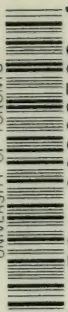


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Dr. T. W. Wade's report

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ON
PUBLIC HEALTH AND
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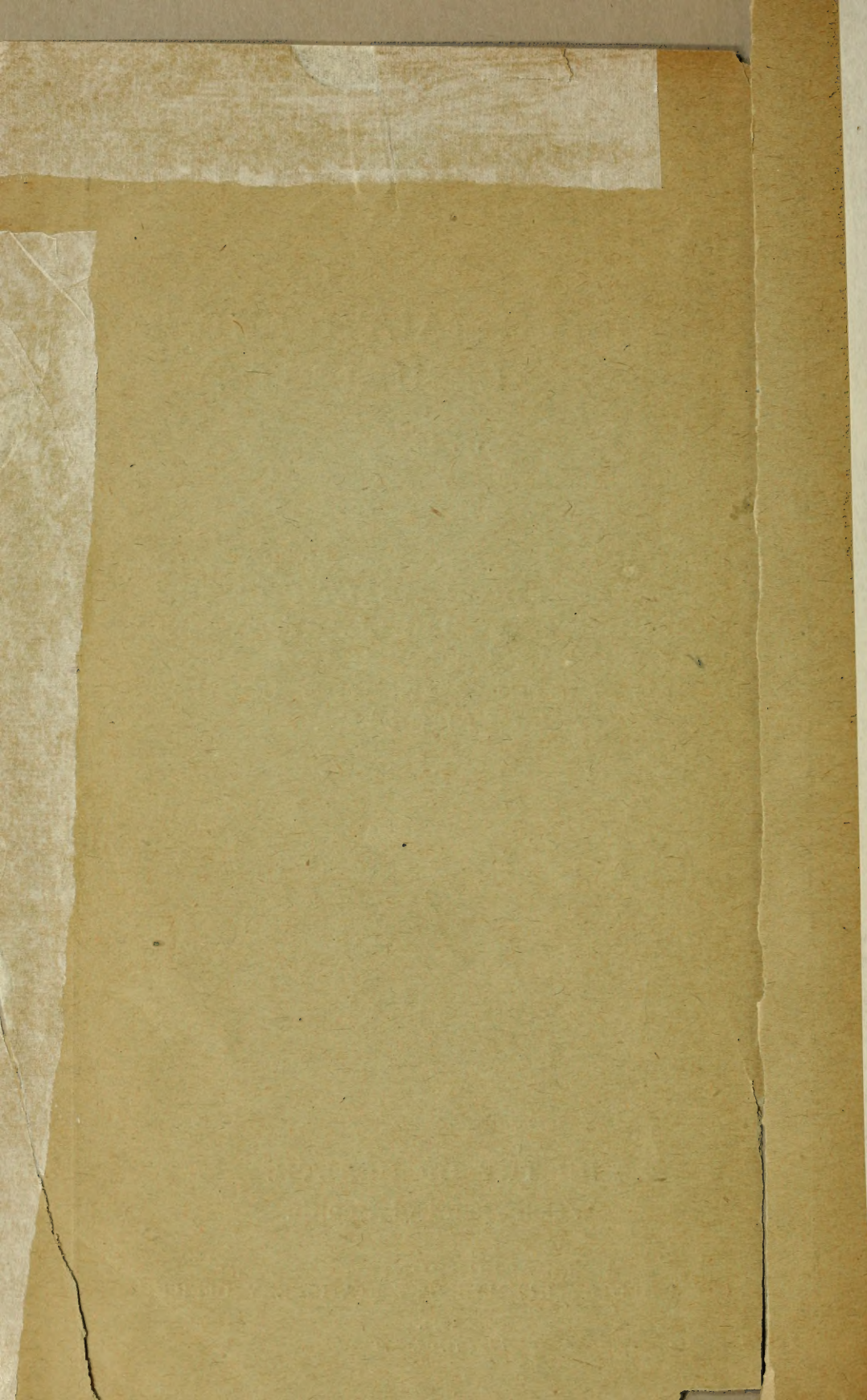


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REPORT ON DYSENTERY AT OGMORE VALE.

To the Right Hon. Sir ALFRED MOND, Bart., M.P.,
Minister of Health.

SIR,

I beg to present the following report by Dr. T. W. Wade, one of the Medical Officers of the Welsh Board of Health, on an extensive outbreak of bacillary dysentery which occurred in the Ogmore and Garw Urban District of Glamorgan. The findings of the report have the concurrence of Dr. Llewelyn-Williams, the medical member of the Welsh Board of Health, through whom the report has been submitted.

The character and course of the epidemic are carefully described by Dr. Wade. It is estimated that in the village of Ogmore Vale alone some 1,100 persons suffered from the disease, the symptoms of which were those of mild dysentery. Fortunately the mortality was low. Bacteriological investigation showed that the causative organism was the *Bacillus Dysentericus* of Flexner (Strain W). Careful search for the origin of the outbreak revealed the fact that it was coincident with an interruption of the water supply to the western part of Ogmore Vale, and the admission to the main of water from a mountain stream which was liable to serious surface contamination. The early cases occurred in the immediate vicinity of the intake from this stream. This coincidence, together with the explosive character of the outbreak, the fact that it affected all classes and ages of the population, and the significant observation that a group of houses in this area which were supplied from a private source escaped, forced Dr. Wade to the conclusion that the water was the medium of infection. In the subsequent development of the epidemic other factors no doubt came into play.

Dr. Llewelyn-Williams makes the interesting suggestion that the infection may have been derived from some of the demobilised soldiers of the 38th Welsh Division. Bacillary dysentery was known to be prevalent in areas occupied by this Division, and it is possible that some of the men of this Division acted as "carriers."

This report emphasises the lesson of the recent Bolton-upon-Dearne outbreak, reported to the Minister of Health early in the present year, namely, that the provision and maintenance of a pure water supply is a primary essential to the good health of a community, and that neglect of this fundamental truth may readily lead to serious consequences.

I am, Sir,

Your obedient Servant,

GEORGE NEWMAN.

WHITEHALL,

October, 1922.

REPORT ON DYSENTERY IN OGMORE VILLE

TO THE CHIEF MEDICAL OFFICER
OF THE MINISTRY OF HEALTH.

SIR,

I HAVE the honour to present a Report on a large outbreak of bacillary dysentery in the Ogmore and Garw Urban District by Dr. T. W. Wade, one of the Medical Officers of the Welsh Board of Health. I agree with the findings of the Report, which are based upon a careful and exhaustive inquiry.

It is a well-known fact that a very large number of men from this district served in the 38th Welsh Division, which was engaged on the Western Front from 1915 until its demobilisation in 1919. Bacillary dysentery was known to be prevalent in areas occupied by this Division. Therefore the possibility that some of these men who returned to the district may have been "carriers" should be borne in mind.

D. LLEWELYN-WILLIAMS.

Medical Member of the Welsh Board of Health.

Cardiff,

August, 1922.

REPORT

ON A

DYSENTERY EPIDEMIC AT OGMORE VALE IN 1921.

In consequence of a telephonic communication on May 23rd from Dr. Murphy, the Medical Officer of Health of Ogmore and Garw Urban District, of an outbreak of enteritis at Ogmore Vale, I visited the district on the 24th and 25th of May and on subsequent dates to investigate the cause of the epidemic.

The first intimation of the epidemic was from Dr. Anderson, of Ogmore Vale, on May 18th. He reported that there was a serious prevalence of diarrhoea accompanied by pyrexia, tenesmus and the evacuation of blood-stained and slimy stools among the children of the Wyndham District of Ogmore Vale. Dr. Murphy had immediately visited the locality to make inquiries and had found that in addition to young children there was a considerable proportion of older children and adults among the sufferers; that in many instances several members of the same family had been attacked simultaneously and that in the early stages of the epidemic the disease was limited to the western side of the village but had missed Gorwyl Road, Spion Kop, Ardwyn Place, and the eastern side of Llewelyn Street, which are streets that obtain their water supply from a private source.

From the evidence at his disposal Dr. Murphy estimated the number of cases that had occurred as about 700 and, from their distribution along a particular water main, he suspected the infection was water-borne.

GENERAL DESCRIPTION OF THE OGMORE AND GARW DISTRICT.

The urban district of Ogmore and Garw is situated in the South Wales coalfield in the central portion of the County of Glamorgan.

In brief, it consists of three narrow and parallel valleys running directly north and south and separated by flat-topped hills high enough to prevent much lateral intercommunication. Of these three valleys, the Valley of the Ogwr Fawr is the middle one and its only outlet is at its southern extremity.

THE VALLEY OF THE OGMORE VALLEY.

At the upper end of this valley is the colliery village of Nant-y-moel (population 5,425). Immediately south is Ogmore Vale (population 6,900). About a mile below that is the small village of Lewistown and then that of Blackmill, the last being about five miles from Nant-y-moel.

The valley is deep and narrow, with good gradient from north to south and consequently good fall for drainage purposes and the distribution of water by gravitation. From end to end the bottom of the valley is traversed by a river, a railway and a main road. The general standard of housing in this valley is good. The great majority of the houses have been built within the last 25 years.

The vital statistics for the area for 1915-20 do not compare unfavourably with those ruling in England and Wales as a whole. There was a large increase in the number of infant deaths in 1920 as compared with the previous year, but of the 103 infant deaths recorded only five were accounted for by diarrhœal diseases.

PREVALENCE OF DIARRHŒA IN THE OGMORE AND GARW DISTRICT DURING RECENT TIMES.

The Medical Officer of Health of the district informed me that diarrhœa had not been very prevalent during the last few years. In 1919 eight deaths were registered as caused by diarrhœal diseases, all in children under 12 months of age, and in 1920 the number was five. In 1921, up to the beginning of May, there had been two such deaths reported; both were infants—the one death occurred in January, the other in February. Apart from these cases very few cases of diarrhœa had come under the notice of Dr. Murphy or his health visitors.

PREVALENCE OF ENTERIC FEVER.

In 1919 there were three cases of enteric fever in the Ogmore district, in 1920 there was one. In 1921, up to the outbreak of the disease under consideration, four cases of enteric fever had occurred, one in January, one in February, and two in April.

DATE OF ONSET OF EPIDEMIC.

From inquiries made of the local medical practitioners it is clear that no cases of acute dysentery had occurred in their practices previous to May (their first visits to any such cases were made on May 12th), and that in the months preceding May there had been fewer cases of diarrhœal diseases than usual. Four cases of typhoid had occurred early in the year, the last two in April in a house on the eastern side of Ogmore Vale. Clinically, these cases were undoubtedly typhoid in the opinion

of both the practitioners in attendance, and the hospital superintendent, although Widal reactions gave negative results. There may have been some cases of dysentery previous to May that did not seek medical aid, but it is extremely unlikely that these could have been many or could have been seriously affected, for practically every family in Ogmores Vale had made arrangements for medical attendance. No such cases were discovered during the investigation.

Three cases of chronic dysentery in discharged soldiers were known in the district; these cases will be referred to later.

Of the cases that received medical attention, the date of onset was given as May 10th in three instances, though none of these were definite cases of dysentery and the date was doubtful—one of these cases was a child of six months who frequently suffered from diarrhoea. Of the first definite cases attended by the local medical practitioners the number occurring on each day during May is given in the following table:—

Date of onset.	Number attacked.	Date of onset.	Number attacked.
May 11th	5	May 22nd	9
„ 12th	29	„ 23rd	12
„ 13th	78	„ 24th	8
„ 14th	32	„ 25th	2
„ 15th	24	„ 26th	5
„ 16th	20	„ 27th	4
„ 17th	20	„ 28th	4
„ 18th	14	„ 29th	2
„ 19th	20	„ 30th	1
„ 20th	9	„ 31st	1
„ 21st	10		

From this table it would appear that the epidemic began suddenly with explosive intensity on or about May 11th. The majority of the cases occurred between May 11th and May 19th, the date of maximum intensity being May 13th.

The 312 cases attended by the local medical practitioners in May were distributed in 148 houses; the following table shows the age distribution of the population of these houses, together with the incidence of the disease upon each age period:—

Age.	No. of Occupants.	No. of Cases.	Incidence per cent.
0—1	32	16	50
1—2	33	28	84·8
2—5	78	48	61·5
5—10	140	61	43·5
10—15	148	47	31
15—25	133	40	30
25—65	380	71	18·7
65—Over	3	1	33·3
All ages	947	312	32·9

From this table it will be seen that persons of all ages were affected—the youngest case was an infant of two months, the oldest a woman of 84 years—but by far the greatest incidence was on young children, the incidence on each succeeding age period being progressively lower.

During the first stage of the epidemic (the month of May), the incidence was somewhat higher upon females than males. In children under school age, girls were more affected than boys; in children of school age, boys more than girls, and in the working age periods of life the incidence was heavier upon women and girls than upon men and boys.

In the age period of working life (15 years and upwards), part of the higher incidence upon females may be explained by the greater risks of infection which the women folk incurred in nursing their sick, but inasmuch as this higher incidence is evident from the beginning of the outbreak there must be some other explanation. In the age period 5–10 years, the greater proportion of boys attacked than girls is not explained by any special incidence of the disease upon a particular class at school or upon any junior boys organisation.

DISTRIBUTION OF INVADED HOUSES.

At the commencement of the epidemic the cases were confined to Ogmore Vale, and no case was known to have occurred in any of the neighbouring villages or adjoining valleys. The first notifications received from Lewistown and Nant-y-moel were on June 1st, and in both instances infection was directly traced to cases at Ogmore Vale.

The village of Ogmore Vale consists of a series of streets placed along the bottom of the valley, on both sides of the river. In length the village extends for a distance of a mile and a half, in breadth at no point does it exceed 400 yards.

About half-way along its length the western and eastern sides are linked together through Commercial Street. North of Commercial Street the village extends only along the western side of the river and but a few houses exist upon the eastern side. South of Commercial Street the streets are built on both sides of the valley and the river is bridged at three points so that there is free intercommunication of the people of the western and eastern sides.

In the early explosive stage of the outbreak practically all the houses invaded were situated upon the western side of Ogmore Vale within the area supplied with water by the "Western Main." Houses on the western side not connected with this main largely escaped invasion; thus the Gorwyl group of 42 houses placed in the centre of the infected district but supplied with water from a private source was not invaded until the epidemic was well established in the surrounding houses.

WATER SUPPLY OF NANT-Y-MOEL AND OGMORE VALE.

The public supply is provided by the Mid Glamorgan Water Board which was constituted on January 1st, 1921, and took over the water undertakings of certain local authorities as well as those of the Ogmor and Garw Water Company.

QUANTITY AND QUALITY OF WATER.

The quantity of water available is said to be sufficient for the needs of the district except in very dry summers, when shortage is felt in the houses situated upon the upper levels of the area supplied. During the present year, such shortage had occurred, and the water inspector of the district stated that the volume of water in May was lower than he had known it for the last 20 years; this observation first presented itself to him about May 10th. Chemical and bacteriological examinations of the water are made twice a year, usually in the summer and autumn. The results of the chemical examinations have always been good, showing it to be a soft neutral water free from evidence of sewage or animal contamination. Bacteriologically, the samples have varied from time to time. In the last five years, out of 19 specimens examined, no B. Coli have been found in less than 10 c.c.'s. of the water except on three occasions when a dry period has been followed by heavy rain. One such occasion was in 1918 when B. Coli were found in 0.1 c.c. of the sample, the other occasions in 1921 when B. Coli (Flaginac) were found in 2 c.c.'s. of the samples examined. These results indicate the need for efficient filtration of the supply; it may, however, be said that throughout the course of the epidemic there was no reason to suspect that the Nant-y-moel water was concerned in the spread of the disease.

In the valley of the Ogwr Fawr one system of water mains supplies the villages of Nant-y-moel and Ogmor Vale, while Lewistown and Blackmill are supplied from other sources. All the houses in Nant-y-moel and Ogmor Vale are connected with the public supply except the farms, which have their own wells or springs, and a small group of houses situated in the mid portion of the western side of Ogmor Vale which are supplied from a private source known as the Gorwyl Supply. This group of houses consists of Gorwyl House, the Gwalia Stores, in Commercial Street, six houses in Spion Kop, 20 houses in Gorwyl Road, three houses in Ardwyn Place, and 13 houses on one side of Llewelyn Street.

Sources of Public Supply.—The sources of public supply are two in number; they are situated in the hills north of Nant-y-moel, where the land is uncultivated and there are no farms or habitations. Apart from sheep and birds, the only animal contamination of the catchment areas that could occur would come from the occasional passers-by who use the mountain footpaths. The

two sources of supply are estimated to yield 450,000 gallons per day. During the dry period their estimated yield was 325,596 gallons per day. The sources are—

I. In the Sugar Loaf Hill, north of Nant-y-moel, arise a series of springs from the Pennant Grit and a number of streams which form the source of the River Ogwr Fawr. Water from these springs and from the river near its origin is piped to filter beds (800 feet above O.D.), situated about 300 yards north of Nant-y-moel Farm.

II. In Cwm Nant-y-moel, which lies north-west of Nant-y-moel village, runs a mountain stream from which a 6-inch steel pipe conveys water to the filter beds already referred to in the previous paragraph. Before this pipe reaches the filter beds it gives off a 3-inch branch main which passes across the valley below the level of the filter beds to supply the houses on the higher levels of the eastern side of Nant-y-moel.

Filter Beds.—The water which arrives at the filter beds consists of spring water and upland surface water—it passes direct to the filter beds which are three in number and are worked concurrently. Each bed is approximately 21 ft. by 21 ft. in area and 12 ft. in depth. The filtering medium consists of a lower stratum of gravel 2 ft. deep, a middle stratum of coarse sand 2 inches deep and a top layer of fine sand 4 inches deep.

At the bottom of the filter beds is arranged a series of perforated pipes through which the filtered water passes to a clean water tank of small capacity.

No records have ever been kept of the volume of water reaching the filter beds, nor can the rate of filtration be regulated in any way. The water passes direct from source to filter beds and the whole arrangement for filtration is primitive and unsatisfactory. No storage reservoirs exist.

Distribution of Water Mains.—In following the description of the distribution of the water mains, reference should be made to the 25-inch ordinance maps of the district (Glamorgan, Sheets XXVI., 8, 12 and 16, Edition 1918).

The water leaves the clean water tank by an 8-inch cast iron main, which, at a point 80 yards below the filter beds, divides into two, a 5-inch main which runs along the western side of the valley and a 6-inch main which runs along the eastern side.

The circuit is completed $1\frac{3}{4}$ miles lower down the valley by a 4-inch cross main which runs from the eastern main to the western main through Commercial Street, Ogmores Vale. Below the cross main both eastern and western mains are continued down the valley along their respective sides; ultimately, however, the eastern main crosses to the western side of the river but does not again communicate with the western main, and both terminate at the southern end of Ogmores Vale.

The accompanying diagram (see Appendix III.) illustrates this system of water mains; the line B.F.G. represents the western main and the line B.H.J. the eastern main, while H.F. is the cross main completing the circuit.

The Eastern main from its point of origin proceeds along the eastern slope of the valley and supplies all the houses on the eastern side of Nant-y-moel except the houses situated on the upper levels of the district. Leaving Nant-y-moel it passes along the Aber Road which separates Nant-y-moel from Ogmores Vale on the eastern side of the river, until it reaches a point opposite the Workmen's Hall, Ogmores Vale, where it gives off the 4-inch communicating main which proceeds along Commercial Street to join the western main. After giving off this branch, the eastern main proceeds via Bethania Road, High Street, Bridge Street, and across the river to Cemetery Road, where it ends. In its course from the Workmen's Hall to Cemetery Road the eastern main supplies through its branches all the streets in Ogmores Vale east of the river and in addition the following streets which are placed on the western side of the river at the lower end of Ogmores Vale, viz., St. John Street, Water Street, Bridge Street Walters Road and Cemetery Road.

The Western Main.—From its source the 5-inch western main proceeds down the western side of Nant-y-moel through Garon Street, Tiery Crescent and past the Court Colman Hotel. Here, reduced to a 4-inch pipe, it passes through Nant-y-moel Row and Glanavon Terrace to reach that stretch of road which separates Nant-y-moel from the Wyndham district of Ogmores Vale. In its course through Nant-y-moel the western main supplies all the houses in Nant-y-moel west of the river.

Arriving at the Wyndham district of Ogmores Vale the western main proceeds via Wyndham Road, Dunraven Place, Fronwen Terrace, North Road, Oxford Square and Tynewydd Row to a spot at the rear of the junction of Tynewydd Row and Llewelyn Street, where it meets the cross main sent to join it from the eastern main. Below the point of junction the western main is continued along the back of Llewelyn Street, then through Prospect Place and finally passes through Meadow Street to end in Bryn Road. In this section of its course, from its point of junction with the cross main to its termination in Bryn Road, the western main supplies either directly or through its branches the following streets: Prospect Place, Highland Terrace, Meadow Street, Oak Street, Elm Street, Railway Terrace, Greenfield Terrace, Suffolk Place, Caeddu Road and Bryn Road.

FURTHER DESCRIPTION OF WESTERN MAIN AND ITS RELATIONSHIP WITH THE FRONWEN BROOK.

Previous to January of this year the water flowing through the western and eastern mains was from the common source

above Nant-y-moel, but on January 21st the western main was severed near the Wyndham Pit on the road between Nant-y-moel and Ogmores Vale by a cutting away of the road for a distance of 100 feet in the course of the extension of the surface plant of the colliery. The cut ends of the main were secured and capped.

In order to maintain a supply of water through the western main below the cut section, water from the Fronwen Brook was led into it at the upper end of Ogmores Vale.

The Fronwen Brook derives its source from three springs situated about 300 yards above the Fronwen Farm on the western slope of the valley in the Wyndham district of Ogmores Vale. The small streams which flow from the springs unite after a short course to form the brook. In their course two of these streams pass through cultivated land and the third passes unprotected across a mountain pathway. From the point of junction of these streams the brook passes directly down the hillside and through Fairy Glen Terrace thence under the main road to reach the Ogwr Fawr. About 300 yards above the main road and immediately below a sheep washing pond an intake weir of a temporary nature has been built from which a 3-inch steel main guarded by a copper screen takes water direct from the brook to the western main.

The estimated dry weather yield of the Fronwen Brook is 78,000 gallons per day.

The level of the intake weir is approximately 700 feet above O.D. Above the intake, a mountain road leading to the Garw Valley runs along the side of the stream while other pathways cross it in its course.

The brook is unprotected throughout its entire course and acts as the natural channel drainage for surface water in this section of the hillside. Human and animal excreta have been found near the brook above the level of the intake weir. The water is untreated and unfiltered and is carried in the 3-inch steel main through Fairy Glen Terrace to join the 4-inch western main at Dunraven Place. Before reaching Dunraven Place the 3-inch main sends branches of supply to Fairy Glen Terrace and Hendre Avenue.

Situated upon the western main at the northern end of North Road, a quarter of a mile above the junction of the cross main with the western main, is a sluice valve which on May 10th was partly closed and on May 20th completely closed in order to maintain a sufficient supply of water to the houses on the upper levels of the Wyndham area of Ogmores Vale.

Previously to May 10th the Fronwen water passed freely down the western main. After May 20th the main below the valve was supplied only with water from the eastern main through the cross main.

The Cross Main.—This is a 4-inch main taken off the 6-inch eastern main at the corner of Commercial Street near the

Workmen's Institute—it proceeds along Commercial Street to join the western main at the back of Llewelyn Street near its junction with Tynewydd Row. In extent the main is about 800 feet long; it supplies Commercial Street and gives branches of supply to River Street and the west side of Llewelyn Street.

In Ogmore Vale the eastern main supplies 553 houses, the western main 702 houses and the cross main 79 houses.

For the purposes of comparison of the incidence of the epidemic upon the areas of supply in different lengths of the western main, it may be regarded as composed of three sections. From north to south these are—

I. Section D.E., extending from Fairy Glen to the Sluice Valve in North Road, is half a mile in length and supplies 344 houses.

II. Section E.F., extending from the Sluice Valve in North Road to the junction of the cross main with the western main at the back of Llewelyn Street, is approximately a quarter of a mile long and supplies 144 houses.

III. Section F.G., extending from the junction of the cross main with the western main, to the termination of the western main in Bryn Road, is a little less than half a mile long and supplies 214 houses.

The great majority of the early cases attended by medical practitioners were taken ill between the 11th and 19th of May. In this period the doctors visited 124 infected houses, of which—

8	were situated upon the eastern main.
3	„ „ „ „ cross main.
112	„ „ „ „ western main.
1	was „ „ „ Gorwyl private supply.

Of the 112 invaded houses connected with the western main—

51	were connected with the upper segment D.E.
18	„ „ „ „ middle segment E.F.
43	„ „ „ „ lower segment F.G.

Of the eight infected houses on the eastern main, the first cases in three of them are known to have consumed water from the western main; in the remaining five houses such a connection could not be traced, but in the compact community at the lower end of Ogmore Vale there is considerable intermingling of the people of both sides of the valley and frequent visits are made to one another's homes.

The 43 houses connected with the Gorwyl supply remained comparatively immune up to the end of July. A house to house inquiry made on the 4th of June yielded but four cases contained in four houses, and two of these cases were extremely mild forms of diarrhoea; the one a boy aged 12 had sickness and diarrhoea which lasted one day, the other a boy of 6 had slight diarrhoea which lasted a morning. The invaded houses connected with the western main were distributed along its entire length from

Wyndham Street to Bryn Road, and houses connected with its upper, middle and lower sections were invaded on May 12th as well as on the two succeeding days. Two of the streets most heavily affected were Hendre Avenue and Fairy Glen, both of which are connected with the 3-inch main that carries the water from the Fronwen Brook to the western main.

In the period May 11th to May 19th, out of the 124 houses visited by the local medical practitioners, there were 60 houses in which more than one person was attacked. In 22 of the houses the persons were attacked on the same day, these being the initial cases in the house. More frequently, however, it was found that an interval varying between 24 hours and several days occurred between each case, the most common intervals being 24 and 48 hours.

MAGNITUDE OF THE OUTBREAK AND DISTRIBUTION OF ALL CASES.

To obtain data as to the magnitude of the epidemic and the distribution of the cases among the various streets of Ogmores Vale in relation to the water supply, at least 50 per cent. of the houses in each street were visited by the Council's Health Visitors, who made inquiry as to the number of cases of diarrhoea that had occurred in each house since the beginning of the outbreak.

The inquiry was made between the 6th and 30th of June. The number of houses visited was 892 (65 per cent. of all the houses in Ogmores Vale), and 722 cases of diarrhoea were found to have occurred in them.

If in each street the same proportion of cases occurred in the houses not visited as occurred in the houses visited, it is estimated that in Ogmores Vale about 1,100 persons were attacked by diarrhoea during May and the early part of June, of whom only 30 per cent. sought medical attention. The cases not seen by a doctor were usually of mild type—ill for one, two or three days with diarrhoea that was not accompanied by the passage of blood or mucus. The cases that obtained medical attention during May were distributed in 148 houses and the number of cases that occurred in these invaded houses was 312.

During the period June 1st–August 31st, 236 fresh cases were notified, so that the total number of cases up to the end of August, knowledge of which was obtained through medical practitioners, was 548.

The results of the house to house inquiry in June are given in the following tables which illustrate the greater incidence of the epidemic upon the houses supplied by the western main as compared with the other mains and the comparative immunity of the houses connected with the Gorwyl supply. They also show that along the course of the western main the incidence was higher upon the houses nearest the source of supply (that is the Fronwen Brook) than upon those more remote.

TABLE SHOWING THE RELATIVE INCIDENCE OF THE EPIDEMIC UPON THE HOUSES ALONG THE UPPER, MIDDLE AND LOWER PORTIONS OF THE WESTERN MAIN.

(Inquiry made between June 6th and 30th.)

	No. of Houses.	No. visited.	No. with one case.	No. with two cases.	No. with three cases.	No. of houses invaded.	Percentage of houses invaded.
Western Main from Fairy Glen to Sluice Valve in North Rd.	344	224	67	39	57	163	73
Western Main from Sluice Valve to junction with the Cross Main - -	144	108	33	17	16	66	61
Western Main from the junction with Cross Main to end of main - - -	214	135	35	20	19	74	55

In this table it will be noticed that the highest incidence was upon the houses nearest the source of supply of the western main. Below the sluice valve in North Road the Fronwen water meets water from the cross main, and this dilution of the Fronwen water may account for the gradual diminution in the incidence upon the houses in the middle and lower sections of the main.

TABLE SHOWING THE RESULTS OF THE HOUSE TO HOUSE INQUIRY AT OGMORE VALE AND THE RELATIVE INCIDENCE OF DIARRHŒA ON THE HOUSES SUPPLIED BY THE DIFFERENT WATER MAINS IN THE DISTRICT.

(Inquiry made between June 6th and 30th.)

	No. of Houses.	No. visited.	No. with no case.	No. with one case.	No. with two cases.	No. with three cases or more.	No. of houses invaded.	Percentage of houses invaded.
Houses connected with Western Main -	702	467	164	135	76	92	303	64.8
Houses connected with Eastern Main -	553	323	238	60	16	9	85	26
Houses connected with Cross Main - -	79	60	43	12	2	3	17	28
Houses connected with Gorwyl Supply -	42	42	38	4	—	—	3	9.5
Totals - - -	1,376	892	483	211	94	104	408	45.7

TABLE SHOWING THE RELATIVE INCIDENCE ON THE STREETS SUPPLIED BY THE WESTERN MAIN IN ITS COURSE FROM FAIRY GLEN TO NORTH ROAD.

Street.	No. of Houses.	No. visited.	No. with one case.	No. with two cases.	No. with three cases or more.	No. of Houses invaded.	Percentage of Houses invaded.
Fairy Glen - -	17	15	3	5	4	12	80
Hendre Avenue - -	23	22	2	4	12	18	82
Wyndham Street - -	60	39	17	4	10	31	80
Dunraven Place - -	73	46	15	6	12	33	72
Adare Street - -	133	73	23	15	11	49	67
Coronation Road - -	11	9	2	—	3	5	55
Fronwen Terrace - -	27	20	5	5	5	15	75

It will be remembered that the water from the Fronwen Brook is piped by a 3-inch main which runs down the hillside through Fairy Glen to feed the western main. In its course down the hillside the 3-inch main supplies both Hendre Avenue and Fairy Glen, and the incidence on these two streets was exceedingly heavy.

River Pollution.—There is no gross pollution of the river from sewage contamination. Colliery washings enter it and certain careless householders deposit refuse in it, while the Council's refuse tip near Waun Fach is placed upon its bank.

Closet Accommodation.—Most of the houses are provided with hand-flushed long hopper closets which are difficult to keep clean, but the more modern houses are fitted with wash-down pans, flush tanks and syphons. The great majority of the closets are outdoor and depend for disconnection from the sewer upon the closet trap only.

Sewers and Drains.—The valley is efficiently served with a drainage system and the properties are connected with 4-inch stoneware pipes and 6-inch subsidiary drains to the main sewer. Drains generally are ventilated with 4-inch vent shafts to each house, but the older properties have one vent shaft to every four houses. The main sewer is carried along the whole length of the valley and the sewage is ultimately treated along with the sewage from the other parts of the area at the Council's sewage farm near Brynmenin. The main sewers vary in size from 9 inches to 21 inches in diameter, and in the towns are ventilated with 6-inch vent shafts and in the open fields with open manhole covers.

Scavenging.—A removal of house refuse is undertaken every alternate day in the villages, the refuse being deposited on refuse

tips. At Nant-y-moel there are three such refuse tips; the one at the top end of Station Road and the one near the Wyndham Pit are removed from dwellings, but the one upon the river bank near Waun Fach is in close proximity to the streets of Waun Fach, Waun Wen, Waun Llwyd, Waun Goch and Gwendoline. The refuse of Ogmores Vale is removed to a tip below the southern end of the village and away from any dwellings. The receptacles used by householders for storage of refuse are of diverse pattern: broken boxes and buckets predominate and the sanitary bin is conspicuous by its rarity.

SYMPTOMS OF THE PRESENT ILLNESS.

Practically all the people of Ogmores Vale are attached to the practice of Dr. Anderson, who is the only practitioner resident in the place; there are, however, two doctors practising at Nant-y-moel who have a few patients at Ogmores Vale.

Dr. Anderson informed me that the epidemic occurred suddenly, with explosive intensity and without the occurrence of previous cases to give warning of the outbreak.

On May 12th and the succeeding days Dr. Anderson had been called in to see a large number of patients suffering from acute diarrhœa which differed in type from ordinary summer diarrhœa in its greater acuteness, its association with high pyrexia, tenesmus, and the passage of blood and mucus per rectum, and its incidence upon persons of all ages.

At onset the patients complained of feeling very ill, and of pains in the back and head. A temperature of 104° F.— 105° F. was common with rapid pulse and scanty urine. Vomiting occurred as a prodromal sign in a few cases. Restlessness was a prominent symptom, but where the toxæmia was intense the patient remained prostrate in bed. The tongue was always coated, and in a few cases Dr. Anderson noted herpes of the lip. Within 12–24 hours of onset the patient complained of abdominal discomfort with occasional spasms of pain and uncontrollable diarrhœa.

At first the stools were liquid, greenish in colour and slightly slimy—later they became brownish and looked like dirty water—afterwards blood and mucus was passed, and in a few cases mucous casts.

After 36 hours the temperature dropped to normal but the abdominal pain increased, and tenesmus and the evacuation of blood and mucus continued. Gradually the patients improved. The duration of illness varied from a few days to three weeks; one fatal case lasted 31 days. The cases of mild type recovered within a week; they were ill for three or four days with abdominal pains, diarrhœa and tenesmus and slightly raised temperatures. The majority of them passed blood or mucus, and the number of stools per day varied between five or six and almost constant diarrhœa. In Dr. Anderson's experience, the proportion of acute

cases was higher among those attacked during the first few days of the epidemic than among the later cases.

Sequelæ.—In six instances the patients suffered from recurring attacks of diarrhœa. These were the only sequelæ noted during the whole period of the epidemic from May 11th—August 31st.

Dr. Anderson provided me with a list containing the names and addresses of all the cases that had occurred in his practice, together with the dates of his first visit to each case.

The Inspector of Nuisances and the Health Visitors of the Local Authority acting under the supervision of Dr. Murphy afterwards visited each of these homes to make investigation into the circumstances attending each case. The results of these investigations are embodied in this report.

Mortality.—In the period May 11th—August 31st, there were 12 deaths from dysentery—four male and eight female. Five of the deaths were in infants under 12 months of age, of which number two were aged 1 month, one aged 2 months, one aged 4 months, and one aged 8 months. Of the remaining seven deaths, five were in children of the age period 1 to 5 years, and two were women aged 59 and 79 years respectively. The average duration of illness in the fatal cases was 13 days, the longest period was 31 days and the shortest 24 hours; in three cases the illness lasted 21 days. The number of deaths recorded in each month was one in May, three in June, one in July, and one in August. The case-mortality rate, if estimated upon the number of cases seen by the medical practitioners (which was 548) would be 2·2 per cent.

BACTERIOLOGICAL AND SEROLOGICAL FINDINGS.

On the evening of May 24th, Dr. Colston Williams, the County Medical Officer of Health, and Dr. Parry Morgan, the pathologist of the Cardiff and County Public Health Laboratory, visited Ogmores Vale to take specimens of blood and fæces from some of the patients. Specimens of stools were obtained from three patients in the early stage of the disease, and blood specimens from three patients who had been ill for more than a week. The sera of all three patients in dilutions up to 1-800 agglutinated *B. Dysentericus Flexner* (Strain W. of the Oxford series), the Dreyer method of test being employed.

From two of the stools Dr. Morgan isolated non-lactose fermenting organisms which morphologically and culturally were identical with *B. Dysentericus Flexner*, and which were agglutinated by the sera of the three positive bloods in dilutions up to 1-800. The organisms were also agglutinated by the polyvalent dysentery serum of the Lister Institute. At different times during the period May to September, 23 specimens of blood from cases notified as dysentery were sent to Dr. Morgan for examination, as well as three specimens to act as controls from persons

living within the infected area who had not been affected by the disease.

Two of the controls failed to agglutinate *B. Dysentericus* (W.) in dilutions of 1-50, the other did agglutinate it slightly in 1-50, but not at all in 1-100. The 23 suspected bloods were tested against *B. Dysentericus* (W.) with the following results:—

9 agglutinated <i>B. Dysentericus Flexner</i> (W.) in dilutions up to			
			1-800 of serum.
1	“	“	“
			1-400
3	“	“	“
			1-200
3	“	“	“
			1-100 „

Of the remaining specimens, six gave negative results in 1-50, and one gave a doubtful positive reaction in 1-50. The strongly positive results were obtained from mild as well as severe cases of dysentery. In addition to testing against *Flexner* (W.), 12 of the specimens were tested against *B. Dysentericus* (Shiga) and (*Flexner Y* and *Z*), 10 against *B. Typhosus* and *Paratyphosus A* and *B*, and four against *B. Gaertner*. All gave negative results with these organisms.

On May 28th, when the exact nature of the disease had been determined, the Medical Officer of Health communicated with the local practitioners informing them of the bacteriological findings, and reminding them that dysentery was a notifiable disease under the Public Health (*Pneumonia-Malaria-Dysentery, &c.*) Regulations, 1919.

CAUSATION OF OUTBREAK.

Briefly the features of the outbreak were—

I. The epidemic began with explosive intensity, and persons of all ages were affected.

II. The epidemic was limited in the first instance to a defined area, coincident in extent with the area supplied with water from the western main.

III. Within this defined area the incidence was general, but the evidence shows that it was unevenly distributed, and that the houses situated nearest the source of supply of the western main were more seriously affected than those more remote.

IV. Within the defined area, in the first few days of the outbreak, multiple cases of infection occurred on the same date in houses distant from one another by more than a mile.

V. The Gorwyl group of houses practically escaped invasion, although situated near the middle of the invaded district.

The Gorwyl houses are supplied with water from a private source.

VI. The causative organism of the disease was the *B. Dysentericus Flexner* (Strain W).

From a consideration of these facts there can be little doubt that the infection was spread through the water supplied by the western main. Investigation was made of other possible causes of the epidemic, but no other could be found that would support the facts; the milk supplies could not be implicated, for the invaded houses derived their milk from different and distinct sources, including condensed milk of different brands. In the same way no evidence could be obtained of the transmission of the infection through any article of food. At the time of the epidemic the children of the district were being fed at canteens which had been established to relieve the distress caused by the coal stoppage. No suspicion, however, could be attached to the canteens as being concerned in the outbreak, for out of the first 40 cases that occurred, two only had attended the canteens.

POSSIBLE SOURCES OF CONTAMINATION OF THE WATER.

The specific contamination of the water supplied by the western main must have occurred before it entered the main, because Hendre Avenue and Fairy Glen Terrace were among the streets most heavily affected in the first stage of the epidemic, and both the streets are connected with the 3-inch main that carries the water from the Fronwen intake to the western main. The distance between the Fairy Glen houses and the Fronwen intake is 130 yards, and the 3-inch main in this section of its course is practically exposed along its entire length, so that any leakage would readily be perceived, as would also any possible source of contamination. None such could be found, so that it must be inferred that the water was contaminated before it entered the main.

The springs that form the source of the Fronwen Brook are situated high up on the hillside where the land is uncultivated and there are no habitations. On the occasions of my visits to the springs there were no animals upon the hillside above or anywhere near the level of the springs, although sheep are grazed there at times. The only possibilities of human contamination of the watershed above the springs would arise from occasional wayfarers on the hill or from the workmen engaged in erecting standards to support the electric cables that are being carried from one valley to the next. At the time of the outbreak the workmen so engaged were encamped on the watershed of an adjoining valley, many miles away from Ogmores Vale, and none of them had suffered from diarrhoea in any form for several months

prior to the outbreak. The distance from the springs to the intake at Fairy Glen is about 400 yards. From the springs three streams rise; two of them pass one on either side of a clover field which is manured every year. The last time of manuring was in December, 1920, when artificial manure was employed. Surface washings from this field certainly enter the streams; still, it is hardly conceivable that such pollution would give rise to the specific type of bacillary dysentery that occurred. Below the clover field the two streams unite and cross a mountain footpath before they unite with the third stream to form the Fronwen Brook. In its further course down the hillside the brook is again crossed by another footpath, while the mountain roadway from Ogmores Vale to the Garw Valley runs along its bank for a distance of 40 yards above the point where the water is taken into the 3-inch main. Immediately above the intake weir is a sheep-washing pond, which, however, has not been used this year. The Fronwen Farm is 300 yards below the level of the springs and 100 yards away from the brook in any part of its course, and there is no evidence to associate the farm with the outbreak, for the slope of the land occupied by the farm is away from the brook, and the drainage from the farm is in the opposite direction to the brook. The closet-arrangement at the farm is a movable pail which is cleaned frequently and the contents buried in the garden. Both the closet and the garden are on ground that slopes quickly away from the farm and the brook.

The water supply of the farm is from a well immediately above the farm. No cases of diarrhœa have occurred at the farm during the present year.

The features to be specially noted concerning the Fronwen supply were—

I. The proximity of the Fronwen Brook and the intake weir to a centre of population. The nearest street to the weir is 130 yards away, and the main street of the Wyndham district of Ogmores Vale but 300 yards distant. From these streets the brook and weir are approached by the mountain road which leads from Ogmores Vale to the Garw Valley. This road, it will be remembered, travels along the bank of the brook for a short distance above the point where the water is taken into the main.

II. The brook and weir were not railed off in any way, and were entirely unprotected from any chance source of contamination. The farmer informed me that during the warm weather the children played about the sheep-washing pond and waded in the brook, and that frequently he had driven them away, for they made a playground of the brook-side.

How the water was contaminated by the specific organism was not discovered. The most likely theory is that some infected person defæcated upon the ground drained by the Fronwen

Brook or its tributaries, and that the rain washed the polluting material into the brook.

No rain fell in this district between May 1st and May 7th.

On the 7th there was a fall of .86 inch.

„	8th	„	„	.51	„
„	9th	„	„	.03	„
„	10th	„	„	.07	„
„	11th	„	„	.14	„
„	12th	„	„	.00	„
„	13th	„	„	.00	„
„	14th	„	„	.19	„

The records of rainfall appear to lend support to the theory, for after a dry period came a series of days on which rain fell, and which ended with the 11th of May, the day on which the outbreak began. How long the water remained the vehicle of infection it is impossible to say, but the period was probably a short one. The epidemic reached its culminating point on the 13th of May, when 78 cases were attended by medical practitioners. After the 13th the number of new cases occurring each day dropped very considerably, and by the 20th the number was reduced to nine, and thereafter to the end of the month comparatively few cases occurred in homes not previously invaded. In the practitioners' series of cases out of the 148 houses invaded during the period May 11th to May 31st, only 12 new houses were invaded between the 19th and 31st of May.

Copies of the reports on the bacteriological and chemical examinations of the water will be found in Appendix I. The results of the chemical examinations of samples taken on the 19th and 20th of May showed no evidence of sewage or animal contamination, but bacteriological examinations of samples taken on the 21st yielded unsatisfactory results, for *B. Coli* were found in 0.5 c.c. of the samples. A search for the specific organism in samples collected on May 27th failed to reveal the organism in 500 c.c. of the water.

SEARCH FOR ORIGINAL SOURCE OF INFECTION.

A search was made for the original source of the infection, but without success. Three ex-soldiers discharged from the army with dysentery were found. All three lived on the western side of Ogmores Vale, and two of them in houses quite near the Fronwen source. No connection, however, could be traced between these men and the outbreak, for one of them was in hospital from May 1st to May 15th, another gave a negative blood reaction to *B. Dysentericus* (W), and the third was confined to the house with synovitis of the knee for some weeks previous to the outbreak. The third man gave a positive blood reaction to *B. Dysentericus* (W) in dilutions of 1-100 and to Flexner V and Z in dilutions of 1-50. The positive result, however, is no indication to his original type of infection, for nine

of the members of his family were affected in the present outbreak, and he himself was taken ill on the 23rd of May, but his blood was not examined until the 30th of May, by which time the specific agglutinins of his recent infection would have appeared in his serum.

The *B. Dysentericus Flexner* (W) is probably a much more common inhabitant of the human intestine in this country than is generally supposed. In Dr. Morgan Rees' report on an outbreak of diarrhoea in the parishes of Blackwell and South Normanton in 1915, the *B. Dysentericus Z* appeared to be the causative organism in many of the cases affected, and this is the same organism as is now referred to as W. Since the war the number of carriers of *B. Dysentericus* has probably increased, and the original cause of the epidemic, if found, would probably turn out to be either a healthy carrier of the disease or a mild unrecognised case of dysentery.

CONTINUATION OF EPIDEMIC.

With such a large number of mild and ambulant cases in the district it was not surprising that the epidemic spread beyond the confines of the defined area, and cases were notified from all parts of the village of Ogmores Vale and from the neighbouring villages of Nant-y-moel and Lewistown.

In all 236 additional cases were notified during the period June 1st–August 31st—127 in Ogmores Vale, 101 in Nant-y-moel, 7 in Lewistown, and 1 in Blackmill. The number of cases that occurred during each week in each of these villages is given in the following table:—

	Ogmores Vale.	Nant-y- moel.	Lewis- town.	Black- mill.	Total.
Week ending June 4 -	19	—	1	—	20
11 -	7	1	—	—	8
18 -	5	1	1	—	7
25 -	3	—	—	—	3
July 2 -	6	—	—	—	6
9 -	12	—	—	—	12
16 -	14	15	1	—	30
23 -	15	12	—	—	27
30 -	19	16	3	—	38
August 6 -	9	25	—	—	34
13 -	8	18	1	1	28
20 -	5	7	—	—	12
27 -	3	4	—	—	7
27-31 -	2	2	—	—	4
Total for period June 1 to August 31 - -	127	101	7	1	236

Cases at Nant-y-moel.—The 101 notifications received from Nant-y-moel were contained in 95 houses. The first case notified

was a child living in Oakfield Terrace, who was taken ill on May 30th. The infection was directly traced to a visit paid to the house by relatives from Ogmores Vale who were convalescing from dysentery. A few days after the first case a second case occurred in the same house, after which no further cases were notified in this street until July 16th, when two cases were notified from the other end of Oakfield Terrace. No direct connection could be traced between the first and second households attacked, but several cases of diarrhoea occurred in the street in the intervening period. Other cases had meanwhile occurred in other streets.

After July 16th cases occurred in the houses next to those invaded on the 16th, and at intervals of a few days other notifications were received from houses more remote from them. By the end of August the number of notifications received from this street alone totalled 21, and the number of houses invaded 19.

Oakfield Terrace is centrally situated in a group of streets consisting of Park Street, Ogwy Street, Brynogwy Street, Oakfield Terrace, and John Street, which are placed at the end of Nant-y-moel nearest Ogmores Vale. These streets are arranged parallel to one another and constitute a compact community cut off from other streets except through Ogwy Street by a colliery tramway. The first case in the new outbreak occurred in Ogwy Street on July 11th, and between this date and August 31st, 12 notifications were received from this street. In Brynogwy Street the first case occurred on July 12th, and thereafter six additional cases occurred in this street. The first case in John Street arose on July 16th, and eight other notifications were afterwards received from John Street. The number of cases in Park Street was four, and the date of onset of the first case was July 30th.

Out of the total of 101 notifications received from Nant-y-moel, 53 were received from the Oakfield Terrace group of streets; and the remaining cases were distributed throughout Nant-y-moel.

Infection from case to case could not be traced in more than 25 per cent. of the cases, but it is probable that there was a considerable number of missed cases, for the medical practitioners informed me that diarrhoea was prevalent during the period of the epidemic. Most of the cases were of mild type and the patients recovered within a few days; this mildness of attack was the chief contributing factor to the spread of the disease, for patients while in an infective condition freely mixed with the rest of the community.

Cases at Lewistown.—The first case was a child of 15 months who was taken ill on June 1st. The mother of the child did the washing for a sister at Ogmores Vale whose own child was at the time suffering from dysentery. On the 12th of June the mother herself was attacked as well as a son of 15 years of age. A neighbour's child was taken ill on the 14th of June and later three other cases were notified from the same street; these three cases were in houses next to one another, and the interval between the dates of onset of each succeeding case was two days.

Cases at Blackmill.—One case was notified from Blackmill. The source of infection could not be traced.

Extension to Other Districts.—The epidemic was absolutely limited to the Valley of the Ogwr Fawr.

The age and sex distribution of the cases during the period June 1st–August 31st was similar to that of the earlier period May 11th–31st.

STEPS TAKEN TO DEAL WITH THE OUTBREAK.

The usual steps were taken to warn the public by poster and visitation of infected households of the precautions to be taken. A copy of the leaflet distributed at each invaded home is given in Appendix II.

On the evening of June 8th, Chloros was added to the water at the intake weir in the way suggested by Mr. Sugden in the proportion of one gallon of 1 per cent. Chloros to every 500 gallons of water, with the view of immediate disinfection of the mains. The presence of free chlorine was tested for at the lowest points on the mains by the Potassium Iodide and starch reaction. When the blue colour was obtained the sluice valves were closed and one hour contact given. Samples of the water were taken that night and the next morning. The results of analysis showed that the amount of available Chlorine in the first sample was sufficient in quantity to disinfect the mains, the second sample showed only traces of Chlorine, indicating that the chlorinating agent had been effectually removed.

On June 14th the 3-inch main was carried up higher on the hillside above the sheep-washing pond to a place which is protected from the public by a stone wall.

I discussed the question of reconnecting the western main to its original supply with the chairman of the Board and the engineer. The necessary pipes for re-establishing this connection have already been obtained and the work will proceed shortly.

The question of safeguarding the original supplies at Nant-y-moel, by the provision of adequate storage capacity and efficient filtration, is also under the consideration of the Water Board, and I am given to understand that this work will be begun as soon as it can be accomplished at a reasonable cost.

No cases of dysentery occurred among people engaged in handling or preparing foodstuffs.

The Council's refuse tip near Waun Fach was limed, as a measure for the destruction of flies.

The canteens which provided meals for the school children during the strike were visited on several occasions and the arrangements for preparation and serving of meals inspected. None of the staff engaged in the actual preparation or handling of the food was affected by the disease, but a woman who helped in other ways came from an infected house. She was stopped from attendance at the canteen.

The importance of destroying flies was impressed upon the householders by the Health Visitors in their visits to the homes. Flies were not very numerous in the houses visited. Out of 603 houses, where enquiries were made by the Health Visitors in July and August, no flies were noted in 446 of them, 62 were returned as having a few flies, 48 as many and 27 as very numerous.

In conclusion I wish to express my appreciation of the help I have received from Dr. Murphy and his staff in this investigation. I am indebted to Dr. Anderson of Ogmore Vale for much information and kind co-operation. I have also to thank Dr. Colston Williams, the Medical Officer of Health for Glamorgan, and Dr. Parry Morgan and Mr. Sugden of the Cardiff and County Laboratory, for their assistance, as well as the officials of the Mid-Glamorgan Water Board, who willingly supplied me with all the information I required.

T. W. WADE.

APPENDICES.

- I. Copies of Chemical and Bacteriological examinations of the Fronwen Water.
- II. Copy of leaflet distributed at each invaded home; concerning methods of prevention of the spread of Dysentery.
- III. Diagram illustrating the system of water mains in the Ogmore Valley.

APPENDIX I.

Cardiff and County Public Health Laboratory,
9, The Parade,
Cardiff.

Report on Chemical Analysis of Sample of Water.

Collected on May 19th and 20th, 1921, by Dr. Murphy.

Labelled—Fronwen Intake, Ogmore Valley.

Subsidiary Intake, Fairy Glen, open unprotected stream.

No. of sample	-	Fronwen 2023.	Fairy Glen. 2036.
Date of analysis	-	May 20th-24th.	May 20th-25th, 1921.
Appearance in two-foot tube.	-	Very pale green; clear.	Pale green; clear.
Reaction	-	Neutral.	Neutral.
Total hardness	-	2.8	2.9
<i>a.</i> Temporary	-	—	—
<i>b.</i> Permanent	-	—	—
Chlorine	-	1.0	.8
Nitrogen as Nitrates	-	Practically nil.	Practically nil.
Oxygen absorbed from permanganate.	-	—	—
(In hrs. at)	-		
Saline (or "Free") ammonia.	-	.0008	.0010
Organic (or "Albuminoid") ammonia.	-	.0032	.0056
Poisonous metals	-	Nil.	Nil.
Nitrates	-	Nil.	Nil.

} parts per hundred thousand.

Phosphates - - -	—	—
Sulphates - - -	—	—
Microscopic Examination of the Sediment.	Fair amount, sand, vegetable débris, algæ. A few infusoria.	Fair amount; vegetable tissue and débris. A few infusoria.
Volume of Sediment -	1.2 (per 100,000).	.60 (per 100,000).

REMARKS :—*Fronwen*.—A soft, neutral water.

The amount of sediment is somewhat high, but other results are satisfactory.

Chemical analysis shows no evidence of any sewage or animal contamination.

Fairy Glen.—A soft, neutral water. The chemical and microscopical characters are fairly satisfactory. Chemical analysis alone shows no evidence of any sewage or animal contamination.

Date 25.5.21.

Bacteriological Examinations of Waters.

Fronwen Intake, Ogmore Valley.—May 19th, 1921.

Organisms growing at 37° C. = 18 per cubic centimetre.

" " " 20° C. = 270 " " "

Bacillus coli organisms (flaginac) isolated from 100 c. and 50 cc. of water; no coli-like organisms present in 2 cc. or in smaller amounts.

Remarks.—Of moderate bacterial purity for an unfiltered stream.

Subsidiary Intake, Fairy Glen.—May 21st, 1921.

Organisms growing at 37° C. = 28 per cubic centimetre.

Typical bacillus coli (flaginac) isolated from $\frac{1}{2}$ cc. and 2 cc. of water.

Remarks.—Unsatisfactory. Bacteriological examination shows a high relative number of bacillus coli organisms and indicates some contamination.

Tap in Dunraven Place supplied by Auxiliary Intake, Fairy Glen.—May 25th, 1921.

Organisms growing at 37° C. = 20 per cubic centimetre.

Typical bacillus coli (flaginac) isolated from 2 cc. and 10 cc. of water; no coli-like organisms present in $\frac{1}{2}$ cc. or $\frac{1}{10}$ cc.

Remarks.—Unsatisfactory. Bacteriological examination shows a high relative number of bacillus coli organisms.

Surface Water, Fronwen. Stream passing Farm (C).—May 27th, 1921.

Organisms growing at 37° C. = 108 per cubic centimetre.

(a) *General Bacteriological Examination.*

Typical bacillus coli (flaginac) isolated from 10 cc. of water; no bacillus coli organisms present in 2 cc. or in smaller amounts.

(b) *Examination for B. Dysenterious.* 500 cc.

(1) Direct centrifugalisation and plating over LBA plates. Negative results. No non-lactose fermenting organisms found.

(2) *Enrichment Method*.—Negative result.

Remarks.—Bacteriological examination indicates a somewhat higher degree of purity with regard to intestinal organisms than recent previous samples.

Surface Water, Fronwen Intake.—May 27th, 1921.

Organisms growing at 37° C. = 96 per cubic centimetre.

(a) *General Bacteriological Examination.*

Typical bacillus coli (flaginac) isolated from 10 cc. of water; no bacillus coli organisms present in 2 cc. or in smaller amounts.

(b) *Examination for B. Dysentericus.*

Negative result. No non-lactose fermenting organisms found.

Remarks.—Very similar in bacterial quality to Sample C.

APPENDIX II.

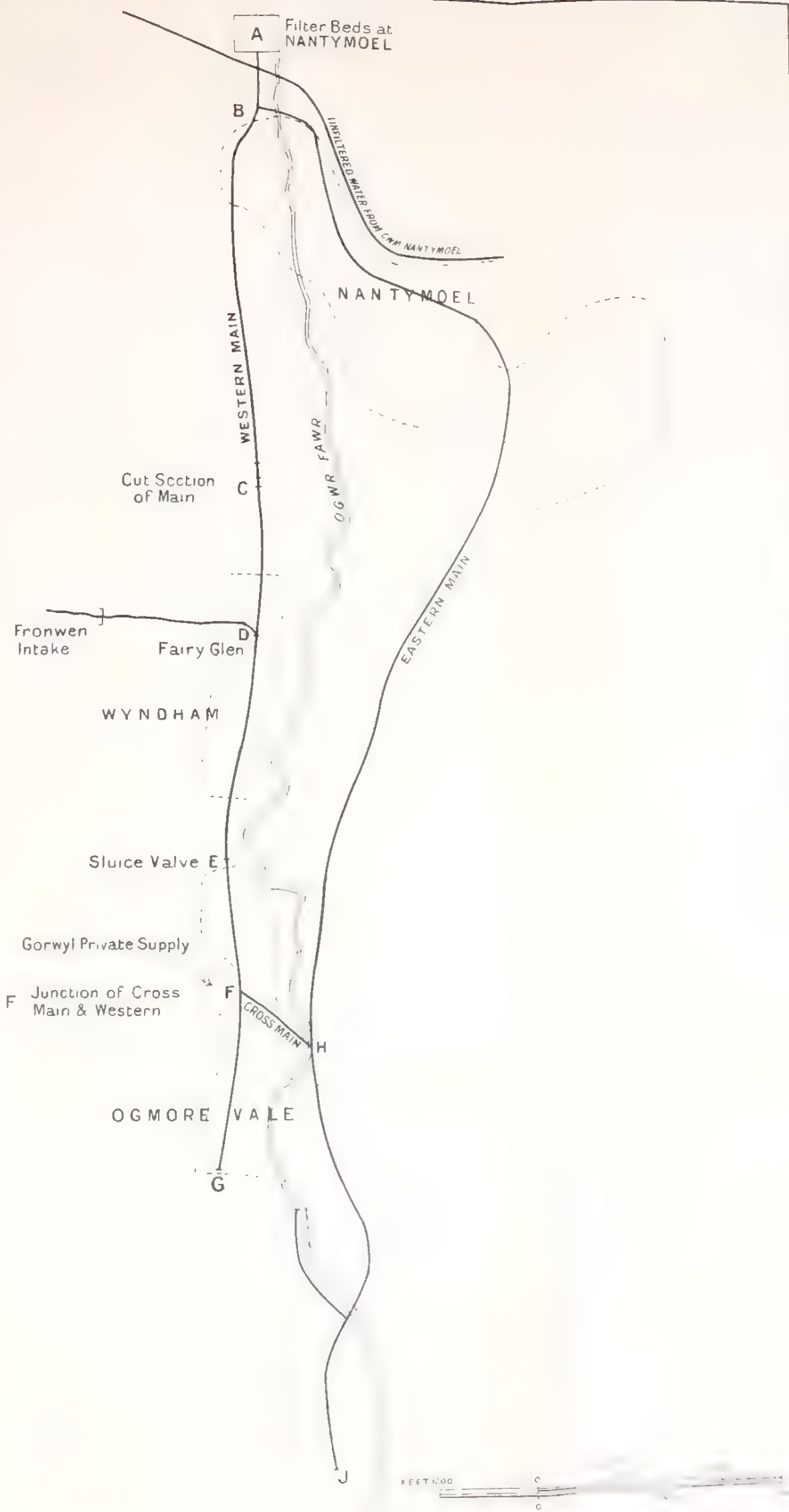
OGMORE AND GARW URBAN DISTRICT COUNCIL.

Health Department.

Infectious Diarrhœa.

1. The patient should be isolated as far as possible.
2. All persons attending on patients should thoroughly wash their hands after each time of attending to the patient.
3. No person attending a patient should handle or prepare food for others.
4. Great care should be taken that discharges from a patient are disposed of so that there is no danger of infection to others. Utensils used by patients should be kept apart, and cups, &c., should be disinfected by scalding after use. Sheets and underclothing of the patient should also be disinfected.
5. Persons from infected households should mix with others as little as possible.
6. All milk and all water for drinking should be boiled before use.
7. Food should be kept carefully covered from flies, &c., and should be used as soon as possible after it has been cooked. No uncooked vegetables or fruit should be taken and no watercress or salads.
8. If flies are noticed in the house they should be destroyed as soon as possible by the use of fly papers, &c.
9. No person who has been ill with diarrhœa recently should take part in any trade concerned with milk or foodstuffs without the doctor's consent. No person from an infected household should take part in a trade concerned with milk or other food supplies without the permission of the Medical Officer of Health.
10. It is advisable that persons who have had diarrhœa should wash their hands after each visit to the water closet.
11. Great care should be taken in disposing of refuse. Yards and the surroundings of houses should be kept specially clean.

Disinfectants may be obtained free of charge from the Council's depôts at Nant-y-moel and Ogmores Vale between 8.30 and 9 each morning, by presenting a form obtainable from the local doctors.



A Filter Beds at NANTYMOEL

B

UNFILTERED WATER FROM OGWR NANTYMOEL

NANTYMOEL

WESTERN MAIN

Cut Section of Main

C

OGWR FAWR

Fronwen Intake

D Fairy Glen

WYNDHAM

E Sluice Valve

Gorwyl Private Supply

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