PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE
(WOMEN'S INSTITUTES).

BULLETIN No. 37.

THE PRESERVATION OF FOOD.

—BY—

MISS ALICE RAVENHILL,
Fellow of the Royal Sanitary Institute, etc., etc.

PRINTED BY AUTHORITY OF
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DEPARTMENT OF AGRICULTURE,
VICTORIA, B.C., 26th February, 1912.

The Honourable Price Ellison,
Minister of Agriculture:

SIR,—I have the honour to submit herewith Bulletin No. 37, entitled "The Preservation of Food," prepared on behalf of the members of the Women's Institutes.

I have the honour to be,
Sir,
Your obedient servant,

WM. E. SCOTT,
Deputy Minister of Agriculture,
Superintendent of Institutes.

THE PRESERVATION OF FOOD.

WHOLESOME, suitable, and varied food is essential to efficient life. Imperfect nutrition from defective, not deficient, food is the unsuspected source of a large amount of ill-health, unhappiness, and crime.

DESIRE FOR FOOD A FUNDAMENTAL INSTINCT.

To desire and seek food is an instinct common to every type of life. The kind of nourishment necessary to maintain life in its countless forms is, of course, widely varied. The dietary of plants (gases from the atmosphere, salts from the soil, moisture from dew and rain) is obviously unsuited to insects, for instance, or fish. The ox is a strict vegetarian; the cat is an equally consistent consumer of animal food. With few exceptions, notably the domesticated pig and dog, the diet of all types of life other than human is monotonous; limited to a few kinds of food, of one class; in the absence of which the creature dies, being unable to adapt itself to any decided change in its food. On the other hand,

MANKIND THRIVES ON VARIED FORMS OF FOOD

and benefits by change of diet. Indeed, if human life is to be vigorous, efficient, and prolonged, a combination of animal, vegetable, and mineral foodstuffs is essential.

Efforts have been made by individuals, in the interests of convenience or economy, to limit their diet to bread or oatmeal over a given period, or otherwise to restrict their daily meals to one or two of the simplest forms in which food can be obtained—eggs, for instance; but the end has been invariably disaster. Appetite fails, energy suffers, illness, even death, results.

Some of the reasons why variety of food is so important to human health will be supplied in the bulletin on "Food and Diet." The point which now claims our attention is this: If a sufficient quantity of wholesome, suitable, and varied food is essential to well-being, upon what does the supply depend?

THREE FACTORS IN HEALTHFUL DIET.

Briefly, it depends upon three factors:—

(1.) Ability to produce, purchase, or otherwise procure the food material necessary:

(2.) Knowledge to guide the selection, preparation, and service of this material:

(3.) Intelligence to direct and control the amount and character of the food prepared.

At first sight factor (1) might be dismissed as dependent upon income only. A little consideration, however, will suffice to show that it underlies the whole question of food-preservation. Some kinds of food can be grown only in certain latitudes; as, for example, wheat and corn, which must be transported long distances to millions of consumers. Most fruits and vegetables can only ripen in certain climates, and unless preserved in season would even then be enjoyed over a very short period of each year; while to thousands their beneficial influences would be entirely denied.

Again, the population of the world is either closely concentrated in huge cities or widely scattered over districts often remote from markets. In either case people depend upon other sources than their own produce for a part at least of their food-supply.

Factor (2) calls for that knowledge which raises housekeeping to the rank of a profession. Training is necessary to understand why food which is wholesome in winter

may be unwholesome in summer. Sausages, for instance, are always suspicious when the weather is warm, owing to the favourable soil they provide for the multiplication of putrefactive bacteria ; whereas this risk is practically absent when there are several degrees of frost, as a low temperature impedes the growth of micro-organisms.

Again, instruction is needful to show why food which is suitable to the hard outdoor worker, such as pork, molasses and beans, is entirely unsuited to the city clerk, who passes his time in an overheated office ; for whose requirements a lunch of fruit and rice-milk, or a lightly cooked egg with bread and butter, would amply suffice.

Knowledge of the process of digestion is required before the evils of a monotonous diet are understood.

Food may in itself be nutritious, abundant, and well cooked ; yet the consumer will, sooner or later, lose all relish for his meals and fall a victim to dyspepsia in one of its myriad forms, unless there be variety of flavour and form.

SOME RESULTS OF MONOTONOUS FOOD.

The craving for a fillip to the palate is one dominant cause of drunkenness. An exaggerated consumption of pickles and sauces, of candies or of fruit, are frequent indications of this failure on the part of the cook to vary the character of her dishes. The craving for change has led even to the voluntary taking of nauseous drugs, which occurred so conspicuously at an industrial school for boys that an investigation as to the cause was undertaken. The unnatural taste was traced to the deadly monotony of the dietary, which was designed to fulfil all the needs of growing lads, except this important feature of judiciously varied flavour.

THIS VARIETY SHOULD BE SOUGHT

not in the use of artificial means, such as highly flavoured sauces, vinegar, or pickles, but by the employment of vegetables, herbs, small quantities of different spices, slight changes in the proportions of perhaps the same ingredients, or even in presenting the same dish baked one day, stewed or steamed another, and so on.

ASSOCIATION BETWEEN FLAVOUR AND DIGESTION.

Many housewives have noted the brightening eyes and smiles of pleasure associated with the appearance on their tables of an unfamiliar or a favourite dish ; but few cooks seem aware that the watering mouths and sniffs of satisfaction, excited by savoury odours from the kitchen, are so many aids to digestion and promoters of efficient work at home and at school.

SOME REASONS WHY MEALS ARE MONOTONOUS.

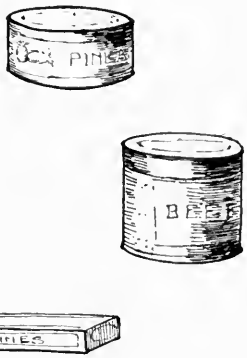
The thoughtful mother, permeated with the bracing spirit of Puritanism, dreads to foster greediness by a too frequent tickling of the family palate. The thoughtless housekeeper skimps her kitchen-work, from failure to realize its bearing on health and happiness. The tired woman shirks the extra trouble occasioned by consultation with her cookery-book before she plans the day's meals.

FOOD-PRESERVATION AN IMPORTANT FACTOR IN WHOLESOME VARIETY.

The country housewife has acquired the habit of preserving certain foodstuffs, plentiful at one season of the year, in order to make good inconvenient deficiencies at another—berries, for instance, or pork. The town housekeeper is tempted, in spite of herself, to introduce some variety into her bill of fare, owing to the produce of the whole world being displayed in most attractive forms before her eyes, at her favourite store.

Dried and canned foods maintain the health of dwellers in the Yukon, or of aretie or tropical explorers, and thus contribute to the world's progress. The lives of infants and invalids may hang upon this means of seeuring for them suitable nutrition under adverse conditions of climate, temperature, or disease.

(Fig. 1.)



Specimens of canned foods in common use.

Figs. (1), (2), (3), (4), (5), (6), (9), and (10) are reproduced, by kind permission of Messrs. Sidgwick & Jackson, London, from "Household Foes," by Alice Ravenhill.

Some form of preservation is necessary for foodstuffs, such as meat, vegetables, eggs, or fish, which constantly have to be transported long distances; half aeross the world, indeed, to meet the needs of some erowded community unable to supply its enormous demands locally. The food-supply of the capital city of our great Empire, with its seven million inhabitants, is drawn from all over the globe. To trace the sources of the ingredients in our own Christmas pudding will be found to constitute quite a fine exercise in geography!

AN IMPORTANT POINT IN FOOD-PRESERVATION.

Too much insistence cannot be laid upon this point in connection with the wholesome preservation of food. It must not be subjeeted to any treatment whieh may interfere in the slightest degree with the process of digestion or whieh will disguise the fact if decay has already set in. Preferably, too, the appearance of the food should not be affected, though this is of minor importance.

To discover how far these points are taken into consideration, it will be well briefly to review the

METHODS OF FOOD-PRESERVATION IN GENERAL USE.

These might be divided into two sections:—

(1.) Commercial methods of food-preservation, carried out on a large scale, of which the products are for sale:

(2.) Domestie methods, earried on in the home, for family use only.

But so many of the processes employed are common to factory and home, varying only in the quantities of food materials handled, that it is possible to pass the methods and their reasons in review without such distinction.

Before doing so, however, it is important to have a clear idea of

WHAT DECAY IS.

For the whole object of the preservation of food is to postpone what we eall *decay*. Those changes in food which alter its character and often affect its appearance, which

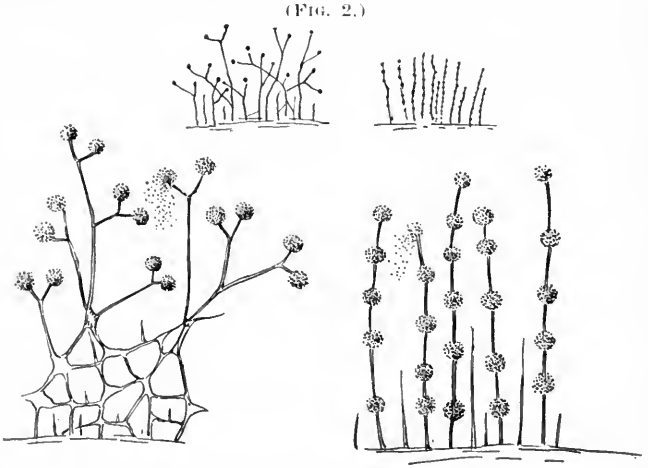
usually influence its flavour and always make it unwholesome, occasionally even poisonous, are all included under the general term *decay*.

Mouldy cheese, sour milk, tainted meat, strong butter, stale fish, decayed fruit, musty flour, bad eggs, and fermented jam have one and all suffered these changes, owing to the invasion of their substance by the invisible seeds of germs, yeasts, and moulds.

WHY DECAY SPREADS SO RAPIDLY.

These micro-organisms multiply with extraordinary rapidity when the conditions of food, of temperature, and of moisture are favourable to their growth. It is said that one micro-organism, in itself too minute to be detected apart from its fellows, even under a powerful microscope, might fill the ocean solid with its offspring in five days, were their development unchecked.

(FIG. 2.)



Specimens of moulds which attack food: life-size and also highly magnified to show mode of growth and method of seed-distribution.

When we bear in mind that each of these microscopic atoms of life can become responsible for seventeen million descendants in twenty-four hours, it is a cause for thankfulness that the delicacy of their organization and the fastidiousness of their tastes never permit the realization of these risks, or they would rapidly oust us from the world.

MICRO-ORGANISMS, GOOD AND BAD.

As a matter of fact, man can only continue to inhabit the earth because of the valuable assistance he receives from these very micro-organisms, who serve his interests faithfully as scavengers when they destroy and remove his refuse, or as labourers when they fertilize his fields and gardens, or as chemists when they heat his silo.

Vinegar, tobacco, linen, and cheese are but a few useful products which we owe to different families of these germs. But, like all good things, they must be kept in their right place, and that place is not in kitchen, larder, or store-room.

WHAT IS FERMENTATION?

Mention of one product of the micro-organisms of decay must not be omitted. Certain of these germs, while not actually themselves injurious to the food on which or within which they find a resting-place, yet render that food unwholesome by the results of their presence. Just as much as a number of people occupying a room for some time

render the atmosphere of that room unpleasant and unwholesome ; or just as much as a garment worn next the skin becomes dirty from the perspiration with which it is in contact, so these minute living things bring about changes in their surroundings by their active life.

The substances which bring about these changes are called *ferments*, and their results are called *fermentations*. If these fermentations occur in foodstuffs, their character and quality are so changed for the worse (with few exceptions) that they are quite unfit for human food.

It may be argued that wine and beer are both the products of fermentation, but that when taken in moderation they are wholesome drinks. In both these cases the process of fermentation is watched; it proceeds under carefully supervised conditions, and is checked at a definite point and moment.

Besides which there are countless varieties of these micro-organisms some of which cause fermentations useful to man, while others are dangerous to his health.

One property possessed by these ferments is the source of considerable trouble to the housewife, and that is their capacity for producing effects out of all proportion to the amount of ferment present. It is not the quantity of ferment produced in a joint of meat by these mischievous germs which taints the whole ; the widespread chemical changes, which render it unfit for food, may be brought about by a microscopic particle of the offending substance.

MOULDS AND YEASTS AS AGENTS OF DECAY.

Moulds also bear their part in causing food to be unpalatable, if not unwholesome , and yeast-plants grow freely in thin syrups, for instance ; hence the fermentation which sometimes takes place in carelessly bottled fruit.

Thus decay in any of its varied forms may actually render food poisonous ; it certainly makes it less wholesome ; it spoils its appearance ; and assuredly it leads to much waste of what should be good nutritious material.

(Fig. 3.)

A dirty practice, which conduces to the decay of food in households where it is permitted.

SUMMARY.

(1.) Decay is the work of living organisms or of the results of their active presence in food substances.

(2.) Necessary to their activity is suitable food, suitable temperature, and sufficient moisture.

(3.) These requirements are easily satisfied in food factory, market, shop, dairy, kitchen, larder, and store-room, unless constant and intelligent care and suitable precautions be exercised.

It is therefore evident that in

THE PREVENTION OF DECAY

is found the means for the preservation of food. Housekeeper and food-purveyor alike are confronted by the problem how to prevent the access to foodstuffs of these germs, yeasts, and moulds, of which decay is the product.

THE PRESERVATION OF FOOD.

Attempts to solve this problem have been made along the following lines :—

(*a.*) By so treating food that it becomes unfavourable to their growth and unsuitable to their nutrition :

(*b.*) By submitting food to conditions which will destroy these micro-organisms, if there is reason to believe they are present :

(*c.*) By protecting and sheltering food from their attacks.

(*a.*) Means by which Food is rendered unsuitable for and unpalatable to the Sources of Decay.

(1.) *Food can be smoked* (i.e., exposed for a longer or a shorter time to the vapour of burning wood or peat). The results of this treatment are threefold :—

(i.) The meat or fish becomes saturated with certain acid antiseptics, such as creosote, which are produced by the combustion of wood, peat, and coal. It is thereby rendered unpalatable to the germs of decay :

(ii.) The foodstuffs become too dry to supply the amount of moisture necessary to germ-growth :

(iii.) The smoke also destroys the micro-organisms, if present, though here

Two Cautions are necessary.

Exposure to smoke will not affect the poisonous products of these putrefactive germs if decay has already set in ; neither does it destroy parasites. Consequently, smoked but uncooked "measly" pork or meat otherwise unsound cannot be made fit for food by this treatment ; neither should the consumption of smoked but uncooked sausages ever be permitted. In Germany it is illegal.

(Fig. 4.)

How flies infect food with seeds of decay and also with the germs of disease ; consumption, for instance, or typhoid fever.

(2.) *Food can be dried by Exposure to Sun, Air, or Artificial Heat.*—This is probably the oldest of all methods of food-preservation, and is still in general use all over the world. Uncivilized man still dries his strips of meat or fish in the sun and wind ; civilized man more often relies upon this means of removing moisture to preserve

vegetables and fruits, such as hops, herbs, peaches, grapes (raisins and currants, for example), or the peel of oranges and lemons. The result is to render the substance of the food too dry to allow any form of life to exist upon its surface. It is to protect from moisture in the air that groceries are stored in tins and roots are buried in dry earth.

(3.) *Food can be immersed in Brine, Sugar, Vinegar, or Alcohol.*—A strong solution of salt has a twofold preservative effect. It extracts water from meat or fish, for instance, so that their flesh is unsuitable to germ-growth; and it also removes some of the nutrient constituents present in the food, leaving it unpalatable to micro-organisms.

Thick syrups and vinegar are also unfavourable to their development. Moulds *will* grow on the surface of both substances, but the delicate fibres are killed when in contact with an acid, neither can they push their way down into a dense substance, such as a thick syrup.

Alcohol hardens food immersed in it, by extracting the moisture, and at the same time renders them unpalatable to any form of decay.

(4.) *Foods can be preserved by being highly spiced or strongly flavoured with Herbs.*—It is believed that certain bitter principles, acids and oils, are present in spices and herbs, rendering the foods with which they are mixed unpalatable to micro-organisms. But, once again, a

Note of Warning

must be sounded. The pungent flavour of these favourite food-preservatives *may* be employed to mask the first stages of decay by unscrupulous tradesmen. Hence highly seasoned potted meats or sausages should be regarded with suspicion, unless their source and mode of preparation is known to the purchaser.

Drawbacks to each of these Methods of Food-preservation

are found in that they affect the flavour and, more important still, they affect in some degree the digestibility of the substances for the preservation of which they are employed.

The change of flavour is often pleasant; rarely, if ever, objectionable; neither is the second drawback really serious when preserved foods form only a part of the diet of adults in good health who are leading an active life. For children they should always be used sparingly, and ought to be well combined with fresh milk, vegetables, and eggs, as their nutritive properties are usually affected as well as their digestibility.

When, as in some climates, foods thus preserved necessarily constitute the sole source of supply, previous soaking in cold water and careful cooking minimize the risks to digestion, or other forms of ill-health, liable to result.

(5.) *Foods can be preserved by the Use of Chemicals.*—Different forms of borax, formalin or formaldehyde, salicylic acid, etc., all retard the decomposition of food. They are so easy of employment that, in the case of perishable articles, such as milk, cream, or sausage-meat, the temptation to use them is often irresistible. No external alteration in flavour or appearance draw attention to their addition to milk, for example; but, unfortunately, they seriously interfere with the process of digestion, cause much dyspepsia, and, in rare cases, loss of life.

Why Chemical Preservatives interfere with Digestion.

The putrefaction of food is due, as has been said, to a process of fermentation caused by the activities of the micro-organisms of decay. Strange as it may sound, digestion within the body is due to a corresponding process, far too technical and complicated to be entered into here. But the fact must not be overlooked that when such antiseptics as boracic acid or formalin are added to foods to prevent the

fermentation known as decay, they also, more or less, prevent digestion after the food is swallowed. Consequently their use should be everywhere illegal, as it is in the United States and, to a partial extent, in England.

The employment of chemicals for the preservation of milk is particularly undesirable, as it enters so largely into the diet of infants and invalids. It is not generally known that the natural souring of milk is its own form of protection against putrefaction, for the germs of decay cannot grow in acid—i.e., in soured milk.

Now, sour milk is not unwholesome, *except for young children and the sick.* But the changes which take place in milk when, by the addition of chemicals, the normal formation of lactic acid is prevented are a source of grave risk to the consumers, specially so to babies.

(6.) *The Preservation of Food by chilling it to a Temperature below 40° Fahr.*—Taking everything into consideration, therefore, this is quite the most satisfactory method of rendering it unsuitable to the attack of any form of putrefactive germ, always supposing that the process be carried on under good conditions of care and cleanliness. No change in flavour, digestibility, or appearance ensues, but the food must be consumed almost immediately after its removal from cold-storage, for a tendency to rapid putrefaction develops when such food is brought back into warm, damp air. This tendency is probably the result of the moisture which at once condenses on its surface; but, whatever the cause, decay quickly ensues, whether it be in meat, fish, fruit, milk, or vegetables.

The Effect of a Low Temperature on Food

is to prevent the development of the germs of putrefaction, or to arrest their activity if already developed. None of the organisms responsible for decay in food can develop at a temperature so low as 40° Fahr. or less. Once again, however,

Two Cautions must be given.

Cold, even zero cold, does not destroy the source of decay if present in food. The seeds of putrefaction remain merely quiescent, to quicken into active life when temperature, moisture, and nutrition are once more favourable to their growth.

The temperature of the domestic refrigerator is rarely low enough or steady enough to be reliable as a certain means of food-preservation. Neither are conditions of cleanliness and ventilation sufficiently understood by the ordinary housewife to allow food materials to be safely stored for more than a few hours.

For commercial purposes, and under skilled supervision, this method is rightly superseding all others for the preservation of foods, whether during transport or while awaiting distribution from market or store.

(*b.*) Means by which Food may be preserved by Exposure to Conditions which will destroy Micro-organisms if present.

Exposure to great heat, or sterilization, prolonged over a sufficient period, is the only means of food-preservation which comes under this head.

Moulds are usually destroyed by any temperature above 150° Fahr., but nothing less than boiling-point (212° Fahr.) can be relied on to destroy germs; and even higher temperatures, which cannot be secured in our kitchens, are necessary to kill the seeds from which these germs grow.

Two Great Drawbacks to Sterilization

exist as a domestic method of food-preservation:—

(i.) All foods are bad conductors of heat, so that the deeper parts of a joint of meat, for instance, never reach a high enough temperature to ensure their protection from putrefaction:

(ii.) The very high temperatures really necessary to destroy the seeds of germs, as well as the germs themselves, can only be secured by apparatus not as yet available for home use; consequently, a false security may be enjoyed if boiling only be accepted as sufficient protection to our food.

Protection of Water by Boiling.

"What, then," you will ask, "about the protection of water by boiling?" In this case the difficulty can be overcome to a great degree, because, in the first place, every drop of water can be raised to boiling-point, given sufficient time. We know that the germs of disease which are conveyed to us by water are killed if boiled for at least half an hour. Therefore, where water is suspicious, the day's supply for drinking purposes can be boiled for that length of time.

"But how about the seeds of these germs," you will inquire; "should not they also be destroyed?" This further protection can be extended to water by allowing it to cool and stand for some hours and then boiling it for a second half-hour. In the interval the seeds of any germs, if present, will develop into germs, in which form a temperature of 212° Fahr. means death to them.

It is believed that the germs of disease most often carried by milk—namely, those of tuberculosis—are completely destroyed by a temperature rather below boiling-point; but, unfortunately, milk appears to suffer some change when cooked for the necessary time, which renders it less wholesome for children.

A Necessary Precaution for Boiled Milk and Water.

Please note the importance of covering all water or milk which has been boiled.

It must be understood that the whole universe swarms with micro-organisms, some of which are floating in the air, from which they fall upon our persons, our property, and our food. Happily, most of these invisible millions are our good friends, and not the least of their very valuable services is to protect our bodies and all forms of food against the invasion of disease and putrefaction.

(Fig. 5.)

Food-preservation by means of a layer of fat.

Sometimes these benign and kindly germs are overpowered by the invaders. If this occur in our bodies, we are sick; if it occur in our food, decay sets in. Now, the misfortune is that when milk or water is boiled, we kill our friends as well as our foes among these germs. Therefore, if the undesirable germs, occasionally present in the air, in dust, or in dirt, fall upon the surface of this defenceless milk or water, they can carry on their mischievous activity unchecked. Sterilized food is defenceless food; therefore it must be sheltered by covering of a suitable kind.

A slip of glass is to be preferred for this purpose. It fits closely to the rim of the jug or bowl, and shows every spot of dirt or greasy finger-mark. A cloth, however clean it looks, may have been exposed to much dirt or handled by many grimy fingers before it is used to cover a jug of boiled water or a bowl of boiled milk.

Exposure to High Temperature.

Exposure to a high temperature over a prolonged period alters in some way the character of the food so treated. While protecting it in one direction, the heat seems

to interfere in another with its nutritive properties. The food seem less digestible and its "livingness" seem in some way destroyed. The reasons for these subtle changes have not yet been clearly traced; that they occur is unquestionable.

We must now pass on to a review of the methods employed.

(*c.*) Keep Food protected from the Attacks of Germs, Yeasts, and Moulds.

Of these there are several, most of them being quite familar to us.

(1.) *The Exclusion of Air.*—As air is necessary to the life of most of these micro-organisms, they cannot develop in or attack food from which all air is excluded.

A favourite domestic application of this method of food-preservation is to cover the surface of potted meat or fish, for example, with a layer of lard or other fat, which is impervious to air. Oil or paraffin-wax serve the same purpose.

Commercially, oil is also employed to preserve fish, such as sardines, herrings, or anchovies; and in Italy a few drops of oil seal the necks of wine-flasks, instead of corks.

The exclusion of air is, of course, one secret of success in jam-making or preserving fruit or vegetables, combined with a very high temperature, which destroys micro-organisms if present. We all know that if a jar is not brimful of boiling fruit and syrup, so that even the tiniest space is left for air to occupy, decay invariably follows, usually in the form of moulds.

The enormous quantity of

Canned Foods

on the market illustrates the wide utilization of this method of food-preservation by air-exclusion, combined with previous sterilization. Ill-effects rarely follow its consumption; nevertheless, every one who uses canned foods should never omit to practise the following precaution:—

(*a.*) Always turn out the contents of any tin into a glass, china, or earthenware dish immediately the tin is opened. This precaution is quite as necessary in the case of fish preserved in oil, though it is usually neglected.

This precaution is necessary, because the exact extent to which the natural acids of food corrode the inner surface of tins is not yet known; but injurious metallic salts are occasionally found, and such chemical action is more liable to occur when the tin is opened and the contents become exposed to the external air than when it is hermetically sealed. For this reason food should, when possible, be always preserved in glass or china vessels.

(Fig. 6.)

Where germs flourish and flies breed.

(*b.*) Form the habit of examining each tin before opening it, as to the soundness of its contents:—

(i.) *By the Eye.* Slight inward bulging, or concavities, of the surface are a good sign. Outward bulgings, or convexities, are a danger-signal, and show that the gases of putrefaction have formed:

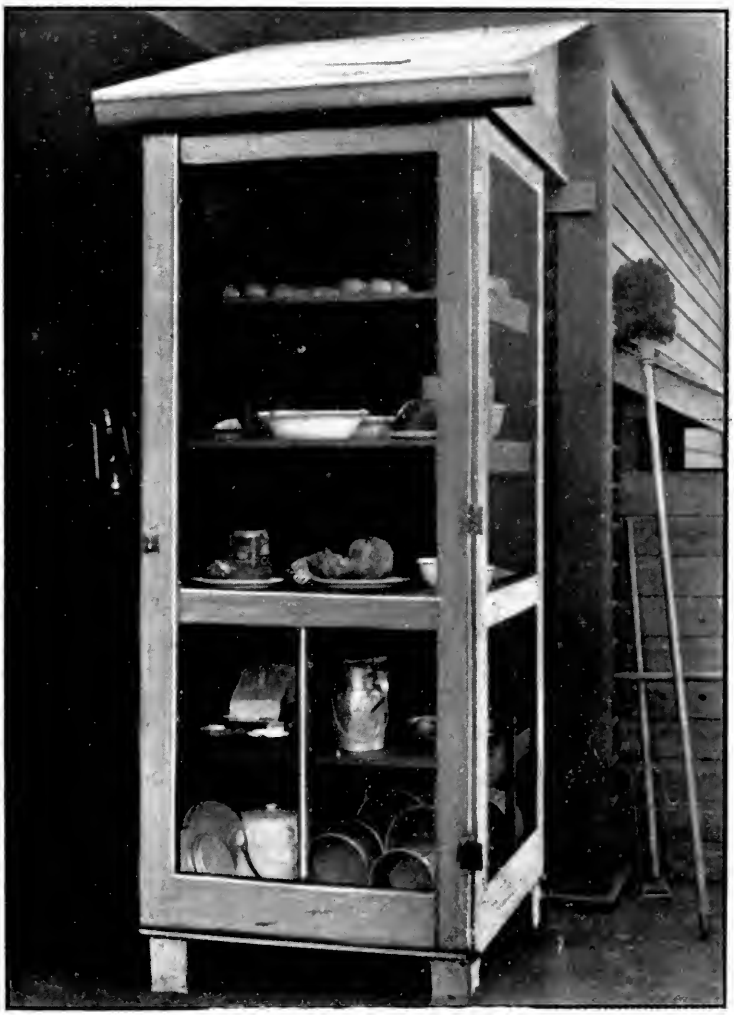
(ii.) *By the Ear.* Tap the tin with a pencil or the finger-nails. A high ringing sound is what should result. A dull, dead sound is a warning that all is not well within.

If the process of sterilization were incomplete or if the tin were insecurely sealed, sooner or later the process of decay begins; and the effect is to give rise to these external signs and sounds. The contents of such tins are unfit for human food.

(2.) *The Preservation of Food by Suitable Storage.*—The requirements for this method of protection should be now known to the reader. Food must be kept—

(*a.*) Dry;
(*b.*) Cool;
(*c.*) Clean;
(*d.*) Protected from the access of decay.

(FIG. 7.)



A good form of domestic larder.

How does the ordinary housekeeper provide for these requirements?

No room is ever entirely free from the presence of moulds, yeasts, and bacteria, though in cleanliness, pure air, and abundant light we possess three powerful agents for their control.

Never forget that darkness, damp, and dirt favour their growth and foster their increase.

Cellars and dark, ill-ventilated cupboards are not fit places for food-storage.

A Good Larder.

To be trustworthy, a good larder must be so light that every corner and crevice can be kept clean. It must have a through draught of air, so that moulds and germs shall be carried through it on a current of air. If the air in a larder be still, any micro-organisms it contains will gradually sink on to the contents of the shelves and breed decay. The shelves and walls should be made of or covered with some impervious materials, so that if grease or milk or syrup be spilt, they can be completely washed off and leave no residue to afford food for the seeds of decay.

It must be dry, or food will taint and mould in spite of all care. Fig. (7) illustrates a home-made effort to secure all these requirements at moderate cost. This larder is made of four mosquito-proof doors. Inside, where each door joins another, mouldings are fixed, so that no insect can force its way in from without.

(Fig. 8.)

Reproduced from "Saving Steps" Bulletin issued by Cornell University, U.S.A.

The woodwork and shelves have had two coats of Solignum (an excellent wood-preservative, so pungent that it banishes insect life and also makes the surfaces impervious). This can be renewed every few months.

This larder stands on a north verandah, in a position which allows a free circulation of air all round it ; where also ample light reveals dust, grease spots or stains.

Daily and Seasonal Care of the Larder.

Daily in summer, at longer intervals in winter, the shelves should be wiped over with a strong solution of formalin (one tablespoonful of formalin to six of water). This is not only a good disinfectant but a destroyer of insects.

In cold weather it is advisable to minimize the inconvenience of frozen food by surrounding the larder at night, or all day in snowy weather, with a washable curtain of burlap or heavy sheeting.

A Useful Supplementary Larder

for winter use is shown in Fig. (8), which is in general use in the United States. The box should exactly fit outside a north window, and should come half-way up the lower sash. It should be about 18 inches deep and fitted with a shelf. When the window is opened the contents of the box are easily accessible ; and in cold weather the sash may remain raised, in order that the warm air from the room may keep the food from freezing. Of course, its contents must be protected from the dust of the room by a muslin curtain, and the inside of the box should be well treated with Solignum or creosote ; or the box may be lined with white oileloth.

Legal Powers

to insist upon suitable accommodation for the domestic storage of food are exercised in England by the London County Council and other large municipalities. The owner who occupies or lets on hire any house, rooms, or lodgings without such provision is liable to a penalty of $10, and a fine of $5 a day, until he obeys the Council's order to supply a "sufficient and suitable" larder for each occupant from whom he receives rent.

Cellar-storage of Food

is only allowable under the following conditions : The cellar must be perfectly dry. The walls and floor should be laid in concrete or, better still, in cement, to keep out moisture. This allows them to be washed at intervals and kalsomined twice a year.

A cellar used for food-storage must be well ventilated and light. Therefore there must not only be windows, but they must be kept clean and made to open. It is also a good plan to have small openings in the walls, well distributed, and covered with mosquito-netting. Through currents of air will thus be ensured.

During the winter, when roots and potatoes need storing in the dark, a curtain can be hung over one or more windows, and periodically removed for sweeping.

A cellar so constructed and kept is serviceable during the heat of summer for storing fresh provisions, always supposing that strict cleanliness be practised.

THE PRESERVATION OF GROCERIES, FRUIT, VEGETABLES, ETC., IN THE HOME.

It will now be realized how sound are the methods in common use by the well-trained housewife for protecting foodstuffs from the attacks of micro-organisms, though often she may have been unable to give a reason for what she does.

Potatoes and root vegetables remain plump and fresh when kept dry and sheltered from the attack of moulds, etc., by a covering of dry earth.

Cranberries are correspondingly protected by the water in which they are immersed.

Eggs can only become "bad," when stored beneath the surface of a 10-per-cent. solution of water-glass, from the activity of micro-organisms already within their shells before preservation.

The object of storing crackers and cakes in tightly closed tins is, of course, the exclusion of moisture. Similarly, sugar, tea, and other groceries are kept in tin-lined or earthenware utensils.

Hams, bacon, or smoked meats or fish should be put into cheese-cloth or linen bags before being hung in a dry, well-ventilated place.

Apples, lemons, tomatoes, and similar fruits should be wrapped separately in soft paper after wiping, and stored on airy shelves, which may be covered with straw or chaff or sawdust.

The reason for this care, which to some may seem superfluous, lies in the channels by which the germs of decay or the seeds of moulds reach the foodstuffs they destroy.

The two channels of primary importance, and those only to which reference can here be made, are:—

(*a.*) The air.
(*b.*) Flies.

(*a.*) The Air.

It has already been pointed out that these mischievous atoms of microscopic life, the organisms of decay, are always present in the atmosphere, with the exception of mid-ocean and the summits of very high mountains.

When the air travels fast, they are rushed along in its currents; but so soon as it is still the micro-organisms, with the dust of which they form an ingredient, gradually drop down on to the surrounding surfaces.

If these be moist and the air be warm, the chances are the seeds of decay will begin to grow. They will certainly do so if the substance on which they settle is one on which they can feed.

Now, invisible moisture collects in the "pits" round the eyes or stems of fruit such as apples, pears, or tomatoes; or in any dent in their skins, or in the crevice where two fruit rub shoulders.

Porous Paper as a Fruit-preservative.

Soft porous paper wrappings serve a double purpose. They absorb moisture from the air before it reaches the fruit at all, and by covering the fruit they prevent germs or moulds from falling on to its surface.

(*b.*) Flies.

In conclusion, a few words must be said about the great importance of the protection of food from flies, which are known to be a fruitful source of disease in food as well as a channel by which the sources of decay menace its soundness and sweetness.

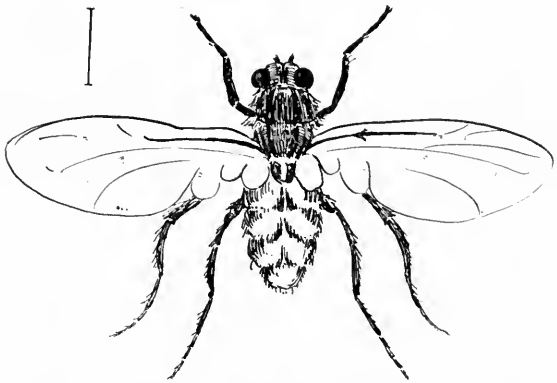
"Fly-spots" consist of the saliva and excrement of flies, as they pass impartially from cow-dung or night-soil to the baby's milk or the family sugar or cake. It is not, therefore, surprising that the fly is now shunned as one of the chief carriers, not only of dirt and decay, but of the infection of typhoid fever, tuberculosis, and other dangerous diseases.

The Structure of a Fly and its Habits

adapt it peculiarly for the conveyance of filth, in addition to the micro-organisms which swarm these "fly-spots." The six, many-jointed legs are densely hairy, and each leg terminates in a pair of hooks, with a "glue-pad" attached to each hook. A glance at Fig. (10) will make clear the enormous power possessed by a fly for carrying filth from the unclean to the clean.

Flies breed in house-refuse, manure, or any decaying matter. They increase with such rapidity that, assuming one-half of one fly's output of eggs to hatch out, live, and raise families of their own, the number of flies from this single source would be 216,000 in thirty days, and in forty days it could amount to over 2,000,000.

(Fig. 9.)



The House-fly, with larva and pupa; all highly magnified.

Larva.
This stage lasts about six days.

Pupa.
This stage lasts about three days.

If a house is infested with flies, the source of the trouble is usually near at hand; for generally they do not fly a greater distance than 200 yards from their breeding-places, though a high wind may carry them much farther.

Coal-oil they abhor. It is wise, therefore, to wash over windows and round the frames with coal-oil at intervals during the summer, and a good dressing of turpentine round every crevice of the windows in the early spring will often destroy flies which have spent their winter in these haunts.

It is worth while, also, to wipe over the network of the larder daily in summer with coal-oil; and saucers containing one spoonful of formalin to six of water should be placed about wherever flies are seen to congregate. They are attracted to the fluid and killed.

Most important of all, no heap of garbage, no refuse of food, no filth, should be allowed to accumulate. Burn in the stove all that the pigs cannot eat ; and any necessary rubbish-heap which cannot be otherwise disposed of during the period when burning

(Fig. 10.)

The leg, claw, and glue-pads of a fly, highly magnified.

is illegal, cover it, after each addition of refuse, with a thin layer of earth ; which simple precaution will prevent it from becoming a flies' nursery. If coal-oil is poured over the earth, it will act the more efficaciously.

CONCLUSION.

Unfortunately, space does not permit the risks to food to be dealt with which are incidental to careless and dirty methods of handling in transport or while under display in market or store.

The subject of food-preservation is, indeed, a vast one, calling for much more detail than can be adequately included in one bulletin. It is, however, to be hoped that the reasons given for well-established customs, the suggestions made on points liable to be overlooked by the busy housewife, the hints offered on unsuspected dangers, may add interest to the work of some women, stimulate others to increased exercise of the "eternal vigilance" often a burden to the unintelligent worker, incite all to a desire for fuller knowledge, and thus promote the welfare of many households.

NOTICE.

The Department of Agriculture is issuing the following series of bulletins prepared by Miss Alice Ravenhill, Shawnigan Lake, B.C., to be available for distribution among the members of the Women's Institutes throughout the Province:—

1. The Place and Purpose of Family Life.
2. The Preparation of Food.
3. The Preservation of Food.
4. Some Labour-saving Devices in the Home.
5. Food and Diet.
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Applications for bulletins published by the Department of Agriculture should be addressed to the Secretary, Department of Agriculture, B.C.

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