to keep the mouth, nose and eyes out of water.

The following is the dip recommended by the U. S. Bureau of Animal Industry:—Flowers of sulphur, 24 lbs.; unslaked lime, 8 lbs; water, 100 gallons. The lime is mixed with enough water in a tub or box to form a paste, and on this is sifted the sulphur, and the lime and sulphur are well stirred together. The paste is then to be boiled in a boiler for two hours with 25 gallons of water, and longer if necessary until the sulphur almost disappears from the surface and the solution is of a chocolate or liver color. Pour the mixture then into a barrel, provided with a bung hole about four inches from the bottom, and allow two or three hours for the

sediment to settle. Then the clear liquid is drawn off into the dipping vat and to it is added water enough to make 100 gallons in all. The sediment should under no circumstances be used for dipping purposes. This dip is cheap, most efficient and non-toxic, but is only suitable for shorn sheep and in flocks having scab.

The following dip may be used in sheep with full fleece and as a preventive against scab in those free from it: Manufactured tobacco, 1 lb.; flowers of sulphur, 1 lb.; water, 5 gallons. The tobacco is soaked in cold or tepid water for twenty-four hours, and, on the night before the dipping, bring the water to 212° F. for a minute and allow the tobacco to remain in it over night. Mix the sulphur in a pail with water to the consistency of a gruel. Then strain the liquid from the tobacco (and press the remaining liquid from it) and to this add the sulphur and enough water to make the proportions as above (Rutherford).

The sheep after dipping must be turned into a clean yard or barn. When scab attacks a flock the apparently healthy as well as the infected should be dipped—the sound ones first. There are innumerable other dips containing arsenic (arsenous acid, $1\frac{1}{2}$ lbs.; iron sulphate, 10 lbs.; water, 100 lbs.—Tessier), creolin ($1\frac{1}{2}$ gallons in 55 gallons of water), and many others, including excellent patent and proprietary dips. The method of using differs with the kind of dip.

Sarcoptic mange in sheep caused by the *S. scabei*, var. *ovis*, attacks the animals about the upper lips, face, forehead and spreading to the entire head. At the beginning 3 per cent. lysol or creolin solutions will cure. When scabs form, soaking in oil and washing with soft soap should precede the use of oil of cade, sulphur ointment (1 to 4), or the mixture of oil of turpentine, 4 ounces; flowers of sulphur, 6 ounces; and lard, 1 lb. (Moussu). These remedies should be well rubbed over the affected area daily with a brush.

Septicemia—Pyemia—Sapremia—Blood Poisoning.

Septicemia or blood poisoning includes pyemia and sapremia

and denotes poisoning by any putrefactive matter, although its meaning is generally limited to poisoning by cocci and bacilli; while Sapremia means poisoning by the products of bacteria, and Pyemia poisoning by the presence of pus-producing microorganisms in the blood.

Septicemia in its broadest sense, as poisoning of the blood by germs and their products, occurs more or less in all infectious diseases, but usage commonly limits its scope to infection caused by the entrance of germs through accidental and surgical wounds and through the raw surfaces occasioned by parturition.

Symptoms.—The symptoms embrace the following: fever, rapid pulse, depression and weakness, chills, seen especially in pyemia, with intermittent rise of temperature and the formation of purulent foci, and diarrhea.

Sapremia is seen in surgery owing to absorption of blood clots or tissue in comparatively aseptic wounds, and also after labor with bruising of tissue but without much contamination with germs. The symptoms of sapremia are comparatively mild, consisting of transient fever in most cases. The symptoms of septicemia vary with the degree of infection from slight and temporary fever to the most severe type.

Treatment.—The treatment of this condition is chiefly surgical, as by the use of antiseptics, the removal of septic material by the knife, curette, etc., drainage of purulent foci, in order to prevent the entrance of bacteria into the circulation. The diet should be particularly nourishing and should be reinforced by the use of milk and eggs. Oil of turpentine is a useful stimulant and antiseptic and may be given internally (H., §i) thrice daily in emulsion with eggs and milk.

As a cathartic calomel may be selected for its antiseptic action (H., §i), and may be given with oil. As special measures which have proven of value in septicemia we have the intravenous injection of normal salt solution, which tends to dilute the toxins in the

blood and deserves more extended use in veterinary practice; and the intravenous injection of collargol, which has already given satisfactory results through its action in inhibiting germ development. Collargol is given (H., ʒss-i; D., gr. i-ii) in 5 per cent. solution in sterile water. Crede's ointment is a method of using it by inunction (H., ʒss; D., ʒss-i) on the inner surface of the thighs after thorough washing with soap and water and alcohol, but is less certain than giving collargol by rectum. Neither are so efficient as intravenous injection.

Antistreptococcic serum has given good results in some instances, especially when the infection is chiefly streptococcic and in its early stage. 20-50 c. c. are given under the skin and repeated every twelve hours if not at once effective. Iron (tinc. of ferric chloride, H., ʒi) is indicated during and after the immediate attack.

Metchnikoff has recently shown that alcohol, quinine and opium inhibit phagocytosis and therefore destroy the body's defence against infection. He recommends the use of sterile horse serum for stimulation of phagocytosis.

Sexual Excitement (see p. 233).

Spasm of the Diaphragm.

Spasm of the diaphragm is caused by overexertion, "nervousness" or gastric or intestinal irritation acting through the phrenic nerve. Horses are attacked with a severe jerking or throbbing which visibly shakes the whole body. This affects more the lower border of the ribs and flanks along the attachment of the diaphragm and is often more marked on the left side. The spasmodic throbs of the body take place at the rate of 10 to 15 to the minute and are accompanied by a dull thumping noise. Rarely, a sound like hiccup in man is heard, although the condition resembles it pathologically. It is distinguished from palpitation of the heart by lack of correspondence between the rate of the heart-beat and pulse and the throbbing of the body. Rarely the rate of throbbing may be synchronous with the heart-beat, but the greatest area of intensity is back of

the heart area. Difficult breathing; frequent, small pulse; trembling and restlessness accompany the condition.

Treatment.—Antispasmodics often relieve the spasm, as spirit of chloroform or compound spirit of ether (of either, H., \mathfrak{z} i-ii). With symptoms of digestive irritation the use of lavage (see p. 289) and a purge would be indicated. Sometimes the disorder lasts for days, when various remedies should be tried. The injection of morphine (H., gr. v-viii) is one of the most successful; inhalation of amyl nitrite (H., \mathfrak{z} i) or of chloroform may be used. Pulling out the tongue and warm applications over the region of the diaphragm have been successful. Sodium bromide and laudanum (H., \mathfrak{z} i of the bromide and \mathfrak{z} iv of laudanum in a pint of boiled starch solution) may be given as an enema per rectum. If breathing becomes very difficult, venesection (see p. 283) offers the best chance of averting fatal pulmonary congestion.

Spinal Inflammation—Spinal Pachy- and Lepto-Meningitis—Myelitis.

It is difficult to separate these rare diseases in veterinary practice. In a general way the symptoms are:—pain and stiffness in the muscles and limbs; tenderness over the spine; muscular spasm and hyperesthesia, followed by loss of sensation, paresis and paraplegia; retention of urine and feces, followed by incontinence; atrophy of muscles. The condition may be acute with fever but generally is chronic. Rapid paralysis of sensation and motion with bladder and rectal symptoms and bed sores indicate myelitis.

Treatment depends somewhat upon the etiology. Traumatism, tuberculous caries of the spine, infections (septicemia and pyemia, distemper, strangles, etc.), and new growths are causative factors. Meningitis must not be mistaken for rheumatism of the lumbar muscles, as seen in dogs, or “asoturia” or black water in horses. In case of acute spinal meningitis the treatment should follow closely the lines laid down for cerebro-spinal meningitis (p. 88), except that cold should be applied to the spine instead of to the

head. In the second stage of an acute meningitis, or in the chronic form, counter-irritation over the spine in the lumbar region—or centres corresponding to the lesions exhibited—is indicated. A fly blister or, on the smaller patients, cantharidal collodion are employed. Sodium iodide (H., \mathfrak{z} ss; D., gr. x, thrice daily) may be of service. Tonics, as strychnine (H. and C., gr. i-ii; D., gr. 1/120 to gr. 1/100 three times daily) and iron are of service. When paralysis (paraplegia) is marked, the larger patients must be kept in slings and the bowels emptied by enemata or manually; the bladder with an aseptic soft catheter. Faradism of the paralyzed muscles, together with massage with the hand alone or with a stimulating liniment (as turpentine liniment), are also of value. It is always doubtful whether treatment is economically advisable, as recovery is uncertain and often remote.

Sexual Excitement—Nymphomania—Satyriasis.

Inordinate and constant sexual excitement in the male (satyriasis) or female (nymphomania) is but a symptom of many diseases of the sexual organs or nervous centres controlling the same. Treatment depends upon the cause. Thus, in the female, vaginitis, metritis, inflammatory diseases and new-growths of the vagina, womb, and ovary are common causes. In the male, retained testis is a frequent source. Over-feeding, lack of exercise and constant exposure to the opposite sex favor the condition. In the mare and cow the source of disease should be sought through local examination. Inflammation of the womb and vagina may be treated, and, if the clitoris is the seat of inflammation, hypertrophy or adherent prepuce, it may be removed with scissors. Disease of the ovary (cyst, inflammation, new-growth, tuberculosis) is cured by ovariectomy, in the larger animals per vaginam. The continual proximity of the opposite sex should be avoided and opportunity for a proper amount of coition provided. Hard work, low diet and sodium bromide in full doses three times daily favor recovery.

Morphine (gr. iii-v) and hyoscine (gr. 1/25) may also be given to the larger animals.

Castration of either sex or slaughter constitutes the last resort. If the trouble is of central nervous origin little can be done in the way of treatment.

Sterility or Inability to Reproduce—Barrenness.

1. IN THE MALE.—This condition may be caused by absence of semen or obstruction (through disease) to the passage of semen (inflammation about the ejaculatory ducts, tuberculosis, stricture, phimosis, etc.). Scanty secretion of semen may exist in debility and old age. Absence of spermatozoa occurs as a result of masturbation; excessive copulation; disease, as tuberculosis, new-growth and inflammation of the testis, epididymis and vas deferens. Debilitating disease, undescended testicle or congenital absence of testicle may also lead to absence of spermatozoa. Microscopic examination of the semen will alone determine this condition.

2. IN THE FEMALE.—Sterility accompanies anemia; general debility from any cause; obesity; and congenital defects, as absence of ovaries, tubes or womb, atresia of the tract or displacement of the uterus. Acquired defects are also responsible and follow from removal of ovaries, uterus or tubes, and from disease and inflammation in the genital tract, with their results, which consist in stenosis, hypertrophy, atrophy, degeneration and mechanical obstruction. Tumors and acquired displacements should also be included in the above list.

The treatment of sterility in either sex depends chiefly on removal of the exciting cause. In the female artificial injection into the uterus of semen deposited in the vagina has rarely proved successful. If general or local disease can be cured the prognosis is good. A careful general and local (of the generative organs) examination is essential to prognosis and treatment. Recently yeast (1 cake of the fresh, compressed yeast dissolved in a pint of tepid

water and after a few hours added to 1 pint of water) has been used to treat sterility, leucorrhœa and epizootic abortion in cows. It has antitoxic and antibacterial properties and in these conditions favorable reports have come from many quarters. The vagina should first be washed well with soap and water and the yeast injected once daily for a few days. (See Impotence, p. 143).

Stomatitis.

Inflammation of the Mucous Membrane of the Lips, Cheeks, Gums, and occasionally of the Palate and Tongue. Various forms and causes. Traumatic, caused by bits, thorns, sharp teeth, rough, sharp food and foreign bodies. Chemical, as by poisonous plants, mercury, etc. Fungi are a common cause. Symptomatic of digestive disturbances, fever and of some general diseases.

General Symptoms.—Anorexia, owing to pain in mastication, salivation, wasting, dulness, and sometimes fever.

Forms.—1. Simple or Catarrhal, in all animals, particularly the young, with heat, redness and swelling of the buccal membrane.

2. Aphthous. Enzootic in horses, cattle and sheep. Characterized by vesicles followed by erosions and inflammation of the buccal membrane. Caused probably by fungi on food. Distinguished from foot-and-mouth disease by absence of apthae about coronets.

3. Ulcerative. This attacks especially dogs, young sheep, and newly born calves associated with omphalitis. Begins with dirty-yellow or gray spots of necrosis in buccal cavity, and goes on to extensive ulceration, sloughing, and usually death in calves. Occasionally fatal in old dogs and in young sheep. Diarrhea is the dangerous complication.

4. Thrush. This form of stomatitis is due to a special fungus (*Oidium albicans*) and is characterized by white, curdy looking elevations on an inflamed buccal membrane. It is seen in young calves.

Treatment.—The treatment for all forms of stomatitis is much the same. Mel boracis is a very useful application by swab in simple stomatitis. The food should always be soft and non-irritating. Potassium chlorate with a small dose of tincture of myrrh may be given internally every four hours in considerable dilution. The dose of potassium chlorate varies from three grains for puppies to two drams for the larger animals. It acts locally and is eliminated in the saliva. When there is ulceration, stronger antiseptics are indicated, as 1 per cent. lysol applied upon a swab several times daily; while the ulcers should be touched with either solid stick silver nitrate or a strong solution (10 per cent.). Tincture of iodine is another good agent with which to stimulate ulcers in the mouth.

A few drams of Glauber's salt and sodium bicarbonate may be given to advantage in the food of larger animals. In the case of sheep, 15 grains each of salt and sodium salicylate are to be dissolved in each pint of drinking water. Mercurial and other forms of stomatitis are treated as recommended above with antiseptics, and local stimulants when there is ulceration. Hydrogen dioxide ($\frac{1}{2}$ strength) is perhaps the best local antiseptic for the mouth, but is more expensive than boric solutions. All sources of local irritation must be removed, as foreign bodies in the mouth, sharp or diseased teeth, and damaged or mouldy food.

The disease is particularly prevalent among young animals and hygienic precautions are indispensable. Plenty of fresh air, cleanly surroundings and exercise should be allowed. The diet must be very nutritious, as milk, raw eggs, and whiskey or brandy. Segregation of the sick from the well is essential. In the case of sheep, a common drinking and eating place is often the means of contagion. Infection of the umbilicus in calves should be treated by removing gangrenous tissue and packing with iodoform and boric acid.

Stomatitis, Mycotic.

This is a non-infectious disease of cattle occurring at pasture and due to the local irritation of certain fungi. In addition to the stomatitis there are swelling and tenderness about the pasterns and often erosions of the skin about the muzzle, teats and udder, associated with fever and emaciation.

Among the fungi thought to cause the disorder are the red and black rusts of clover; the fungus of rape (*Polydesmus excitosus*) and of grasses (*Pecillium* and *Puccinia*). The disease occurs more often after rains in autumn following a hot, dry period.

Symptoms.—These resemble those of stomatitis generally—difficulty in prehension and chewing, so that the animal stops eating and rumination. Minute vesicles developing into ulcers appear upon the buccal membrane and tongue. The ulcers suppurate and give the breath a foul odor. Erosions, crusts and scabs form on the muzzle and lips. Swelling and tenderness of one or more of the pasterns often occur and the skin may be fissured about the coronets. Sometimes there are erosions and fissures on the teats and udders, and the teats are scabby and tender and lactation may be suspended. Occasionally fissures and scabs may also appear on the neck and shoulders.

The animals are dull and either lie down or else stand with the back arched and fore feet extended and hind legs drawn up under them, and move stiffly and often shake or kick the feet. There is fever and emaciation and rarely diarrhea. In mild cases only the mouth may be attacked, but in severe cases the other sites noted are also the seat of disease.

The mortality is slight but severe cases may die if untreated. The average duration is about ten days.

The disease must especially be distinguished from foot-and-mouth disease. In mycotic stomatitis only a few animals are attacked in a herd and hogs and sheep are unaffected. Neither are vesicles ever seen on the teats, udder and feet as occur in foot-and-

mouth disease. On the other hand, scab formation on the muzzle is never observed in the latter disorder. Foul foot and ergotism may be confused with mycotic stomatitis, but in neither is stomatitis found. Calf diphtheria may suggest the disease but this usually occurs in sucking calves, sometimes in those under a year, and presents the appearance of cheesy patches in the mouth (due to *B. necrophorus*) and is unaccompanied by swelling of the feet.

Prevention and Treatment.—Animals should be removed from pasture and fed in barns or yards with soft, liquid food, as gruels, mash, etc. Plenty of pure, clean water should be at the animal's command and two tablespoonfuls of borax may be given in two buckets of water in the morning. Also antiseptics may be given in the food, as two drams of carbolic acid in a quart of bran mash once daily.* Mohler also recommends four ounces of crude carbolic acid mixed with twelve quarts of barrel salt for range cattle to lick as they will. When the animals are gentle the usual remedies for stomatitis are in order—as hydrogen dioxide with equal part of water, or 2 per cent. solution of lysol, creolin, carbolic acid or potassium permanganate applied by a swab several times daily.

The skin lesions are treated by the application of antiseptic solutions and the teats covered with carbolized vaseline.

STOMATITIS, NECROTIC—CALF DIPHTHERIA.—This is a disease affecting usually sucking calves under six weeks but sometimes those of eight to ten months or older and due to an anaerobic organism—*B. necrophorus*—which also is the cause of foot rot, gangrenous pox of the teats and diphtheria of the uterus and vagina of bovines. It occurs enzoötically and more often in winter. It is due to a local inoculation from injury to the buccal membrane by the milk teeth or through mechanical abrasions. The incubation period is three to five days.

Symptoms.—First the animal stops eating or sucking and slob-

* The writer wishes to acknowledge his indebtedness to Mohler's article in "Disease of Cattle."

bers. In the mouth are seen on the tongue, cheeks, palate, gums and pharynx, yellow-gray patches with thick, red, granular borders, from the size of a cent to a silver dollar, irregular in shape. These are due to coagulation necrosis (diphtheric membrane), further changed to a caseous mass by a specific ferment of the bacilli. The necrotic tissue is not readily removed and may perforate the cheek, and gums or palate to the bone, or invade the tongue to the depth of an inch. There are enlarged glands about the throat, high fever, foul discharge from the mouth and swollen tongue, emaciation and great weakness. The nostrils may be the seat of necrotic patches and nasal discharge and obstruction may occur, and, in cases of long duration (three to five weeks), extension of the process may involve the larynx, trachea and lungs with signs of broncho-pneumonia and pleurisy, and the intestines with diarrhea.

In very acute cases the animals may not live longer than a week. Untreated cases are generally fatal, while the reverse is true in those cared for.

No other disease is likely to be mistaken for it. Foot-and-mouth disease and mycotic stomatitis can be readily distinguished from it.

Prevention and Treatment.—Isolation of the sick is imperative. Those exposed should be carefully watched and their mouths syringed out twice daily for five days with two per cent. lysol or other antiseptic solution. Disinfection of the infected premises and also those occupied by bovines with diphtheric inflammation of the genitals or foot rot is also a requisite (see p. 282).

The local treatment desirable is that used generally in stomatitis. Irrigations twice daily with one per cent. carbolic or two per cent. lysol or creolin, painting the patches with Lugol's solution after irrigation, and the internal use of the following is recommended by Mohler :

℞		
	Acid. Salicyli	ʒss
	M. et f. pulv. ʒ. Dispense pulv. tales No. xxi.	
	Sig. One powder t. i. d. in water.	

Strangles in Horses.

Strangles is seen more often in young animals, is communicated through the air by a specific germ, and appears frequently as an epizootic affection. Bad hygiene and sudden changes of temperature in spring and fall predispose. It is characterized by fever, anorexia, dulness and weakness with nasal discharge, and its peculiar feature consists in inflammation, followed usually by suppuration, of the submaxillary glands.

Complications are most numerous, as pharyngitis, laryngitis, bronchitis, pneumonia and inflammation of the accessory nasal sinus's and guttural pouches. An eruption of wheals, papules, vesicles or pustules is common. Suppuration of various lymph nodes and internal organs, with pyemia, is not rare. Vesicles and minute ulcers may form in the nasal mucous membranes.

Treatment of strangles is hygienic and symptomatic. Isolation of the sick in a roomy, airy box-stall and disinfection and thorough cleansing of the premises, after removal of the sick, should be done. The diet should be laxative and easily digestible, as gruels, mashes, steamed oats, grass, roots, with milk and eggs and alcohol, if there is anorexia and much weakness.

The glands may be treated by blistering the swelling, as soon as it appears, with an ointment of red iodide of mercury (1-4), which may even lead to abortion of the inflammation. Hot flax-seed poultices frequently changed should be applied if the swelling persists and progresses, and opening of the abscess should be done when it is fully "ripe". The after-treatment consists in syringing the cavity with normal salt solution and hydrogen peroxide and later in the use of Peruvian balsam. Induration persisting after healing may be resolved by the application of a fly blister. The treatment for the other complications may be found under their respective names. Steaming of the nostrils, as recommended under coryza, is generally advisable. Tracheotomy is required when the breathing becomes impeded by obstruction in or about the larynx.

Sun-Stroke—Insolation—Heat-Stroke.

A distinction has been made between sun-stroke and heat-stroke in that the former occurs from direct action of the sun's rays on the head while the animal is at rest, and is unaccompanied by fever. This would apparently come in the class of what is called heat exhaustion in human medicine. The more ordinary sun-stroke is that occurring in horses at work in the sun, and is shown by lassitude, sweating, rapid breathing and pulse, palpitation, unsteady movements, falling, twitching of the muscles and limbs, contracted followed by dilated pupils, asphyxia, coma and death with high temperature. In cattle, dyspnea, cyanotic mucous membranes, lachrymation, edema about the vulva, erythema of the udder, and difficulty in movement are seen.

Treatment.—The chief endeavor in treatment should be to lower the fever, which is thought to be caused by disturbance of the thermal centres produced by the external heat. To this end, turning a hose of cold water on the animal's head and body, rubbing the body with ice, and giving ice water enemata are indicated. With deeply injected mucous membranes and labored breathing, the abstraction of four to eight quarts of blood may be of life-saving value. If the pulse fails, the injection of camphor (gr. xv), ether (ʒss), and sweet oil (ʒii) frequently under the skin, together with strychnine (gr. i-ii), may be of service. In heat exhaustion, without fever and with subnormal temperature and rapid, weak pulse, the use of the stimulants spoken of and a hot pack externally may prove remedial.

Prophylaxis is, of course, most essential. Horses appear to be even more susceptible to heat in cities than man, and the avoidance of work during the heat of the day, or at least the protection afforded by head coverings, cold water applied frequently to the head, moderation in work and frequent opportunities to rest and drink cold water, should be allowed.

Surra.

This is a febrile disease produced by a protozoön, *Trypanosoma evansi*, in the blood plasma, and attacks horses, asses, mules, camels, dogs, goats and very rarely cattle. It is indigenous in India.

The trypanosoma is a protozoön, 20 to 50 m. long, and 1 to 1.5 m. wide, with a single flagellum attached to an undulating membrane. The parasite appears to gain entrance to the body through green fodder and water and in grain contaminated with mice or bandicoot rat feces. Also by inoculation of the skin through the medium of the tsetse fly, and perhaps by means of lice, fleas and ticks.

Symptoms.—The disease occurs in the fall, from September to December, and in animals fed from grass raised on low-lying and flooded meadows. The period of incubation is variable (from six to seventy-five days) and somewhat dependent upon whether the disease has been inoculated (short incubation) or ingested. The average duration is about fifty-two days. The termination is generally fatal without treatment.

Irregular, remittent or intermittent fever is characteristic. During the remissions the protozoa can not be found in the blood but are present during the paroxysms. Urticaria and edematous swellings on dependent parts—lip, legs, sheath and belly—are seen, Petechiae appear on the mucous membranes, particularly on the membrana nictitans in the horse, and lachrymation is present. Progressive weakness, emaciation and anemia, with often icterus of the mucous membranes, are characteristic. The lymphocytes increase in the blood, while hemoglobin is diminished and rouleau formation of the red corpuscles is lost.

Tsetse Fly Disease, Trypanosomatosis or Nagana, due to *Trypanosoma brucei*, which is prevalent in Africa and is largely inoculated by the tsetse fly, is very similar and many authorities (Koch) claim it to be identical with surra. But in nagana cattle are

affected as well as horses, dogs and other animals, and the protozoa are found at all times in the blood and not only during the paroxysms.

In surra the post-mortem findings include enlargement of the spleen and liver, petechiae on the internal organs, and exudation of a jelly-like consistence into the connective tissue of the throat, neck, chest and belly.

Treatment.—Avoid feeding animals from grass and hay from wet lands and supply pure water. Also grain must not be fed which is contaminated by the feces of rodents. Arsenic is the specific remedy, as in other diseases due to trypanosomes—as sleeping sickness in man. It should be given in increasing amounts in the form of Fowler's solution in the drinking water night and morning. Beginning with a daily dose of one ounce (℥ss night and morning), one may increase this amount by one dram every two days until two ounces are given, and then reduce the amount until the original amount is reached. Then after withdrawing the drug for two days the same course of treatment should be resumed. This applies to a horse weighing 1,000 lbs. Symptoms of arsenic poisoning, as shown especially by digestive irritation, are said to be prevented by giving rice water after the medicine night and morning.

Atoxyl has recently been used successfully in trypanosomatosis in man and animals. It is a white powder, soluble in six parts of water and given subcutaneously every other day. It is much less toxic than arsenic but contains about 26 per cent. of arsenic and must be used with caution. The dose is from ten to twenty times the dose of arsenous acid or white arsenic and the dose of white arsenic in surra is increased from four to ten grains daily, as we have indicated above, in the form of Fowler's solution.

Teats—Fissured, Cracked, Sore and Obstructed.

Various names are applied to much the same condition. As

fissure of the teat may lead to mammitis and general infection, especially after calving, the treatment is of importance.

Treatment.—The udder and teat should be thoroughly cleansed with soap and water and saturated solution of boric acid, and the milk withdrawn with a sterile milking tube (the tube is sterilized by boiling). The fissures should be well coated with compound tincture of benzoin or touched with solid stick silver nitrate and the teats kept anointed with 10 per cent. boric acid in vaseline.

Obstruction of the teat may occur from inflammation, curds, calculi, growths and warts on the mucous membrane, and stricture. This is relieved by manipulation of the udder or the passage of a probe or bougie, in the first instance; by the removal of growths with the scissors or ligature; and by division of a stricture by a teat bistoury.

Teno-Synovitis—Tendo-Vaginitis, Acute and Chronic (Hygrops or Hygroma of the Tendon Sheaths)—Thoroughpin—Windgalls.

Inflammation of the tendon sheaths and tendons go hand in hand. This happens because the tendon is nourished through the sheath. Inflammation of the tendon (tenonitis) alone has been described, but such a condition, apart from any alteration in the sheath, can scarcely exist.

Teno-synovitis is acute and chronic. The acute form may be aseptic and due to blows, sprains, overexertion, fractures and dislocations. Or it may be infectious, following pneumonia, septicæmia, articular rheumatism, infectious abortion, glanders, distemper, tuberculosis and so-called subacute and chronic rheumatism.

Then there is the suppurative form due to puncture or extension from neighboring infected areas and occurring in the course of general infections, as strangles, pyæmia, etc.

Symptoms.—Acute non-suppurating teno-synovitis is characterized by a hot, tender, fluctuating or crepitating swelling along the course of a tendon sheath, with lameness. The inflammation is serous, or dry and crepitating, or plastic—the serous swelling be-

ing more common. It results in recovery, or in fibrous thickening (plastic form), or in chronic teno-synovitis (hygrops, hygroma). In the suppurative form there is great lameness, fever, spreading, tender, edematous swelling along the course of a tendon and often abscess. The traumatic acute form is separated from the infectious by being confined to one area and in not shifting to other sites. Tuberculous teno-synovitis is seen in cattle along the front of the forearm and knee (extensor metacarpi and long extensor of the toe). A hot, tender, diffuse swelling exists, causing lameness, atrophy of the shoulder muscles, and is accompanied by general wasting. The swelling is usually of a fibrous nature and crepitation may be evident. It cannot be distinguished from non-tuberculous disease except by bacteriological examination and inoculation.

Treatment.—In acute serous teno-synovitis the animal should be given complete rest, and, externally, moist heat and pressure should be applied—as by a moist antiseptic dressing (gauze soaked in 2 per cent. creolin) covered with rubber or oil silk and a flannel bandage. Cold applications, as compresses constantly wet with cold water, are also efficient but are not so readily employed nor any better. Bandages wet with white lotion (lead acetate and zinc sulphate, each ℥iii; water Oj) are of benefit. Later on, after the acute stage passes, one may apply tincture of iodine every few days, or iodine ointment, and use massage and pressure with bandage, and gentle exercise. Neither firing and blistering nor operative interference are called for.

If the acute serous synovitis is of infectious origin, particularly in acute articular rheumatism, treatment with sodium salicylate and sodium bicarbonate (of each ℥iv, thrice daily in drench) is of much service.

Suppurative teno-synovitis, in its early stages, may be treated by wet antiseptic poultices (2 per cent. creolin on aseptic gauze) covered with water-proof material and bandage. It is probable that Bier's hyperemia is the best treatment (see p. 278). But, with the

formation of pus, immediate free incision is urgently demanded to prevent necrosis of the tendon and extension of infection to neighboring parts, pyemia, etc. Multiple incisions are often required and the use of drainage tubes with frequent irrigation (2 per cent. creolin or lysol) and the application of wet, antiseptic dressings externally. The incision must be made through the tendon sheath and all necrotic material should be cut away. The wet dressings are employed constantly till recovery is well advanced. Anti-streptococcic serum is of value in cases of streptococcic infection (large animals 20–50 c. c., repeated in twelve to twenty-four hours).

Tuberculous teno-synovitis can only be cured by excising the diseased sheaths, and this is inadvisable in cattle.

Chronic teno-synovitis consists in painless, non-inflammatory fluctuating swellings along the course of thickened tendon sheaths as a result of acute serous teno-synovitis frequently repeated or, more often, from constant rubbing of the tendon on the sheath from overwork. This is very common in old horses (windgalls and thoroughpin) and rarely causes lameness or does harm except in constituting blemishes.

The more common sites of acute and chronic teno-synovitis are as follows:

ANTERIOR LIMB.—1. At the point of the shoulder where the biceps brachii runs through the bicipital groove. There is a bursa under the tendon at this point in which the inflammation begins. The cartilage and bone often become involved in the inflammatory process with pathological results similar to those seen in navicular disease. Shoulder lameness, resting on the flexed toe, swelling and tenderness at the point of the shoulder and of the muscle above, are seen.

2. Of the tendon and sheath of the infraspinatus and bursa under it, where it passes over the external tuberosity of the humerus. In this disease, and that of the flexor brachii, the trouble really originates in the bursa and it should more correctly be classified as

bursitis. Lameness, abduction of the leg, with local tenderness and swelling, are the chief characteristics.

3. At the knee or carpus (thoroughpin of knee). Of the common sheath of the flexors behind, from four inches above the carpus to the middle third of the metacarpus. Oblong swellings are seen on each side of the tendons. In front of the carpus are seen swellings corresponding to the distended sheaths of the extensor digiterum communis, carpi radialis, and oblique extensor; and at the outside and above the carpus a swelling of the sheath of the extensor suffraginis.

4. At the fetlock (windgalls). Teno-synovitis of the common or large sesamoid sheath of the flexor tendons (sesamoiditis) beginning four inches above the fetlock joint and passing down over the sesamoid bones and ligament, to become attached to tendons behind the cannon bone and above the fetlock. These also occur in the hind limbs.

5. In front of the fetlock. A swelling as large as an egg on both sides of the extensor pedis.

POSTERIOR LIMB.—1. At the trochanter. This is also strictly inflammation of the bursa under the attachment of the large gluteus to the convexity of the trochanter. Destructive changes of cartilage, bone and tendon occur as in navicular disease. Lameness with swelling and crepitation over the trochanter, and, later, wasting of the muscles of the quarter, occur.

2. At the hock, or tarsus. Here the sites of teno-synovitis are five: (*a*) Thoroughpin of hock, a swelling reaching up and on each side of the perforatus from the point of the hock. The swellings are about eight inches long and may be pushed through from one side to the other. On the posterior internal surface—there are two swellings (*b*) on the inner surface, and one on (*c*) the posterior surface owing to teno-synovitis of the perforans. The tendon on the inner surface is bound down at the tarsal groove so that the swelling can only appear above and below. On the outside of the

hock (*d*) a swelling may occur at the side of the peroneus, and (*e*) at the middle of the front of the hock due to hygroma of the extensor pedis.

Treatment.—Chronic serous teno-synovitis (hygroma of tendon sheaths), when not causing lameness, needs no treatment. During an acute exacerbation, the treatment is similar to that in the acute form—rest, cold or Priessnitz applications and compression by elastic, Esmarch or flannel bandage. Firing and blistering are of little value in chronic teno-synovitis. Rest is facilitated in all cases of teno-synovitis of the flexor tendons attended with lameness, by the application of high-heeled shoes, whether in the fore or hind limbs. The tendons are thus relaxed. So this means should not be neglected in lameness due to bursitis of the flexor brachii, of the infraspinatus and of the gluteus maximus; nor in teno-synovitis of the sesamoid sheath, sprain of the flexor tendons, nor in thoroughpin of the hock.

Operation is the only means of curing chronic, serous teno-synovitis. This is always attended with the danger of sepsis and resulting damage to the neighboring parts and perhaps death from septicemia, unless asepsis is perfect. The sheath of the flexors are opened with more danger than that of the extensors. Sometimes the sheath connects with the joint, as occasionally in the case of the extensor pedis of the fetlock.

Bog spavin, or hydroarthrosis of the tibio-tarsal joint, must not be mistaken for tarsal teno-synovitis, if operation is to be done. The simplest operation consists in casting the animal, shaving and scrubbing a large area about the part with green soap and water, followed by alcohol (70 per cent.) and ether and drying and painting with tincture of iodine. The instruments having been boiled, a needle of a hypodermic syringe is plunged into the distended synovial sheath of the tendon and left there. Then the fluid is withdrawn from the sheath by a potain or Dieulafoy aspirator connected with an aseptic needle. When the sac is thus emptied, $\frac{1}{2}$ to 1 dram

of tincture of iodine or \mathfrak{m}_{xx} to \mathfrak{m}_{xxx} of 95 per cent. carbolic acid are injected into the sac by a hypodermic syringe connected with the needle. The sheath is then manipulated to bring the injection in contact with its walls.

The application of bandages, constantly wet with 2 per cent. creolin solution, and absolute rest until all inflammation has subsided, are essential. The puncture of the aspirating needle should be immediately sealed with collodion. Instead of the injections mentioned, a 1 per cent. solution of potassium iodide or the tincture of iodine, diluted with two parts of water, are sometimes used to inject the joint with and then removed. This method has been employed successfully in the treatment of carpal and tarsal teno-synovitis, in sesamoid teno-synovitis or windgalls, and in that in front of the fetlock affecting the tendon of the extensor pedis.

The other method of operating, which is more certain and precise and preferable in human surgery, is incision. The preparation of the patient is the same. The sheath of the tendon is incised and the thickened walls curetted away or excised with scissors. The sac is washed with hydrogen dioxide and 2 per cent. lysol solution and swabbed with tincture of iodine. The wound is sutured, leaving a small drain at the lowest point. An aseptic gauze dressing and bandage are then applied and left in place for a week or more, if the case progresses favorably. It would be better to omit the drain if the aseptis is good and can be kept so. This method can not be applied safely in positions where a bandage can not be retained in place.

In the treatment of the inflamed tendon sheath or bursa at the point of the shoulder (flexor brachii and infraspinatus), and at the trochanter (gluteus maximus), long rest with high-heeled shoes on the affected limbs are imperative. Constant irrigation with cold water during acute exacerbations is indicated. In chronic inflammation in these regions firing and blistering are of service. A long rest of six to eight weeks and the avoidance of heavy work

thereafter are advisable. The pathological changes, as erosion of cartilage, rarefying ostitis and destruction of tendon in these parts, like those seen in navicular disease, are incurable, as is also wasting of muscle.

Prevention.—At the onset in young animals, with signs of inflammation about tendons, one should enforce rest and use cold douches, Priessnitz applications and compression by elastic bandage, and, if these measures are followed by only moderate work or pasturing, the occurrence of a chronic swelling may often be averted.

Tetanus—Lockjaw.

This disease is caused by a special bacillus which flourishes without air (anaërobic), and, outside of the body, lives in soil and manure. All animals are susceptible, but tetanus is more common in the horse, cattle and sheep. The germ always gains entrance through a wound in the skin or mucous membranes, although in many cases such may apparently be absent, in which event the disease is wrongly said to be idiopathic. Great prevalence of the germs may give rise to enzoötic or even epizoötic tetanus. Infection most often occurs through wounds or pricks of the feet in horses which are apt to be soiled with manure; in lacerated or contused wounds coming in contact with soil or dust; in cows after parturition; in the new-born (lambs especially), from navel-infection; and after castration, docking the tail and other surgical operations.

Stablemen and gardeners are liable to tetanus because their wounds are subject to contamination with soil and manure.

Symptoms.—In the horse the head is raised and the neck is either stretched out or drawn back stiffly, while the tail is likewise held stiffly level with the back and often to one side. The ears are pricked up and forward like those of a hare. The eyes are sunken and partly covered by the haw. The nostrils are dilated and saliva

and foam flow from the mouth. The legs are spread out stiffly and the muscles of the cheek, neck, back, croup and tail are extremely tense, hard and rigid. The jaws are opened and separated with difficulty (lockjaw) and when made to move the animal walks very stiffly. Noises and rough handling exaggerate the muscular spasm and the animal may fall. Prehension and mastication are difficult. Constipation and retention of urine may occur. Breathing is rapid and shallow; the temperature and pulse are elevated only late in fatal cases. Muscular spasm sometimes causes the back to be hollowed, or again it may be arched upward, or the body bent to one side. The symptoms are much alike in all animals.

When tetanus germs enter a wound they are not disseminated in the blood but remain and form toxins. The toxins combine with the proteids of the nervous tissue and extend along the axis cylinders until the spinal cord is reached, when symptoms first occur. The disease is then indeed far advanced when it first becomes evident.

Treatment.—This is generally very unsuccessful, but, on the other hand, by the injection of tetanus antitoxin immediately after infection and before symptoms appear, the disease can almost always be prevented. The use of antitoxin is indicated in the case of wounds contaminated with manure, soil or dust, especially in wounds of the feet in regions where tetanus is prevalent; also in the new-born, or in cows just calved, or following surgical operations, when tetanus is common to the locality. The administration of antitoxin directly after these events will confer an immunity against the disease which lasts about a month. In the so-called idiopathic tetanus, antitoxin is an efficient preventive and its use is attended with no danger when given aseptically. Antitoxin is also given as a curative agent in tetanus, but, as we have seen, the disease is really advanced when it first becomes clinically evident and its use here has not given such good results as carbolic acid in injections. As a curative agent it is given intravenously, subcutaneously and through

a blunt needle into the brain substance. We advise the injection of antitoxin along with Bacelli's treatment under the skin for prophylaxis (H. and C., 10 c.c.; Sheep, 5 c.c.), and in repeated doses as a therapeutic agent (H. and C., 20 c.c.). Tetanus bacilli and spores may live in the tissues for weeks and therefore it is wise to repeat the prophylactic dose at the end of the first and third week to antagonize any later intoxication caused by a new crop of bacilli. Tetanus antitoxin for human use is now standardized by law. The prophylactic dose is 1,500 units; curative, 3,000 to 20,000 units. Veterinary antitoxin is not standardized and is consequently six or more times weaker in potency (units) per c.c. than human antitoxin. It would be better to use human antitoxin therefore.

If any wound exists when symptoms of tetanus appear it should be most thoroughly opened to its depths to the air and treated with an application of pure carbolic acid, which Kitasato has shown is peculiarly inimical to tetanus germs; while the body is at the same time correspondingly insusceptible to its ordinary toxic action. Iodoform is useful on the navels of the new-born. Bacelli's treatment internally is the most successful in tetanus. One dram of carbolic acid in 5 per cent. solution may be injected into the muscles of the neck and shoulders of the horse every two hours during the first thirty-six hours, and less often thereafter.

To allay the spasm of the jaw and elsewhere, morphine sulphate (H., gr. vii-x) may be injected hypodermically, and chloral given per rectum in boiled starch solution in a dose of from two to three ounces. Chloroform may give temporary relief. The use of slings and a darkened, quiet box-stall with gentle management are desirable. The diet should be sloppy, of milk, gruels and perhaps some green fodder with water within easy reach. The bowels are emptied by hand or enema and the urine by catheter, in the female, or by pressure through the rectum on the bladder in the male.

Thorough disinfection of the premises after a case of tetanus

is of importance. The disease is very fatal (70–80 per cent. mortality in horses and cattle), but Bacelli's treatment has given some wonderfully successful results.

Trichinosis—Trichiniasis.

This disease may attack any of the domestic animals, but usually pigs. The entrance of the larvae of the parasite (*Trichina spiralis*) in flesh into the digestive tract is the usual means of infestation, and, in swine, eating trichinous mice and rats, or meat from slaughter-houses containing the parasites, are—as far as is known—the sources of trichinosis in these animals. The larvae reproduce in the bowels of the host within a week from entrance, and go on ovulating for six weeks. The embryos enter the blood and become encapsulated in the muscles. The symptoms are not marked or characteristic and a diagnosis can only be made by microscopic examination of the muscles post mortem, so that treatment is merely preventive. This consists in destroying rats and mice where pigs are kept; in burning trichinous meat; and in not feeding flesh to swine.

Tuberculosis.

Tuberculosis affects animals in about the following order of frequency: Cattle, birds, swine, cats, goats, horses, sheep and dogs. The disease is due solely to a bacillus—the *B. tuberculosis*. There are, however, three distinct varieties or strains of the bacillus—that of man, of cattle and of birds. Tuberculosis of animals is mostly due to the bovine type of bacillus, and cattle are not very successfully inoculated with the human bacillus. Cats and dogs, however, do most often acquire the human bacillus by living with human tuberculous patients.

Infection occurs through the digestive and respiratory tracts and extends commonly by the lymphatics, sometimes by the blood or by continuity, but often penetrates the part of entrance without affecting it.

In cattle, as in man, tuberculosis is acquired from infected surroundings. The ejected bacilli in the nasal and uterine discharge and feces infect the fodder, water and dust about the building. Crowding, bad ventilation and poor nutrition favor acquisition of the disorder. Some six months of habitation in an infected stable with tuberculous animals is, however, often required for a healthy animal to acquire tuberculosis. It is not hereditary (with rare exceptions), but the tendency to it is inherited. The young acquire it more quickly in infected surroundings than do adults. Tuberculosis assumes many forms. The more common only are noticed here. While the symptoms may be marked, as below, yet they are often notably absent and the subject may appear in good health and even be fat.

Symptoms.—In pulmonary form. Cough, more often in morning and after drinking and exercise. Quickened breathing and enlarged glands about the throat and neck. Wasting, digestive disturbance, as tympanites, constipation alternating with diarrhea, pulse rapid, and temperature in later stages elevated at night. Mucus is often discharged from nose. Local signs include rough inspiratory sounds and prolonged and often blowing expiratory murmur. Bronchial breathing. Various râles, as mucous, sonorous and sibilant, and cavernous sounds. Dulness on percussion, especially over the lower posterior lobes.

Of involvement of serous cavities. In pleural invasion there may be dulness on percussing the lower region of the chest. Friction sounds may be heard. Cough and rapid breathing, without the signs found in lung involvement. Pericarditis may also be present. In the peritoneal form, chronic tympanites and tenderness on pressure may be elicited, and thickening and rigidity of the wall may be felt. Sterility, nymphomania and abortion are common.

Glandular involvement. The retro-pharyngeal lymph nodes are most commonly attacked and may be palpated as enlarged, bosselated, and hard or fluctuating. Pressure of the enlargement

may lead to dyspnea, dysphagia, or roaring. Enlargement of the mediastinal lymph nodes causes pressure on the anterior vena cava and venous pulse in the jugulars, on the trachea with dyspnea, and on the gullet, leading to dysphagia and to loss of rumination and tympanites after eating because eructation is prevented.

In intestinal tuberculosis, chronic tympanites and constipation alternating with diarrhea occur, the latter becoming chronic with emaciation. Tuberculosis of the brain gives symptoms of meningitis, and signs in lungs, enlarged lymph nodes and emaciation are often also present. In the udder, tuberculous involvement is generally in one quarter in the form of a very hard, diffuse, painless swelling, and, after a month or so, the milk becomes thin and contains flakes and perhaps bacilli. Tuberculosis not rarely affects the vertebral column, bones of head and joints. As aids to diagnosis we have examination of the nasal discharge, milk, pus and tissue from suspected animals for bacilli, and the tuberculin test. Also inoculation of milk or minute quantities of suspected infected material into the abdominal cavities of guinea-pigs, when miliary tubercles may be produced in two weeks or more.

The necessity of the tuberculin test in order to make a positive diagnosis of tuberculosis in cattle is shown by the experiments of Schroeder (Circular 118, Bureau of Animal Industry), who found that among cows which seemed absolutely healthy, as far as appearance and physical examination were concerned, forty per cent. were tuberculous, as shown by the tuberculin test.

The Tuberculin Test.—It is best to take the temperature of cattle from 6 A. M. every two hours until tuberculin is injected on the evening of the same day between 8 and 10 P. M. The test is unreliable in animals whose temperature reaches 103.2° F. (except young bovines, in which a temperature of 103.2° F. is not abnormal) during this period prior to the injection. Animals should be kept at rest for twelve hours before tuberculin testing. The test is misleading within a few days of calving—either before or after. The

injection is made aseptically into the subcutaneous tissue back of the left scapula or into the side of the neck with a syringe previously boiled. The animal should be kept in the stable during the time required for the test and should not be allowed to drink large quantities of cold water. Tasteless antipyretics are sometimes placed fraudulently in the food to prevent rise of temperature. The temperature of the animal should be taken at 6 A. M. on the morning following the injection and from that time every two hours till 8 P. M.

A rise of 2° F. is necessary for a positive reaction—that is, a rise of 2° over the maximum temperature of the animal in the fourteen hours before the injection. Those animals in which the temperature does not rise to 103° F. within fifteen or twenty hours after the injection may be considered non-tuberculous. When the temperature is between 103° F. and 104° F. the test is doubtful and the animal should be re-tested after three months. When the temperature rises gradually to 104° F. or over within fifteen hours after the injection, the animals may be classed positively tuberculous—providing this temperature constitutes a rise of two degrees over the maximum temperature recorded prior to the injection.

Before admitting new cows to a herd they should be isolated until tested twice with tuberculin without reacting. This is necessary because cows may not react in the incubative or latent stage and because previous injection of cows with tuberculin may render them insusceptible to the usual doses. Therefore, after a first test, with negative result, the cows are kept isolated for three months, when a second test is made with three times the first dose of tuberculin. Milk from these cows may be sold as certified during the isolation period after the first negative test.

Old and emaciated animals require double the ordinary dose of tuberculin, and in all re-tests three times the initial dose should be injected. The average dose of the tuberculin as prepared and diluted for immediate use by the U. S. Government is 2 c.c., repre-

senting 0.25 c.c. of old tuberculin. If tuberculin is kept any length of time it is wiser to procure the concentrated toxin and dilute it with $\frac{1}{2}$ per cent. of carbolic acid prior to injection. Tuberculin should be kept in a cool dark place and rejected if it becomes cloudy. Most herds should be regularly tested once yearly with tuberculin and twice if there has been much infection.

The ophthalmo-tuberculin and skin tuberculin tests are still too recent in veterinary practice to permit one to discuss their precise value or limitations.

Treatment.—Treatment is rarely advisable in animals because often unsuccessful and because there is danger of communication to other animals and to man by meat or milk from the same, or—in the case of dogs and cats—by their sputum. An outdoor life, night and day, with good feeding, may lead to recovery and is the most successful form of treatment known—as in the case of man.

Prevention.—This is secured by the following plans:

1. Keep cattle out-of-doors in pastures or open sheds all the time, or at least in well-ventilated, uncrowded stables.

2. Isolation of the sick by the double tuberculin test and destruction of those which react. This method is suitable in cases where there are not many patients in a herd. Where a large proportion of a herd react the money loss and the fact that in the re-test more will react and at the next test more again—these facts militate against this method of prophylaxis. It is always wise for persons in search of stock not to buy from herds in which there is much tuberculosis, even if the animals desired do not react to tuberculin, for the reason just stated; that is, because in such herds there are always individuals which are in a latent or incubative stage of the disease, so that while not reacting they are tuberculous and will react later. For the same reason cattle that have reacted and cease to react should not be placed with sound cattle.

3. Bang's Method of Segregation. Kill cows which show marked physical signs of tuberculosis, especially disease of the

* See Bull. No. 172 Dep't Agriculture for state of Pennsylvania.

uterus, udder and lungs, in which the germs are spread broadcast respectively by uterine discharge, in the milk, and in the feces from swallowing of sputum. Those animals reacting to the tuberculin test (not including those showing physical signs) should be isolated and their calves removed to a separate farm, barn or even to a separately partitioned portion of a barn. When born, the calves may be fed the first day on their mother's milk, but thereafter on milk from the tuberculous cows which has been previously boiled. There should be two sets of employees if possible; if not, the healthy animals should be first tended and then the overalls, shoes, etc., should be changed and a separate set of utensils should be used for the tuberculous and healthy animals. The stock should likewise be separated in pasture. The healthy animals must be tuberculin-tested twice annually and those reacting must be isolated.

4. Ostertag's Method. By this is meant briefly the weeding out of all cattle which show physical signs of tuberculosis and isolating the calves and bringing them up by artificial feeding.

5. The combination method of Strelinger, by which calves are vaccinated when two to three weeks old with von Behring's Bovovaccine according to his technique and isolated for three months until after a second vaccination. The temperature of these calves is taken repeatedly the day before and following the vaccination and may be considered normal when not exceeding 103.2° F. (as a maximum) in young cattle. A reaction occurs, as with tuberculin, in tuberculous calves. The young are brought up with and fed from the herd. Tuberculosis is eradicated from the herd only so far as regular and careful physical examinations can determine tuberculosis. Bovovaccine, according to Strelinger, is preventive, inasmuch as in five-year-old animals thus treated the prevalence of tuberculosis has been reduced from 50 per cent. (which prevailed before in five-year-old animals unprotected by bovovaccine in the same herds) to 10 per cent. Bovovaccine may be obtained of C. Bischoff & Co., New York. Its status in the rôle of prevention

of tuberculosis in this country is yet unsettled. It consists of a culture of dry, living tubercle bacilli of the human type. Objection has been made to bovovaccination because virulent human tubercle bacilli have been found in the calf's glands eighteen months after such treatment. It is said that 2 or 3 intravenous injections of $\frac{1}{2}$ gm. tuberculin at intervals of ten days will afford similar immunity in calves.

The milk from tuberculous cows is unfit for food for man or beast, particularly when the udder is diseased, but also when it is not. Thus in investigations at Washington (Anderson) it has been shown that eleven per cent. of dairies supplied milk containing tubercle bacilli, and this is borne out by the examination of thousands of samples abroad.

As to the danger to humans, the investigations of the British Royal and the German Commissions have authoritatively shown that from 10 to 23 per cent. of the tuberculosis in children is due to the bovine type of tubercle bacillus—and therefore to milk. Park estimates that 25 per cent. of tuberculosis in children is due to the bovine tubercle bacillus. Koch states that eleven out of every twelve cases of tuberculosis in the human are cases of tuberculosis of the lungs, and in these the bovine type of tubercle bacillus is never found. This restricts tuberculous infection from milk to the remaining twelfth of human cases and to a percentage of these. In children, diseases of the bones and glands are the commoner forms, and it is to these that the figures of the Commissions above chiefly apply, and in which the bovine bacillus is found. Theobald Smith states that 1 to 2 per cent. of all cases of tuberculosis in humans, including adults and children, are caused by the bovine tubercle bacillus. The whole question is still in an unsettled state, but any method of caring for cows which does not include the tuberculin test, and in which milk is used from cows that have not been shown free from tuberculosis by the tuberculin test, must be condemned. The health authorities in many cities require that milk shall only be sold which is

obtained from cows tuberculosis-free, as shown by the tuberculin test. This custom will soon more generally prevail. The same applies to cream, and milk used for cheese and butter making. Tubercle bacilli are found in both and will retain their pathogenic virulence three months even in salted butter. It has been estimated that tubercle bacilli may be present in 25 per cent. of butter as it is found in 25 per cent. of separator slime (Schroeder & Cotton).

The barn in which tuberculous animals have lived must be thoroughly cleaned, washed and disinfected before healthy stock are placed in it. The floors, stalls and feed-boxes should also be washed or sprayed with three per cent. formalin, or five per cent. carbolic acid solution. Whitewash, in which is incorporated five per cent. chlorinated lime, should then be applied. Five per cent. solution of chlorinated lime should be used on the floors as well.

Tympanites—Acute Meteorism or Hoven—Gaseous distension of the Rumen in Cattle or Sheep.

This form of indigestion often comes on suddenly and, in acute cases, the animal may die within an hour or two. The danger is proportionate to the rapidity of development of the condition. The most frequent cause is a sudden change in food from dry to green fodder, especially to clover and lush grass.

Symptoms.—There is at first restlessness, eructation of gas, cessation of feeding and anxiety. Distension appears in the flanks, more marked in the left over the rumen. On examining this region, no peristaltic sounds are heard or movements felt. The distended rumen presses on the diaphragm and disturbs the breathing, which becomes hurried and difficult. The nostrils are dilated, the animal stands with fore feet apart and struggles for breath until—in fatal cases—it falls and dies of asphyxia.

Treatment.—This consists in active massage of the left flank to excite peristalsis and expulsion of gas. Massage is safer and more efficient than exercising the animals. The passage of a

stomach tube may permit of escape of gas, if it does not become clogged. The Germans use a stream of cold water thrown against the left flank to start peristalsis of the rumen.

To stimulate peristalsis, alcohol may be used in some form in concentrated solution, or, better, compound spirit of ether, one ounce for cattle, two drams for sheep.

With the distension increasing, despite these measures, a trocar and canula (or, for want of this, a long knife) should be quickly plunged into the most prominent part of the swelling in the left flank, between the last rib and angle of the haunch. The tissues should be compressed about the canula, while forcing it into the rumen, to prevent the gas and food from entering into the tissues. The canula may be left in place for twenty-four or forty-eight hours, to prevent re-accumulation of the gas, and the animal fed for several days lightly, as on a little hay and bran mash.

If the rumen is also impacted, see p. 134.

Urinary Retention—Calculus—Lithiasis.

This is a symptom of various vesical conditions. It is a common symptom of intestinal colic from spasm of the sphincter; it occurs from the obstruction offered by foreign bodies in the bladder or urethra, as calculi; it is caused by compression from without of growths, fecal masses, etc.; and from any obstruction in the urethra from inflammation, stricture, phimosis and paraphimosis; from paralysis of the detrusor muscle in over-distension of the bladder; and as a symptom of brain or spinal disease and very severe inflammation about the bladder.

Symptoms.—Retention from calculus is not uncommon in oxen and male sheep, and stone is rarely diagnosed in them until obstruction of the urethra and retention has already happened. Loss of appetite and rumination, dulness and constant unsuccessful attempts at urination with dribbling or absolute suppression of urine and perhaps raising of the tail and rhythmical contractions of the accelerator urinæ below the anus call attention to the obstruction of

the urethra by calculus in these animals. In the large animals examination per rectum will discover the distension of the bladder and sometimes stone in the bladder. In small patients palpation and percussion over the hypogastrium will elicit the condition. In case of obstruction by stone the use of a sound or palpation along the course of the urethra may show its presence. Rupture of the bladder occurs after long over-distension followed by cessation of dyspnea, uriniferous breath, peritonitis and death. Thus sheep, after exhibiting the symptoms of obstruction described above, together with shivering fits, lie down and die from urethral stoppage or bladder rupture. Horses and dogs show decided symptoms of retention of urine—from any of the causes enumerated—by colic and frequent unsuccessful attempts at urination. Of course in horses such symptoms are common in intestinal colic and black water, cystitis and labor, but these can easily be determined and examination of the bladder will elucidate the condition.

Calculus of cattle is a winter disease in stall-fed animals, especially those living in limestone regions; in winter, because too dry fodder is often given and the urine becomes too concentrated. This is particularly true when much dry wheat bran is fed which is unusually rich in ash and protein. Stone in the kidney is more common in oxen and in them is more apt to produce symptoms. This follows because these animals lose water while at work in sweating and in accelerated respiration, and because work is more apt to bring on symptoms from renal irritation in stone in the kidney which often do not occur in animals at rest. The symptoms of renal stone are briefly stiffness and weakness in the loins on motion and tenderness in this region on pressure—with possibly the appearance of blood or sand in the urine. In renal colic the animal frequently gets up and down, shifts from one hind leg to the other, looks at the flank and has urinary frequency. Accumulations of stony matter may be seen about the hair of the sheath in oxen.

Calculi are commonly of five varieties: 1. Chiefly calcium carbonate, white, and pearl or coral-like appearance, or green and metallic. 2. Ammonio-magnesium phosphate. These are precipitated from magnesium phosphate by the occurrence of ammonia in the bladder from infection and fermentation of urine. 3. Siliceous or hard, smooth, round stones, precipitated from potassium or sodium silicate by acid in the urine. 4. Calcium oxalate or rough, mulberry-like calculi due to insufficient oxidation of organic acid in the body. 5. Gravel or simple crystals found especially in the sheath of oxen.

Treatment.—This will of course depend upon the cause. If retention is merely due to spasm of the sphincter of the bladder, then the use of heat—as by hot cloths over the loins, a warm bath for small animals, or the use of a warm enema—will often suffice, with the administration of morphine and atropine internally. Pressure on the bladder through the rectum and the use of a catheter are most efficient. In case of stone in the urethra in oxen, which is usually found in the ischial region or in the S curve, treatment consists in working forward the stone by massage or in urethrotomy, unless the animal is too fat. If this is unsuccessful, the animal must be killed before rupture of the bladder spoils the meat. In sheep the urethra is apt to be obstructed about the meatus by local deposit of sediment, which leads to inflammation of the end of the sheath. It is necessary to remove the spiral filament at the extremity of the penis to secure expulsion of this sediment, which should be done, or else the animal be slaughtered to avoid rupture of the bladder. Stroking the urethra should, however, be tried first, to remove the stone or sediment at the distal end of the urethra. Sheep which are richly fed should be compelled to move several times daily in order that micturition will be brought about. Circumcision, incision, or cystotomy may be indicated in phimosis, paraphimosis and stone in the bladder.

Stone is caused by foreign bodies in the bladder, by precipita-

tion of lime from hard water or from food rich in its salts (bran), commonly from excessive feeding of nitrogenous food and lack of exercise, in fattening (uric acid stone), and from phosphatic deposits in the bladder from the decomposing urine of cystitis and infections of the urinary tract. In addition, there is thought to be a constitutional tendency—lithiasis—allied to the gouty and arthritic dyscrasiae. Supplying a liberal amount of sodium bicarbonate on the feed (C., 3i; Sh., 3i), and a generous supply of water, will prevent stone in most cases and is commonly practiced.

Retention of urine from paralysis of the detrusor muscles in nervous disease may be treated with strychnine and remedies directed toward the primary disorder.

The formation of calculus or stone in the kidney is seen in horses occasionally and other animals. Diagnosis rests on the occurrence of attacks of colic, especially after exercise, and following these there is apt to be blood in the urine and the constant presence of albumen, without casts or other evidences of nephritis. A pyelitis or pyelo-nephritis, with the presence of pus in the urine, may be induced by stone in the kidney. In human medicine a positive diagnosis of stone in the kidney is now possible by the use of the X-ray.

A stone not uncommonly lodges in the ureter, when the symptoms may resemble renal colic, as it shifts along from time to time. Or dilation of the urethra above the stone and hydronephrosis, etc., may follow. Examination per rectum may lead to discovery of ureteral stone.

Removal of stone from the kidney or ureter in the large animals is a difficult undertaking. Stone in the bladder is a much simpler matter as to diagnosis and treatment. The symptoms are generally of cystitis, but, besides frequency of micturition, there is often a sudden stoppage of the stream during the act, owing to plugging of the neck of the bladder by the stone. Pain is also more marked, so that the animal groans, stretches out his limbs, kicks his belly,

and perhaps lies down. Stone is much less frequent in females than males, but mares are often troubled with a sandy deposit in the bladder. Incontinence is another common symptom of stone, in which the skin of the thighs and legs becomes much irritated owing to constant dribbling of urine. The presence of stone may be positively determined by examination of the empty bladder through the rectum, after the latter has been washed out by enema. This may be done with the animal standing or cast.

In the mare, vesical stone may be removed by passing a spoon-bill, curved forceps (boiled, warm, and anointed with sterile oil), into the bladder on the finger as a guide introduced into the urethra. The other hand should be placed in the rectum to facilitate removal. Daily washing of the bladder with warm 2 per cent. boric acid solution should follow, if cystitis is marked. Crushing of the stone may be required if it is of large size.

In the male, perineal section must be done. The horse should be cast on the side or back and chloroformed. Then, with a catheter passed into the bladder as a guide, a median incision in the perineum is carried through the urethra. The stone is removed by forceps through the incision in the membranous urethra. The bladder is washed with warm, boric acid solution and the wound closed by stitches.

In human surgery drainage through the perineum for a few days is always indicated, to drain the bladder and thus relieve the cystitis, but with the surroundings inevitable to veterinary practice it is probable that increased infection would be caused by this procedure.

No drug will dissolve or remove stone in the body. In renal colic, the use of morphine and atropine under the skin may relieve spasm and allow the stone to pass into the bladder. In dogs, lycetol (gr. v) in capsules thrice daily may prevent calculus. Hard water is prone to cause stone in horses. Moderate diet, plenty of exercise and water are the most useful measures in preventing calculus.

The chief of means of prevention is pure water. This should be rain water in a limestone region, and a similar result is also attained by giving succulent food, as pasture grass in summer, and gruels, mashes, roots, and particularly ensilage, in winter. When animals have renal stones it is often better to fatten and kill them. The administration of one dram of hydrochloric acid or of potassium hydrate in the drinking water once daily may prevent the formation of stone—although in diametrically opposite ways.

Urticaria—Nettlerash—Surfeit—Hives.

Urticaria is due to external irritation from nettles, bites of insects, fleas, lice, chemicals, and to sudden cooling after overheating. Also to the generation of irritants within the body, commonly to the products of indigestion and toxins produced in the course of acute infections.

During pregnancy, rheumatism, hemoglobinemia, and through the influence of specific foods and medicines, urticaria is sometimes induced. It is characterized by flat lumps of varying size on the skin covered with roughened hair, which appear, disappear, and coalesce with surprising rapidity, often forming large elevated areas (giant urticaria). The skin lesions are occasionally associated with redness and swelling of the mucous membranes, which also change in appearance and site within a short space of time. Where the skin is white—as in swine—a red areola may be seen about the lesions and sometimes vesicles surmount them.

Treatment.—When the cause of the disease is uncertain or liable to be caused by indigestion, a purge is advisable: In horses, an aloes ball; cattle, Epsom or Glauber's salts; swine, calomel (3ss-i), in their food; dogs, one to three compound cathartic pills. External remedies are chiefly useful in allaying itching, which, however, is often not marked in animals. For this purpose saleratus (one teaspoonful to the quart of water) or vinegar, diluted or undiluted, are efficient. Sanitas, diluted with an equal amount of water, and terebene (1 to 8) in water, are also beneficial.

Vaginitis or Vulvo-Vaginitis.

Inflammation of the vulva and vagina, or of the vagina alone, occurs most frequently after labor and is due to infection of injured parts. It may occur at other times from irritation caused by strong injections, from the effects of foreign bodies, etc. A form of vaginitis, due probably to a specific germ, is contagious and communicated to the cow by the penis of the bull, appearing shortly after copulation. The acute form tends to become chronic and persistent if untreated. Vaginitis with croupous patches is sometimes seen in the course of puerperal fever (see p. 215).

Treatment.—In the acute stage, with swelling of the vulva and active inflammation and discharge from the vagina, the use of warm alkaline injections into the vagina through a perforated, sterilized, rubber tube is indicated. One tablespoonful of sodium bicarbonate to the pint of water may be used. The vulva should be anointed with vaseline. If there are deep lacerations in the vagina, it should be washed with one per cent. lysol or saturated boric acid solution, and the vagina filled with dry boric acid, packed with gauze and frequently dressed. After the acute condition has passed, vaginal injections may be made with zinc or copper sulphate, one dram of either to the pint of water, used twice daily. The occasional use of a five to ten per cent. argyrol solution is an efficient remedy for local application by means of a swab to the vagina. The existence of a vaginal discharge is not necessarily significant of a vaginitis, as it may originate in the uterus. Examination with a speculum will disclose the source of the trouble.

Varola—Pox of Sheep, Cattle, Swine, Goats, Dogs, Birds and Monkeys.

Variola in man (smallpox) and in animals is the same disease, although the symptoms in animals are usually much milder and the result favorable. Sheep-pox most nearly resembles smallpox in its symptoms and mortality. Smallpox produces the form of variola natural to animals when its virus is inoculated into them. Variola

inoculated into man from the various animals never causes small-pox, but only the local lesions seen in vaccination (vaccinia), and protects man from smallpox. Cow-pox, horse-pox and sheep-pox may be communicated to man naturally—by contact with variolous animals—but, in the case of sheep-pox, both inoculation and communication by contact are very rare and difficult to bring about.

The fact that the etiological microorganism of variola (*Cytocytes variolae*) has been discovered in smallpox, sheep-pox and cow-pox also proves their common origin. This is a protozoön living in the epithelial cells of the skin. Secondary infection with streptococci accounts for fatal, purulent cases.

Variola is highly infectious in sheep and is communicated by the secretions, excretions, attendants, infected objects of all kinds, including animals and insects, and through the medium of the air.

In cow-pox and horse-pox the disease appears to be chiefly brought about by contact of healthy animals with variolous or vaccinated persons, although the disease may rarely arise naturally in the cow and be transmitted from cow to cow by healthy milkers.

Sheep-pox is the most common, important and fatal. Incubation is variable—four to twelve days. It begins with conjunctivitis, coryza, and the animal is feverish, lies down and refuses food. The eruption appears about the eyes, nose, mouth, inside thighs and arms; and on belly, chest, prepuce, labia, anus and udder, tail, and often later becomes general. It consists first of red papules on a swollen skin and these are often surrounded by an areola and have a depressed centre. After a few days the papules become vesicles, and often pustules, and then yellowish and brownish crusts form which finally drop off, leaving pits and bare spots. The duration is about one month, and the average mortality 10 to 20 per cent., although it may be as high as 90 per cent. The dangerous forms are the confluent, with general running together and suppurating eruption, swelling of the head and eyes, loss of eyes, and severe inflammation and gangrene of the skin; and the hemorrhagic

variety, with ecchymoses of the skin and bleeding from mucous membranes and cavities of the body.

COW-POX VACCINIA.—This usually attacks young cows, but occasionally bulls, oxen and young stock. In cows, papules appear on the teat or udder as large as a pea and change into bluish vesicles on a red swollen base. The vesicles may be depressed in the centre and be surrounded by an areola. The eruption is mature on the tenth day, and the vesicle may become a pustule and then a crust, which falls off and leaves a cicatrix in twenty-one days; or breaks down into an ulcer. The disease is mild, although it may be associated with some fever and loss in milk.

In other bovines than the cow, the same eruption may appear upon the thighs, buttocks, chest and back. Smallpox may be inoculated into the bovine, and after inoculation of the virus from one animal to another a few times, and inoculated back into man, the result is the same as ordinary vaccination, and vaccine may thus be obtained.

HORSE-POX.—There is some fever and swelling of the flexor surface of the pasterns, particularly behind, with heat, redness and lameness. Papules occur, changing into vesicles and pustules, with maturity on the tenth day, and ending in scabs which fall on the fifteenth to twentieth day; or ulceration may terminate the eruption. Rarely the eruption may appear on the naso-labial region, on the head, belly or legs and mucous membrane of the nose, mouth and eyelids. It is mild and, like cow-pox, thought to be now largely caused by accidental inoculation from vaccinated attendants. Rarely in swine and dogs accidental inoculation from vaccinated persons is seen, while sheep-pox is the only form of variola which appears and spreads like smallpox of man and is therefore regarded as a distinct disease.

Treatment.—In the case of sheep-pox the disease is so serious that prevention by slaughter of the diseased and exposed animals and thorough disinfection of infected premises and objects are gen-

erally most satisfactory. Infection may last for six months or more about infected premises or objects, and for as many weeks about sheep recovered from variola. Dipping the latter in 2 per cent. creolin or lysol will, however, destroy the infection. Ovination or inoculation of sheep with the virus of sheep-pox has been done with greatly varying mortality (2-20 per cent.). It is said that inoculation from an inoculated sheep, by means of the virus from the pustule taken at the tenth day and introduced into the end of the tail of a healthy sheep, will produce immunity without eruption; also that ordinary vaccination will protect. No inoculations should be practiced until an outbreak has occurred in a flock, as the disease may be spread by the process.

Medical treatment includes cleanliness of surroundings and bedding; warm shelter; fresh air, and sloppy, nourishing food. The nostrils and eyes must be kept cleansed with saturated boric solution, and chalk may be used in the water if there is diarrhea.

In the case of cow-pox, the patients should be isolated and a separate attendant provided. The use of a milking tube, frequent hot fomentations, and measures advised under mastitis are indicated when the udder is affected. In horse-pox, cleanliness, clipping hair from the parts, and bathing with hot 2 per cent. lysol solution, the application of wet compresses of the same or other antiseptic, and later of carbolized vaseline, are of service. Vaccine lymph is made by inoculating calves about five months old with glycerinated vaccine lymph by rubbing it in over shaved and scarified areas on the sides and flank.

After five to eight days the crusts are cleansed and removed and the lymph scraped off and squeezed out of the vesicles and mixed with an equal part of glycerin. After two months the preparation is sterile and suitable for vaccination purposes.

Vertigo—Megrims—Blind Staggers.

This is a nervous disorder which occurs most often in horses;

occasionally in dogs, pigs, cattle and sheep. At times it is apparently a pure neurosis, and at other times symptomatic of cerebral congestion from pressure of harness on neck or from too short overdraw check, or from chronic heart or lung disease, especially when the animal is overheated. It may also be a symptom of cerebral anemia (see p. 20) or general anemia. Finally, peripheral irritation originating in strong reflected light upon the eyes, in foreign bodies in the ears, or perhaps in indigestion, may reflexly induce vertigo. It occurs in horses more often during exercise (wherein it differs from epilepsy) and when driven rather than under the saddle.

Symptoms.—An attack lasts in the horse a minute or two. The animal slows, stops, sways, staggers, shakes and nods the head, sweats and leans against a support and sometimes falls. There are unconsciousness, dilated pupils, rapid pulse and breathing. Recovery is quick.

Treatment consists in covering the eyes, removing harness about the neck and walking the animal about. Cold water thrown over the head will also excite consciousness. If any of the causes enumerated can be discovered, their removal should be attempted. Heart disease must be treated. Animals subject to megrims when driven may sometimes be ridden without danger of an attack. Certain blinders appear to favor the disorder. Regular and hard exercise is sometimes remedial. It is well to give an aloes physic ball after a seizure.

Warbles—Hypodermosis.

This is a condition very commonly seen in cattle in February and March and consists of a number of roundish swellings, five to twenty in number, appearing upon the back, lumbar region, shoulders, ribs and quarters; less often on the chest, belly and thighs. The swellings are frequently about as large as the closed hand and involve the connective tissue under the skin. They are caused by

the larvae of a bot fly—the *Hypoderma lineata*—which lays its eggs on the skin especially above the heels, in spring or summer (according to location), and these eggs are swallowed and reach the subcutaneous tissues by wandering out through the walls of the esophagus. The swellings on the skin suppurate and a small aperture is formed through which the larvae escape and then the swelling disappears spontaneously within three weeks or so of its appearance.

Treatment.—When the larvae is about to escape it may be hastened by gentle pressure and removal with tweezers. Very rarely general septic poisoning occurs from extensive suppuration. Kerosene may be injected, by means of an ordinary machinist's oil can, into the apertures in the warbles at as early a stage as the apertures can be discovered or two applications of thick grease to the swellings in winter stop up the breathing holes of the grubs and kill them. By this treatment it is said that the large swellings do not form but that the disease subsides without any further development or suppuration, and at the same time the larvae are killed.

Prophylaxis consists in the application of agents to prevent the gadfly from alighting on cattle in July and August, and brushing to remove the eggs when laid on the skin. The daily application of axle grease or kerosene to the legs and flanks is effective; also creolin solution (3 per cent.), or one of the proprietary remedies against flies, may be sprayed over the body prior to turning cattle to pasture. Warbles causes in the aggregate enormous financial loss owing to the holes in the hides and shrinkage in milk.

Wind-Sucking—Crib-Biting.

This does not refer to simple biting of the stall fixtures, although the trick may thus begin, but to the habit by which air is drawn into the larynx through setting the jaw or teeth against an object or by alternately depressing and throwing up the head. The air is then partly swallowed—with resulting tympany—and partly emitted, with characteristic sounds. It is commonly seen in horses, in which it originates through idleness or through imitation of other

animals having the vice. Wind-sucking occasionally occurs in cattle.

In the beginning, simple biting of the stall fixtures may be prevented by covering all such parts with metal or using iron fixtures and giving so much work that there will be no time for acquiring vicious habits. In wind-sucking the use of a muzzle or spiked strap about the larynx will sometimes prevent the habit. The absence of anything about the stall to bite may favor a cure. This is obtained by avoidance of any manger and feeding on the ground, or by using a manger which may be removed after feeding or turned into a recess in the wall. When tympany occurs, the use of carron oil (3iv) on the food (which should be easily digestible, as cut hay and grain) will tend to overcome this condition. Isolation of wind-suckers, to avoid communication of the trick to other animals, is essential.

Wounds—Fistulae—Open Joints—Ulcers.

OPERATIVE WOUNDS.—The hair should be shaven from the surrounding area and the skin scrubbed with green soap and water the night before the operation, and the skin should be painted with tincture of iodine just before the operation. It is safer for the operator to wear rubber gloves and better for the patient. The wound should be handled as little as possible. All bleeding must be arrested before closing the wound. If the wound is deep, it may be closed by layers of buried sutures of sterile catgut and the skin by interrupted silkworm gut sutures. Irrigation of the wound is not advisable in human surgery, unless it has become soiled by infectious material, and is then conducted with normal salt solution. In veterinary practice the surroundings and air are favorable to infections and therefore it is well to irrigate the field of operation with 2 per cent. lysol or 1 to 3,000 corrosive sublimate solution.

Drainage in a wound made aseptically in uninfected tissue is usually uncalled for, unless the wound is very deep, or involves

much fat, or has been subject to much manipulation. In case a drain is used, it may be of rubber tubing, or gauze covered with gutta percha tissue, and it should reach to the lowest depths of the wound, while the rest of the wound may be closed with sutures. It is well to cover the wound with a layer of aseptic gauze, saturated with 1-1,000 corrosive sublimate solution, and then with dry aseptic gauze and bandage. If an aseptic wound is thus secured it is of the utmost advantage to leave the dressings undisturbed until the latest moment. Only pain and swelling, fever and other evidences of infection; or the necessity of removing stitches or drain should lead one to remove the dressing for a week or ten days. If the dressings become saturated with blood or serum they may be covered with more material. The use of splints on a limb is conducive to rest and asepsis after an operation on this part. Dogs are the best veterinary subjects for aseptic surgery.

ACCIDENTAL WOUNDS AND ULCERS.—In emergency and accident cases requiring immediate operation no washing of the skin is required. The hair is to be clipped about the wound and tincture of iodine swabbed on the skin and wound, after wiping away the blood with absorbent cotton. In fresh wounds, bleeding must be arrested by hot, or even boiling, water; ice water; the hot iron at red heat in very vascular or deep seated wounds; hemostatic forceps; tourniquet; acupressure or finger pressure; torsion or chemicals, as adrenalin solution, according to custom or circumstance. Long and continuous cleansing of the wound, by allowing solutions of corrosive sublimate (1-3,000) or lysol (2 per cent.) to fall upon the wound from a height or by means of forcible washing with a sterile syringe, is essential to get union by first intention. All foreign bodies and bits of destroyed tissue must be removed. It is wise to finally swab out the wound with hydrogen dioxide.

Divided tendons, nerves and muscles should be properly approximated by sterile catgut. If the wound is not deep, nor much contused nor lacerated, nor infected, it may be closed without

drainage; otherwise drainage should be introduced to the most dependent part of the wound and the wound closed in the remaining parts by sutures. If infection occurs it is always easy to pull out the sutures and reopen a wound, but it is impossible to secure first intention if the wound has become infected. It is therefore better to close a wound without drainage if circumstances appear to favor first intention. If a fresh wound is much soiled by contact with dirt it may be disinfected in part by the application of pure phenol over its entire surface and then by pure alcohol, which prevents the irritation of the carbolic acid; or the tincture of iodine may be used, and the wound packed with iodoform gauze. Wherever it is possible the wound should be dressed and bandaged as advised above for operative wounds.

Old and contused wounds should be treated by the free* application of aseptic gauze soaked in a two per cent. solution of lysol or 1 to 3,000 corrosive sublimate solution. This should be covered with oil silk or rubber dam and bandage and renewed each day until the inflammatory and septic character of the wound has abated. When, owing to location, bandaging is impossible, the wound should be frequently bathed with hot lysol or corrosive solution and covered with iodoform and tannic acid (1-5), or treated as advised for granulating wounds. Unhealthy granulations in old wounds and ulcers should be removed by a thorough curetting or by touching with lunar caustic stick.

Moreover, in granulating wounds the daily application of carbolic acid in glycerin (1-12 to 16) as a regular dressing, or gauze saturated in Peruvian balsam, are indicated. In chronic ulcerations—as decubitus—the use of equal parts of naphthalin and iodoform, or an ointment containing one part of silver nitrate, five parts Peru balsam, and twenty parts vaseline, are of benefit, especially where the wound can not be covered with a dressing and bandage. In unhealthy, sloughing ulcers, thorough removal of the dead tissue by curetting is desirable. Wound healing in old ulcera-

tions may be hastened by freeing the skin all about the margins of the ulcer and drawing the skin together by wire or silkworm gut sutures.

Sinus's are treated by the application of carbolic acid or tincture of iodine, by injection, or by curetting the sinus with a special sinus curette. If a sinus does not close it is because of some foreign body at its origin, as carious bone.

In the treatment of fistulae the injection of the Beck ointment has almost revolutionized the methods in vogue in human surgery. Old fistulae of years' standing have been cured within a short time by its use. The ointment is heated until soft and injected with a sterile glass or metal syringe through the nozzle alone or through a sterile rubber tube or catheter in the sinus until it is completely full, and the sinus refilled every three days with a sufficient amount of ointment to replace that which has escaped. The ointment is composed as follows:

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Bismuth subnitrate	6 parts
White wax	1 part
Vaseline	12 parts
Soft paraffin	1 part
Boil and mix and place in sterile jar.	

Very septic ulcers, as about the coronet of horses (phagadema or carbuncle), should be disinfected by burning with the actual cautery, or by curetting and the application of antiseptic poultices.

PERFORATING WOUNDS OF THE ABDOMEN.—Protruding viscera should be protected by sterile gauze wrung out in hot (115° F.) boiled water. The whole surrounding region should be sterilized, as described for operative wounds. Prolapsed omentum should be tied off and excised. Any protrusion of the bowel must be cleansed in the most prolonged and painstaking manner by irrigation from a pitcher or other vessel with warm (110° F.) sterile salt solution (one level teaspoonful of sodium chloride to the pint of boiled

water), and the bowel returned to the belly. The abdominal wall must then be closed in layers with chromic catgut, using, however, interrupted silkworm gut for the approximation of the skin. It is wise to insert also several silkworm gut sutures, through all layers (except the peritoneum) of the abdominal wall at certain points, to reinforce the layer sutures and prevent hernia. The wound may be sealed with iodoform and collodion (1-8), and covered with sterile gauze and adhesive plaster and band about the belly.

PUNCTURED WOUNDS.—The rule is to clip the hair and disinfect the dry skin with tincture of iodine, and not to probe or disturb the wound unless it contains a foreign body or it becomes necessary to pack the wound or ligate a vessel to arrest hemorrhage. The wound should then be sealed with iodoform and collodion (1-8) and covered with gauze wet in corrosive sublimate solution and bandage. Punctured wounds with a manure fork, harrow tooth or nail are likely to give rise to tetanus, and a prophylactic dose of tetanus anti-toxin should be given (see Tetanus). If signs of inflammation appear, with local heat, pain and swelling and general fever, then the wound must be opened to liberate pus, or Bier's hyperemia (see p 278) may be tried.

GUNSHOT WOUNDS.—The indication for treatment is as for punctured wounds—sterilization of external wound, and sealing with wet antiseptic dressing and rest. Probing is to be avoided. If a foreign body has been carried in by the missile, then its removal will probably be required, but not so in the case of a bullet unless it is subcutaneous. If local or general infection ensue then incision becomes necessary to afford drainage, but not to discover the missile.

JOINT WOUNDS.—When there is a small perforating wound of a joint the surrounding area should be sterilized as recommended for punctured wounds. The immediate point of perforation should be subjected to prolonged irrigation (1 to 1,000 corrosive solution), but the wound itself should not otherwise be interfered with. Then

the wound is to be sealed with iodoform and collodion (1-8), and iodoform gauze or gauze saturated with the corrosive solution bandaged over the puncture; whenever this is possible, Bier's treatment is in order. Immobilization of the joint is also desirable. For this purpose slings, for horses, and a covering of plaster of Paris or adhesive plaster and splints may be used. Sometimes blistering with mercury biniodide (1-8) of the neighboring parts is practiced, and when a bandage can not be used this may properly be done. In dogs, plaster of Paris, with a window for inspection of the wound, is indicated.

Large penetrating wounds of the joint should be irrigated for half an hour or so with lysol (2 per cent.) or corrosive (1-3,000) solution and closed by suture, when the wound is fresh and there is any probability of an aseptic result. Even with fracture of the bones entering into the joint, a favorable recovery sometimes follows this method, providing the joint is thoroughly covered with gauze saturated with corrosive sublimate solution and immobilized as just advised for punctures. If infection occurs the wound must be reopened and drained. With infection of the large joints in the large animals—especially if there is fracture associated—the outlook is unfavorable and at best ankylosis is to be hoped for. In dogs, where the limb can with ease be completely immobilized in plaster of Paris and a window left for treatment, the prognosis is much better. Thorough drainage and frequent antiseptic irrigation of the joint are then required for joint infection.

See also Bites and Rabies.

Bier's Hyperemia Treatment.

In human surgery no new method of treatment has proved so valuable as this within the last decade in which it has been used. Bier's treatment depends upon hyperemia produced artificially. Active hyperemia is brought about by heat, as hot air, etc. Passive

hyperemia is secured by suction, as cupping and the use of other suction apparatus, and also by placing an elastic ligature about a part sufficiently tight to prevent the return of venous blood but not so tight as to obstruct the arterial inflow. This latter method is the one which has recently been employed in veterinary surgery and is the method we will describe.

Bier finds that passive hyperemia is useful in infections and inflammations, particularly of limbs and joints, because of the following actions: 1. Bactericidal effect. 2. Relief of pain. 3. Resolution of inflammatory deposits and relief of stiffness in joints. 4. Arrest of absorption of toxins into circulation. 5. Shortening or aborting infections.

Methods of application.—A rubber Esmarch bandage, about three inches wide and five feet long, is applied about the limb of a horse, between the wound and the body, tight enough to produce a warm edema below the bandage. The bandage is kept in place twenty hours out of the twenty-four in severe cases; or ten hours in the twenty-four in milder infections. Just how tight to apply the bandage is not possible to describe. In the human, relief of pain and a red edema is the desideratum. In the horse, the chief point is to avoid producing a cold limb because of too great constriction. Some animals will bite or paw and so displace the bandage. The rubber bandage should have tapes sewed on each end and is wrapped about the limb and kept sufficiently tight by tying the two tapes together. The bandage is placed in the fore limb on the forearm above the chestnut one day, and the next below the knee (on the metacarpus), and so shifted from day to day. In the hind limb the bandage is placed one day about the middle of the tibia and the next day below the hock. It should always be placed as far proximally from the lesion (that is, as near the body) as possible, but in the horse it cannot be affixed at groin and axilla as in man. The position of the bandage is shifted from day to day to avoid necrosis of the skin. It is well to protect the rubber by a cloth bandage over

it. If the infection is of the knee or hock the constriction must be placed above these points.

The bandage should be applied at the earliest stage of infection to secure the best results. Then edema may be expected from the bandage, but in later stages edema may not occur, and if this is the case the treatment is of little service. If the treatment is successful either pus will not form and resolution occur, or else it will be necessary to make but small incisions to liberate pus and the course of the condition should be much shortened. The treatment is only applicable to cases which can be under frequent observation in order that the obstruction produced by the bandage may be regulated. Placing the finger under the bandage after its application will give one an idea of the amount of pressure and observation of the limb will show if the result is obtained—edema, but warmth in the distal parts, with apparent relief of pain. The turns of the elastic bandage should spread over some area of skin and not be applied one over the other.

The appropriate conditions in veterinary practice for Bier's hyperemia include the following:—Joint infections and stiff joints, including rheumatic joints. These embrace purulent teno-synovitis and arthritis, and phlegmons about the hoof in horses. A wet, antiseptic dressing may be applied loosely over the point of infection.

It is yet to be proved of how great value this method is in veterinary practice, although many favorable reports have been made. In human surgery its value is beyond cavil.

Artificial Feeding.

Artificial feeding consists in the introduction of food into the body other than in the ordinary way by the mouth. Rectal feeding is the only procedure of much value. The agents employed must be bland, and capable of easy absorption and assimilation. If the food is at all irritating, tenesmus and ejection quickly occur. From two

to four ounces of liquid nourishment may be given to small or medium sized dogs; from four to eight ounces to large dogs. One quart may be employed for horses. The nutrient enema should be introduced into the bowel through a flexible rubber tube carried up into the colon. An hour before the enema is given the bowel is to be washed out thoroughly with cold water. The nutrient injection should not be given oftener than once in six hours, and if the bowel is irritable, not oftener than once in twelve hours. The absorptive power of the rectum is slight, but that of the colon is considerably greater. Predigested food is most valuable. Leube's Beef Peptone may be used. A bullock's pancreas is finely chopped and rubbed up with eight ounces of glycerin. This extract will keep fresh several weeks in a cold place. To one-third of the extract are added five ounces of finely chopped beef, and the mixture is ready for immediate use. The peptonizing powders of Fairchild Brothers & Foster are most convenient in preparing digested food. Each powder consists of five grains of pancreatic extract and fifteen grains of sodium bicarbonate.

A useful nutrient enema for a large dog may be made of two eggs and six ounces of milk. Four to six eggs may be added to a quart of milk for use as an enema for a horse. The mixture is then to be peptonized and introduced into the rectum at the temperature of the body. In using the peptonizing powders, one is placed in a quart glass jar together with a teacupful of cold water. Then a pint of the mixture to be peptonized is poured into the jar, and the latter placed in a vessel containing water as hot as the hand will easily bear. The jar is kept in the hot water for twenty minutes and put on ice. When the mixture is used it should be heated to 100° F. If predigested food is to be given by the mouth, it is well not to keep the glass jar immersed in hot water more than five minutes, as otherwise the taste will be bitter and disagreeable. A small dose of laudanum is always useful to prevent the expulsion of enemata. Brandy may be added in the proportion of one ounce to the pint of

milk after peptonizing. The addition of salt to egg-albumin greatly facilitates absorption. Gruels of all kinds, and broths, may be peptonized, as well as milk. It is not essential, however, to peptonize milk and other fluids, although absorption is rendered somewhat more complete. The digestive powers of the large intestines are but slight. Sugar is absorbed unaltered; undigested proteids (with certain exceptions) and fat are not absorbed. Peptones, soluble proteids, as milk, meat juice, egg albumin, and emulsified fat are absorbed. Nevertheless, absorption from the lower bowel is trivial compared with that from the stomach and small intestines, and as the extent of surface with which rectal injections come in contact is small, and their sojourn short, it follows that rectal feeding cannot take the place of normal alimentation.

In tetanus, paralysis of muscles of deglutition, fracture of the jaw in horses, persistent vomiting and convulsions in dogs, and in all animals refusing food, rectal feeding is indicated. It is possible to feed animals through a stomach tube (or catheter), and, in hospital cases, this method may be preferable.

Practical Disinfection.

The premises occupied by animals suffering from contagious diseases, together with all articles contained therein, such as harness, blankets, stable implements, and evacuations, must be disinfected after the removal of all animals and isolation of the sick. The excreta should be mixed with milk of lime (1 part of freshly slaked quicklime, with 2 parts, by volume, of water), or with pure chlorinated lime. The floors and walls must be scraped and washed. Boiling water should then be poured over every available part of the premises, and these brushed with a saturated solution of chlorinated lime. Or all available parts of infected stables should be saturated with one of the following solutions by means of a small hand force-pump, or brush: 5 per cent. formalin, 1 to 500 corrosive sublimate, 2 per cent. cresol, or 5 per cent. carbolic acid. Clothing

may be treated by boiling in water, or by soaking in a solution of corrosive sublimate (1-500), or carbolic acid (1-20), for twelve hours. Harness is disinfected by washing with soap and water, and then with a 2 per cent. crude carbolic acid or creolin, or 1-1000 corrosive solution. Valueless articles are given to the flames. Stable and metallic instruments and fixtures are to be freed from dirt, scrubbed with soap and hot water, drenched with boiling water, and then with a 5 per cent. crude carbolic acid or creolin solution.

Gaseous disinfection is now in order to kill microorganisms in remote and inaccessible places. Live steam is the most efficient means at our disposal for this purpose, when a suitable apparatus for its application to woodwork, haymows, etc., is obtainable. In place of this we may resort to formaldehyde, chlorine or sulphurous acid gas. The walls are finally painted or covered with whitewash containing 5 per cent. of crude carbolic acid. Healthy animals, which have not been exposed to infection, may now be allowed to return to their disinfected quarters.

Venesection.

Venesection, or blood-letting, formerly abused, has, for that reason, fallen into almost complete disuse. This is unfortunate, since blood-letting is a valuable and often life-saving measure. The indications for venesection are chiefly limited to conditions associated with a general high arterial pressure and local engorgement of some organ.

In such cases venesection very rapidly reduces general blood-tension to a point lower than existing in the engorged region, so that congestion is relieved. A full, incompressible pulse is said to indicate the desirability of venesection in severe acute disorders—in accordance with the above—but this is not by any means invariably the fact, as will be shown.

Venesection leads to a reduction of temperature, and vascular tension is lowered for from 3 to 48 hours, according to the quantity

of blood withdrawn, but the blood-vessels quickly adjust themselves to the smaller mass of blood, and the original quantity of this vital fluid is soon restored (24 to 48 hours) through absorption from the tissues and alimentary canal. The heart beats more rapidly, owing to the lessened resistance in the vessels, and venesection is accompanied by nausea and prostration.

The blood is less dense and more fluid after blood-letting, and for this reason, if inflammatory processes follow, exudation is more apt to ensue. The fibrin is first regained, then the normal number of white, and finally that of red corpuscles, in from one to five weeks. Circulatory depressants—as *veratrum viride*—accomplish much the same results as blood-letting, by causing general reduction of vascular tension and relief from local congestion, thus “bleeding an animal into its own veins” without loss of blood, it is true, but with less rapid and certain effect.

Cathartics, diuretics and diaphoretics also lower blood pressure by abstraction of fluid from the vessels, but their action is slow. The following disorders are those most suitable for treatment by venesection when they exist in an alarming form in robust animals:

Cerebral congestion. In isolation and tympanitis.	Sthenic pneumonia.
Apoplexy, particularly parturient apoplexy of cows.	Sthenic pleuritis.
Encephalitis.	Urticaria.
Acute cerebral meningitis.	Lymphangitis.
Active pulmonary congestion and apoplexy.	Hemoglobinemia.
Passive pulmonary congestion in cardiac disease.	Toxæmia { Bacterial, Mineral, Vegetable.
	(Followed by saline infusion.)

Venesection from the jugular in cerebral congestion is, in fact, a species of local blood-letting by directly draining blood away from the brain; and it preserves life by preventing pressure on, and paralysis of, the great medullary centres controlling the respiration and heart. Moderate blood-letting is sometimes advisable in the

early stages of severe inflammatory attacks of the brain or its membranes.

In cerebral congestion, and dyspnea due to gastric tympany and pressure on the diaphragm, bleeding may give relief. Blood-letting is particularly applicable in the prophylactic treatment of parturient apoplexy of cows, when the disease has once occurred, and may be practised in plethoric animals immediately before parturition. Venesection alleviates dangerous pulmonary congestion, removes the venous load on the right heart, and relieves dyspnea and cyanosis by making it possible for the heart to force a smaller quantity of blood through the less obstructed lungs.

A feeble and easily compressible pulse does not necessarily contraindicate venesection in engorgement of the lungs, for this condition leads to stasis in the pulmonary circulation, prevents the proper flow of blood into the left ventricle, and thus causes arterial anemia. Therefore, so far from contraindicating blood-letting, this condition urgently demands it. Alarming dyspnea, great cyanosis, together with a general plethoric state, should guide us in blood-letting in sthenic pneumonia and pulmonary congestion, rather than the state of the pulse. Venesection is serviceable in advanced cases of cardiac disease in dogs—with failing compensation, venous engorgement of the lungs, and dyspnea—by relieving obstruction to the right heart. Moderate blood-letting is occasionally useful in severe cases of acute pleuritis, laminitis, lymphangitis and urticaria in plethoric horses.

Finally, in various toxemias, blood-letting drains away both the blood and its contained poison. The mass of blood removed may be advantageously replaced by injection of normal salt solution into a vein or under the skin. This method is not in prevalent use in veterinary medicine, but is applied with notable success in human practice. Every veterinary practitioner should be competent to bleed an animal. An amount greater than $\frac{1}{5}$ of the total quantity of blood should not be withdrawn. The total quantity of blood is

equal to about 13.5 per cent. of the body weight in horses; to 2.2 per cent. of the body weight of fat swine; to 6.6 per cent. of the body weight in dogs, and to 7.7 per cent. of the body weight in man. Large horses or cattle may be bled to the extent of from 4 to 6 qts.; smaller subjects, 2 to 4 qts.; sheep, $\frac{1}{2}$ to 1 pt.; dogs, 4 oz. to 1 pt.

Blood-letting is generally done to animals in the upright position by clipping the hair and painting the skin over the jugular vein with tincture of iodine in the upper part of the neck. The vein is made prominent by pressure below the site of operation, and a fleam, or knife carefully guarded, is plunged into the vein, making a good clean incision. The blood should be quickly withdrawn and carefully measured and the effect on the pulse noted, and the blood-letting maintained until there is noticeable reduction in the vascular tension and other symptoms, for the relief of which venesection is employed. The bleeding is arrested by suturing the lips of the wound and by pressure with a bandage.

Local Blood-letting, or Scarification, is often useful in relieving tension and pain in locally congested or inflamed tissues, and may even avert death of the part. Furthermore, stasis is removed and exudation from the engorged vessels may be prevented, while a fresh supply of arterial blood flows in to reinstate the vital processes.

Scarification is practiced by making numerous small, parallel incisions into the skin, fascia or other tissues in the long axis of a limb or part. In inflammation of the periosteum it is necessary to puncture this membrane. Bleeding is facilitated by warm poulticing, and is arrested by packing the incisions with sterile gauze.

Indications.—Lampas, Glossitis, Periostitis, Cellulitis, Conjunctivitis, Mastitis, Laminitis (to secure blood for microscopic examination).

Sometimes the veins leading from an inflamed area are opened, thus securing local abstraction of blood; *e. g.*, the digital veins in laminitis; the milk veins in mammitis.

Scarification, or puncture, is indicated in the above-mentioned

conditions whenever there is great swelling, pain and tension in the affected parts, and not otherwise.

Enteroclysis.

Enteroclysis applies to slow, rectal injection of normal salt solution (105° F.) to secure absorption. This method may be applied in cases not so urgent as to demand intravenous saline infusion or hypodermoclysis, more especially moderate degrees of hemorrhage, shock, collapse and circulatory depression, when the intrinsic heat of the injection is valuable in restoring the normal bodily temperature.

Indications for Saline Infusions.—Grave hemorrhage; shock, traumatic, operative, and electric; suppression of urine; severe diarrhea; eclampsia; purpura hemorrhagica; hemoglobinemia; toxemia (bacterial, mineral, vegetable); in threatened death from any accidental cause; in any disease with feeble heart and low vascular tension.

Hypodermoclysis, or the intravenous injection of saline infusions, find their greatest usefulness as life-saving measures in severe hemorrhage. While these methods are not in vogue in veterinary practice, they have become recognized procedures of great practical value in human medicine. The indications, following hemorrhage, are to fill up the vessels and to restore vascular tension. since danger is imminent, not from loss of blood corpuscles, but from lack of a circulating medium. There is a sufficient number of red corpuscles to carry on the respiratory and oxygen-bearing functions even after the greatest loss of blood possible from ordinary causes. In fact, respiration is but slightly impaired in human subjects suffering from pernicious anemia, when there is a 90 per cent. reduction in the normal number of red corpuscles, and two-thirds of the blood may be withdrawn from animals and replaced with normal salt solutions without serious damage resulting. In shock there is general vasomotor paralysis, so that most of the blood collects in

the abdominal veins, while the ventricles and arteries are emptied. In this condition saline infusions (105° to 110° F.) are of infinite value, because absorption of drugs from the digestive canal and subcutaneous tissue is impaired. Saline infusions greatly dilute the blood—and, therefore, poisons in the blood—in toxemia, while they increase the activity of the kidneys and elimination of toxins. The intrinsic heat of the injections is thought to stimulate antitoxin formation, and the restoration of vascular tension is believed to assist the natural bodily resistance of the patient.

A great variety of disorders have been treated successfully in human medicine with saline infusions, on this basis, including: septicemia, pneumonia, uremia, diabetic coma, purpura hemorrhagica, tetanus, ulcerative endocarditis, pyelitis; acute alcohol, ether, chloroform, carbonic monoxide, arsenic and mushroom poisoning; and toxemias resulting from acute infectious disorders. The same treatment might be applied to hemoglobinemia and other toxemias peculiar to the domestic animals. Venesection for the purpose of removing the poisoned blood should, in most cases, be resorted to prior to practising saline injection in the toxemias. Excluding shock and hemorrhage, where heat is invaluable, saline infusions are generally given at the temperature of 103° F. by the rectum, under the skin, or into a vein.

Since writing the above, favorable reports of the use of saline infusions have been accumulating. Thus G. W. Dunphy (*Amer. Vet. Review*, June 1905) writes that he treated two cases of purpura hemorrhagica in the horse by injection of 6 liters of normal salt solution following the removal of 5 liters of blood from the jugular (by means of a trocar and canula), and, at the end of twenty-four hours, bled 2 more liters and injected 3 more liters of salt solution with very happy results. He also demonstrates the wonderful life-saving influence of intravenous saline infusion after the loss (by a horse) of 25 liters of blood.

Lavage.

Lavage is a term applied to washing out the stomach with the stomach tube. This process, while an every-day occurrence in human medicine, has been too long neglected in Veterinary practice. Fortunately, new interest has been awakened in this useful procedure by Phillips, of St. Louis, who has perfected a tube and demonstrated the practicability of its use. (*Amer. Vet. Review*, 1904).

The passage of the tube is chiefly of value in acute indigestion of the horse, with gastric flatulence and distension, where pain and danger of rupture of the organ are averted by permitting escape of gas. By further washing out the stomach in such conditions, and in gastritis and engorgement, toxic, fermenting ingesta are immediately removed and the evil results, as tympanites and local inflammation of the stomach and of the intestines, are prevented. In choking, as by oats, the passage of the tube may afford relief, while in poisoning the washing out of the stomach is the one essential treatment. Gastric indigestion and flatulence are shown by colic, distension in the region of the stomach, difficulty in thoracic breathing and eructations of gas by the mouth, or attempts at retching and vomiting.

To pass the tube, the horse may be backed into a stall. The operator stands to the animal's left and an assistant, holding up the horse's head and the distal end of the tube, to the patient's right.

The tube is placed in warm water and the surface is dusted with powdered slippery elm or smeared with vaseline. The left nostril of the horse is also lubricated in the same way.

The operator pushes the tube gently along the floor of the left nasal fossa with the left hand, while guiding its direction with the right hand.

The first obstruction is likely to be met, when the tube has been entered about a foot, by its contact with the turbinates. The point of the tube should then be held downwards, by the pressure of the right forefinger pushed as far as possible into the nostril, while

the outer part of the tube is lifted upward to force the point down into the pharynx. When the tube enters the pharynx attempts at swallowing are likely to occur and these are just what are needed to close the epiglottis over the larynx and to force the tube into the gullet. If swallowing is not evident it may be brought on by pushing the end of the tube gently backward and forward into the pharynx, and, when an attempt at deglutition occurs, the tube should be thrust forward. If the tube goes into the trachea instead of the oesophagus, it will meet with little resistance and expired air may be felt coming from it, while coughing often results. If it is in the gullet, the tube will be held more firmly by its walls and only fetid gas may escape with stomach contents. It should by these means be definitely established then that the tube is in the gullet before introducing it farther.

The tube should be made with white marks on the rubber to show when it may be expected to have reached the gullet and again the stomach.

During the course of passing the tube it must be well lubricated.

When the stomach is reached the gas may have already escaped and fluid contents may be siphoned off by filling the tube with warm water from a funnel or syringe, holding the distal end tightly closed and lowering it to the ground so as to permit of the escape of stomach contents by siphonage. If the contents are largely solid, the stomach must be repeatedly filled with 2 to 4 quarts of warm water and allowed to escape again by lowering the outer end of the tube to the ground. If the flow stops, owing to choking of the tube, it may be started again by injection of water into the tube with a syringe or pump.

The latter must not be used to suck out the contents of the stomach except so far, if necessary, as to start the siphonage. The stomach should thus be repeatedly washed until the water comes

away clear. If water is injected with a syringe, care must be taken to avoid forcing air into the stomach.

When passage of the tube becomes impossible through one nostril, the other one may be tried. Phillips reports failure to pass the tube in the horse in only 5 per cent. of trials. The tube is best made of red Para rubber and long enough to reach from the stomach to the ground when in place.

Lip-and-Leg Ulceration in Sheep—Necrobacillosis.

This disease is enzoötic and highly communicable. It is due to the bacillus necrophorous, which has a normal habitat in the intestine of the hog, and perhaps also in that of the horse and cow. In the United States necrobacillosis has been especially prevalent in the north-western and western states, and has been frequently mistaken for foot-and-mouth disease. The latter is characterized by the occurrence of apthae or vesicles in the mouth and about the pasterns, which are not seen in necrobacillosis, and the necrotic processes, with extensive destruction of tissue peculiar to lip-and-leg ulceration, are not observed in foot-and-mouth disease. *B. necrophorous* is anærobic and pleomorphic. It appears in coccoid, bacillary and filamentous forms—the latter over 100 mm. in length—according to its habitat, age, etc. For its cultural and other characteristics, the reader is referred to circular 91, U. S. Department of Agriculture. In circular 160 will also be found a study of the special form of the disease under consideration, to which the writer is much indebted.

The bacillus gains entrance to the body by inoculation through abrasions of the skin and mucous membranes or disease of the same. Its products induce coagulation, necrosis of mucous membranes, with sometimes the formation of false membranes and caseonecrotic lesions on the skin and internal organs.

The bacillus attacks horses, cows, calves, sheep, pigs and goats, dogs and chickens. It is responsible for many apparently diverse

diseases in these animals. It is the sole cause of necrotic anovulvitis, vaginitis and metritis in cows and heifers, of foot-rot in sheep and cattle, of necrotic scratches and quittor in horses, of necrotic stomatitis in calves, lambs and pigs, of pseudo-membranous disease of the mouth in fowl and other birds. It is a contributing cause of hog cholera and of confluent pox in cows and sows, and the sole cause (in some cases) of white scour and umbilical and joint infection of new-born calves. Not only this, but the bacillus may cause one form of disease in one animal and give rise to another form when the disease is transmitted to another animal of the same or of another species.

Predisposing Causes.—These are especially abrasions of the skin and mucous membranes. The immediate cause of such in lip-and-leg ulceration in sheep are cuts, bruises and abrasions produced by thistles, briars, cactus, greasewood, etc., about the mouth and limbs, and injuries to the limbs and muzzle arising from crusted snow, and abrasions on the limbs caused by the tearing off of mud plastered and dried on the same. Drouth favors the disease in leading the sheep to browse on rough vegetation. It is not known whether the bacteria ever exists on plants, unless they have been contaminated with diseased animals or animal excretions. As in the case of most contagious diseases, it is the infected animal which transmits the infection.

Symptoms.—Not only are the face (including the lips, nose, chin, cheek, gums and roof of mouth) and pasterns attacked, but also less often the feet, penis and sheath, vulva, udder and teats in sheep, the tail stumps in docked lambs, and other parts of the body from cuts in shearing sheep. Different forms of the disease, therefore, are described according to the site.

(1) In the more common lip-and-leg ulceration, either the muzzle or fetlocks may be affected separately or both these parts may be attacked in the same animal. The disease may be active and malignant and fatal, or mild, chronic and without fatality.

Active Form.—In this, the lips swell twice or thrice their normal size. They are covered, first, with papules which develop into pustules, and these running together, become covered with scabs under which suppuration goes on. Feeding is interfered with. The disease may spread up the face to the eyes. There is, then, a thick muco-purulent nasal discharge, swelling of the nostrils, obstructed breathing, and conjunctivitis. Suppuration may be so extensive about the muzzle that a part of the lip and tip of the nose may slough away. In the destructive type of the disease, the long, beaded filamentous form of the bacillus is found. Erosions and red, fungoid, wart-like vegetations may occur on the gums and the roof of the mouth. Similar lesions to those on the lips may appear on the legs, about the coronet or joints, and in the fold of the fetlock. Lameness ensues. On removing the crusts or scabs, a red, granulating and suppurating surface is seen. The lesions on the legs may or may not co-exist with those on the lips.

(2) *Sore Mouth in Lambs.*—This is a milder and more chronic form of lip ulceration. It is not associated with leg ulceration, and rarely results in sloughing and destruction of the lip and nose. It occurs more often in lambs in the fall, but sometimes early in the season. The onset is sudden, with much swelling of the lips. At the margin of the skin and mucous membrane appear either warty patches or, in more severe cases, diffuse, fissured crusts on both lips and on the muzzle. Removal of the scabs exposes a raw, purplish, bleeding surface, or yellow-white, suppurating ulcers. Erosions, or soft, warty, fungoid elevations may form inside the mouth. Yellowish necrotic areas appear at the corners of the mouth and heal last. The lesions have an odor of Limburg cheese. Feeding is made difficult, and in some cases there is loss in weight. Usually the lesions heal under the scabs without the appearance of open ulcers. While the disease is not often fatal, yet the most malignant type of leg-and-lip ulceration may arise in sheep exposed to such cases.

(3) *Venereal Form.*—This may occur alone or associated with lip-and-leg disease. The sheath in bucks and wethers, and the penis in bucks are affected. On the sheath, in folds at the margin of skin and mucous membranes, appear yellow spots or ulcers. The ulcers spread until the whole skin surface of the sheath may be an ulcerating mass, angry and swollen. The penis is more rarely involved in bucks. It becomes ulcerated and swollen, and is known as “big pizzle.” Clap, syphilis and ulcerated sheath are also synonyms for the venereal form, which is at times very fatal. In ewes the perineum, region under the tail and margin of skin about the vulva may be the seat of the ulceration characteristic of this infection.

(4) *Foot Rot Form.*—Ulceration about the feet may occur with or without lip disease. It attacks all ages and both sexes in sheep. The cleft in the foot is first affected by ulceration, more often about the heel. The ulceration bores under the claw and a thin, disagreeable purulent discharge escapes from the fistulous opening under the horny tissue.

The mortality varies greatly in necrobacillosis. In favorable climate and on good feed, it may be nil. From 10 to 30 per cent. of loss has been reported among flocks in different outbreaks and in various localities.

Treatment.—This may be described under preventive and medical treatment.

Prevention includes segregation of newly bought animals for two weeks. It includes frequent and careful examination of healthy animals which have been exposed to the disease. It includes thorough disinfection of infected premises and utensils which have been contaminated by infection. The germs of the disease may live several years in the soil, and on infected material outside the body, providing the conditions are favorable. Freezing, however, will destroy the bacilli, so that infected pastures may be used after a winter with frost. The manure and soil must be

removed from the surface of infected corrals, and the soil then wet with a saturated solution of chlorinated lime. The walls, floors, racks and troughs of pens or sheds should be disinfected by a solution of 5 per cent. formalin, or crude carbolic acid, or sheep dip, by means of a force pump or with a brush. In case of an outbreak of the disease the healthy sheep should be transferred, if possible, to new pastures and bed grounds, and frequently examined for new cases.

The *medical* treatment of the disease, in its various forms, is the same:—Removal of crusts, scabs and necrotic tissue and the application of local antiseptics and stimulants.

In the milder type of the leg-and-lip ulceration, the scabs and necrotic tissue may be removed by a dull curette or sharpened piece of stick and the antiseptic recommended by the U. S. Agricultural Department applied. This consists of the following ointment:—

R	
Cresol	5 parts
Sulphur	10 parts
Adipis	100 parts
M.	
Sig. Apply externally 4 times weekly.	

In the more severe acute forms of leg-and-lip disease, and in chronic obstinate forms, stimulation of the diseased parts is desirable. For this purpose, the Agricultural Department states that a solution of nitric acid or zinc chloride (1 to 70) applied by means of a swab, carefully, to the ulcerated parts thrice weekly, after scraping off all crusts, scabs, and exuberant granulation tissue, is decidedly the best application. It should be followed by the use of the ointment noted above. Four or five weeks' treatment is usually sufficient to secure recovery in most cases. It is generally cheaper to kill the old and resistant cases than to continue hand treatment too long.

On the other hand, the treatment by dipping large numbers of diseased sheep is not nearly so effective as the hand treatment

described. Where this is done the animals may be driven through a five per cent. solution of cresol or other sheep dip in a shallow trough thrice weekly, so that the diseased parts will come in contact with the solution.

This treatment is particularly applicable to the leg and foot cases. The severe cases and those resistant to baths should receive hand treatment. The necrotic tissue must be curetted away and dead horn about the hoof removed and fistulous tracts drained.

In ulceration of the penis in bucks, the penis must be forced out of the sheath and the ulcerated areas stimulated by a careful application of the nitric acid or zinc chloride solution, and the whole surface swabbed with a one per cent. lysol, cresol, or creolin solution, or a 1-500 permanganate of potassium solution. This should be done daily. Extensive ulceration of the penis or inner surface of the sheath generally demands destruction of the patient.

Ulceration of the sheath is cared for by removal of wool and the application of the milder antiseptic washes thrice a week and occasional stimulation with the nitric acid or zinc chloride solutions. Vaginal and vulval lesions are treated the same as the sheath in the male.

In the case of the warty lips seen in this disease, especially in lambs, the application every other day of an ointment containing 5 per cent. of cresol or creolin, or 1 part of creosote in 50 parts of linseed oil, is very effectual. The use of antiseptics internally is said to be of benefit. Thus one tablespoonful of the creosote and linseed oil mixture twice a day to lambs, or a mixture of sulphur and salt, 1 to 12, may be fed to sheep. Ulcerating lesions in the mouth of lambs may be swabbed daily with saturated boric acid solution, or 2 per cent. potassium chlorate solution.

Before diseased sheep are returned to the pasture, after recovery, they should receive a complete dipping in one of the recognized and efficient sheep dips of cresol or coal tar.

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