

## EPIDEMIC ENTERITIS IN ABERDEEN DUE TO FOOD INFECTIONS.

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IN a preceding paper<sup>1</sup>, details were given of an investigation which demonstrated that an epidemic of milk-borne enteritis occurring in Aberdeen in 1919 was due to infection of milk with dysentery bacilli of the Flexner type. It was further stated that the epidemiological and clinical features of antecedent epidemics of milk-borne diarrhoea were such as to suggest that the former epidemics were probably also dysenteric infections, although bacteriological investigation had failed to identify the causative organisms.

More recent experience of food poisoning outbreaks in Aberdeen indicates need for expanding the view thus expressed. Three succeeding outbreaks of enteritis have occurred in Aberdeen since the dysentery epidemic of 1919, and it has been found impossible to provide convincing bacteriological proof of the nature of the infection in any one of the three outbreaks.

It has to be noted, moreover, (a) that in all the infections cases were available for complete clinical and bacteriological investigation practically from their first onset; (b) that in their clinical manifestations the cases had the clinical features of either Gaertner infections or of infections of bacillary dysentery; and (c) that, notwithstanding the fact that all the resources of a modern bacteriological laboratory within the hospital were available and were utilised fully in the effort to arrive at a bacteriological diagnosis, the nature of the infections in the three outbreaks remains without exact determination.

In view of conclusions about to be set forth as a result of this experience, it appears desirable to record with some detail the enteritis investigations under review.

### I. MEAT POISONING OUTBREAK.

During the forenoon of 5th November, 1921, a total of 30 cases of vomiting and diarrhoea occurred within a very limited area in the Footdee district of the city of Aberdeen. The police were early informed of the cases, and arranged for some of them being removed to the Royal Infirmary and to the Sick Children's Hospital. At the same time they communicated with the Health Department, and steps were immediately taken to investigate the outbreak. On inquiry, it soon became obvious that the cases were due to meat poisoning, and several of them were removed to the City Hospital for direct observation and treatment.

<sup>1</sup> Kinloch (VIII. 1923). *Journal of Hygiene*, XXI. 451.

*Cases and symptoms.* The inquiries made then and subsequently showed that there were 30 cases, of which 23 were females and seven males, and that all the cases were confined to 12 families. The ages of the sufferers varied from about 1½ years to 53 years—eight of them were under 5 years of age, seven were from 5 to 15 years, nine were from 15 to 30 years, and the remaining six were above 30.

The symptoms consisted of nausea, vomiting, diarrhoea and muscular cramps. In all the cases, except one where nausea alone occurred, there was vomiting. In 14 cases there was diarrhoea in addition to the vomiting, and in five cases there were cramps. In two of the cases with cramps there was no diarrhoea. In all the cases, symptoms developed within five hours of eating the suspected meat, and subsided within 48 hours. Apart from the nausea, vomiting was the first symptom in every case, and began in one case as early as half an hour after eating the suspected meat; in six cases it began in from one to two hours; in 12 cases in from two to three hours; in nine cases in from three to four hours; and in one case in from four to five hours.

In a few cases diarrhoea was reported to have occurred almost simultaneously with vomiting. In other cases it followed after a quarter of an hour to half an hour, or even an hour. In a small proportion of the cases, after the vomiting had apparently subsided, there was a recurrence of it as late as 10 or 12 hours after the initial symptoms, and in one case even as late as 36 hours. The stools were in most cases frequent and watery. There was no evidence of blood having been present in the stools. The cramps were mainly confined to the calf muscles and to the feet.

The temperature in almost all the cases was not above normal, although in at least one case it was 101° F. about nine hours after eating the suspected meat and about seven hours after vomiting and diarrhoea had begun. In this case there were cramps and a tendency to collapse. A moderate degree of collapse was noticed in several of the cases where vomiting and diarrhoea were pronounced.

The pulse was, in many of the cases, found to be considerably accelerated, being in a few cases about 130 to 135.

Severe headache was complained of in some cases, and in at least one case there was profuse sweating.

All the cases made a fairly rapid recovery, being practically restored to their normal health within 24 to 48 hours. In one case, which was removed to the Royal Infirmary, the patient was confined to bed for about four days.

The quantity of the suspected meat eaten by all the sufferers was small, and in several cases did not exceed half an ounce.

A cat in one house was said to have eaten some of the suspected meat and to have suffered also from vomiting and diarrhoea and to have died. On the other hand, a cat belonging to the vendor of the suspected meat was also said to have eaten a small portion of the meat without showing symptoms of illness.

*Source of poisoning.* Inquiry showed that all the persons suffering in the outbreak had partaken of tinned boiled beef supplied to them from a small grocery in the centre of the affected area, kept by a woman who had two unmarried daughters living with her of 19 and 23 years. The meat was taken from one tin containing about 6 lbs., which had been opened on the morning in which the meat was sold, and the contents transferred to a white enamelled metal plate. The plate was apparently clean, as also was the knife used for cutting the meat. It was admitted by the grocer that she had supplied portions of the meat to all the affected families, and that her own daughters had also partaken of it and had suffered. They formed part of the small group in which cramps were present as well as vomiting and diarrhoea, and one of them was the case in which illness began half an hour after eating the meat. The meat had, among all the affected persons, been eaten for breakfast.

The whole of the contents of the tin had not been sold by the time the police became aware of the outbreak of poisoning, and they accordingly took possession of the remaining 14 ounces of meat, and also of the empty tin, which, however, had been thrown into the ash bucket. The tin had been opened at both ends, and one of the ends was detached and not looked for by the police, and was not subsequently recovered.

The grocer, who had been in the habit of dealing regularly with tinned meat in her business, stated that the tin was not a "blown" tin, and a subsequent careful examination of the tin by the manager of a tinning factory did not reveal to him any evidence of the tin having been blown or punctured; but, as already stated, one end of the tin was awanting.

The grocer was certain that the meat showed no discoloration, and that it had no unusual odour, and so far as she knew, it had no unusual taste. In the case, however, of one or two of the families who suffered, it was stated that the meat had a peculiar sourish taste, and on that account a man in one of the houses, who had begun to eat the meat, spat it out.

So far as could be ascertained, no family that had received a portion of the meat from this tin wholly escaped symptoms of poisoning. Indeed, of all the 33 persons who partook of the meat, including the man referred to who said he spat it out, only three did not show poisoning symptoms.

The tin containing the meat looked comparatively fresh outwardly, and as if it had not been in stock for any great length of time. It bore a label which indicated that it was "*Fresh Boiled Beef*" packed by a well-known meat-production firm in South America.

The grocer stated that the tin was taken from one of two cases, each containing 12 tins, which had been received by her on 1st November from a wholesale merchant in Aberdeen. She also stated that she had previously sold in small quantities the contents of two tins from the same case, and that no complaint had been received from any of the purchasers. Inquiry among some of these customers by the Health Department confirmed her statement.

The wholesale merchant stated that the two cases of the tinned boiled beef

supplied to the grocer were part of a consignment of 14 such cases received by him on 3rd September from the London Company supplying the beef. All these cases had been sold to retail shops by the time that the outbreak took place—the whole of the shops, except one at Inverurie, being within the city of Aberdeen. Inquiries were made at every one of these shops as to whether complaints had been received of illness occurring in the families of persons to whom portions of this tinned beef had been sold, and in no case had any complaint been received, nor was any complaint received subsequent to the inquiry.

It would appear, therefore, that only one tin of the whole consignment was poisonous.

From the circumstances stated, it is scarcely open to doubt that the tinned boiled beef sold by the grocer on the morning of 5th November was the cause of the poisoning. It was the only meat or food sold by her that morning to the families involved in the outbreak that was likely to produce poisonous symptoms, and was, in any case, the only form of food sold by her to all the affected families. No other common food for these families was ascertained. Moreover, all the 33 persons who partook of the meat, except three, suffered.

*Bacteriological and chemical investigation.* Six samples of the suspected beef were submitted to examination at the City Hospital Laboratory. Five of these samples consisted of unconsumed portions of the beef that remained in five of the affected households, and the sixth sample consisted of the 14 ounces of beef that remained unsold from the suspected tin. Four samples of vomit, three samples of faeces, two samples of urine, and one sample of blood, all directly obtained from patients when their symptoms were most urgent, were also examined. The organs of the cat which died after eating the beef were also submitted to examination.

From all these materials cultures were made for the determination of the presence of *Salmonella* group bacilli, but with negative results. Anaerobic cultures from the same materials revealed no anaerobes of any significance in food poisoning.

Blood serum reactions from the patients in the hospital were also tested in reference to *Salmonella* type bacilli, the types used being those of the National Collection of Type Cultures in the Lister Institute. The results were negative.

Rats, mice, and guinea-pigs were fed with the beef, but showed no symptoms of illness; nor did certain rabbits and guinea-pigs when injected intravenously, intraperitoneally, and subcutaneously with a filtered emulsion made from the beef. The blood sera from these rabbits and guinea-pigs were tested for the presence of agglutinins, but without any positive result of diagnostic significance.

At the request of Dr Leighton, the Veterinary Officer of the Scottish Board of Health, samples of the meat were sent on 8th November to Mr Bruce White, Public Health Laboratory, University of Bristol, to be examined by him under the direction of Dr W. G. Savage.

Mr White reported that extensive cultural examinations of the meat for organisms of the Salmonella group had proved negative; but that the blood serum of a guinea-pig, which had received subcutaneously injections of filtered extract of the meat, developed a slight but definite agglutinative reaction in regard to the *Aertrycke* bacillus (Mutton type), thus indicating the presence of the toxins of this bacillus. The highest dilution, however, in which Mr White obtained evidence of definite agglutination, varied from 1 in 20 to 1 in 40, and it is obvious that such agglutinations are practically without any diagnostic significance whatsoever. The serum was tested against not only this bacillus, but also against *Bacillus aertrycke* (Newport), *B. enteritidis* and *B. paratyphosus* B.

At the request of Mr White and Dr Savage, samples of blood from four of the sufferers in the outbreak were sent to Bristol. The samples were taken about 26 days after the outbreak. Mr White found that an agglutinative reaction was obtainable with the *B. aertrycke* (Mutton type) with the serum in dilution of 1 in 10 from one of the patients. The sera from the three other patients gave a negative result.

Dr Savage, whose experience in the investigation of outbreaks of meat poisoning is greater than that of any other expert in this country, is of opinion that the outbreak under report was due to the toxins of *B. aertrycke* (Mutton type), but that no living organism of this bacillus, or of other meat-poisoning bacillus, were present—the bacilli having been destroyed in the process of canning.

The clinical characteristics of the outbreak and the brevity of the incubation period strongly support this view.

It remains to be added that a portion of the meat was examined chemically at the City Hospital Laboratory, immediately after the outbreak, for the presence of arsenic, antimony, lead, tin, and copper, and that no trace of these was found.

## II. HOSPITAL ENTERITIS OF UNDETERMINED ORIGIN.

Following upon the Footdee Meat Poisoning outbreak, nine cases of which had received treatment in the City Hospital, and the last of which cases was discharged from hospital on 9th November, 1921, a limited epidemic of enteritis occurred among hospital patients beginning on 19th November, 1921. The treatment of the patients suffering from meat poisoning was so recent as to suggest at once that a carrier had been created in the hospital staff and was the cause of the fresh enteritis. Careful investigation, however, gave no support to this assumption. Not only so, but the clinical features of the cases suffering from meat poisoning as described were those of Gaertner enteritis, whereas in the hospital enteritis, as about to be described, the symptoms clinically were those commonly ascribed to bacillary dysentery.

*Incidence.* The outbreak originated on 19th November, 1921, and the cases—21 in number—were spread over an interval of eight days, the incidence on

successive days being 1, 8, 6, 0, 0, 3, 2 and 1. No age-period escaped, the youngest patient affected being an infant of nine months, while the oldest was 60 years of age. Sex appeared to be of no importance.

*Distribution.* The distribution of the cases is given in Table I, and reveals the interesting fact that the only ward which remained unaffected was the Ailing Infants' Ward, which contained for the most part debilitated infants whose powers of resistance might reasonably be assumed to be low. Another interesting feature was that only one member of the rather extensive staff was affected, the patient being a nurse who was on duty in a ward which furnished three of the more acute cases, and who developed the disease simultaneously with the ward cases. Table II, which gives the order of occurrence of the cases in the individual wards, suggests a more or less sporadic distribution.

*Aetiology.* Food contamination was suspected, but no evidence in support could be found. The same food, cooked in the same utensils, was supplied to the staff and patients indiscriminately, and no proprietary meat preparations were employed. A milk contamination was negatived by the fact that the Ailing Infants' Ward, which utilised a considerable amount of the hospital milk supply without further sterilisation, gave rise to no cases of infection. No history of recent diarrhoea or of dysentery could be elicited from any of the ward-maids, kitchen, nursing, or medical staff, while no case of diarrhoeal disease was being treated in the hospital at the time of the outbreak.

*Symptoms.* The symptomatology showed a remarkable uniformity in all the cases. The onset appeared to be acute, and in the majority of the cases could be definitely fixed in point of time. A period of nausea, culminating in vomiting, was followed in from two to three hours by severe diarrhoea. The temperature quickly rose to 101 or 102° F. and was accompanied by a much accelerated pulse rate. The stools were frequent, numbering in one case as many as 12 within the first 24 hours, and were characterised by the presence of mucus in 17 cases and blood in 11 cases. Some patients complained of headache at the onset. Rectal tenesmus was not noted, and there was no evidence of the occurrence of cramps. These symptoms subsided in from 12 to 72 hours, the tendency to diarrhoea being last to disappear. Recovery was complete in every case, and the only treatment employed was the routine administration of a purgative, usually castor oil, and the use of stimulants in severe cases.

*Bacteriological investigation.* Repeated examinations were made of the stools in every instance, and of vomited material whenever available. All these specimens gave negative results for the typhoid-dysentery group bacilli. Several blood cultures made in the acute stage of the illness were sterile. The blood serum of six of the patients in the second week of illness was tested against the following organisms, viz. *B. paratyphosus* B., *B. paratyphosus* B. (Mutton), *B. paratyphosus* B. (Newport), *B. enteritidis* Gaertner, *B. dysenteriae* V, W, X, Y, Z and Shiga. No agglutination was obtained in any diagnostic dilution in any of these tests.

*Distribution of Cases.*

Table I.

Pavilion	Inmates	Cases
Diphtheria	34	5
Scarlet Fever (A)	54	5
Scarlet Fever (B)	12	3
Reception House	9	3
Tuberculosis (Male)	49	2
Tuberculosis (Female)	69	2
Nurses' Home	100	1
Ailing Infants	17	—
	Total	21

Table II.

Pavilion	Serial numbers of the cases
Diphtheria	2, 3, 4, 6 and 10
Scarlet Fever (A)	9, 13, 15, 16 and 20
Scarlet Fever (B)	7, 8 and 9
Reception House	1, 18 and 21
Tuberculosis (Male)	11 and 12
Tuberculosis (Female)	14 and 17
Nurses' Home	5

Many similar epidemics of hospital diarrhoea have been reported formerly, and hospital authorities are indebted to Dr Harold Kerr, Medical Officer of Health, Newcastle-on-Tyne, for the following recent summary of such outbreaks in the Maternity Hospitals of this country:

*Maternity Hospital, Newcastle-on-Tyne.* Recurring enteritis experienced for some considerable time. Newcomers to the hospital were found to be especially affected.

*Jessop Hospital, Sheffield.* Similar outbreak experienced recently. Some serious defects in the drainage system were found, and these were remedied. No further cases have occurred since.

*Maternity Hospital, Glasgow.* Maternity Hospital opened in 1908, and three outbreaks have occurred during the last seven years. Only affects untrained midwives, and very rarely babies, patients, or trained nurses. Suggests that the diarrhoea is a neurosis probably dependent on change of food and discipline. Associated polyuria?

*Queen Charlotte Hospital, London.* Reported outbreak at this hospital some years ago. Due to the use of Perchloride of Mercury?

*Union Maternity Hospital, Belfast.* Three cases among nurses occurred in August, 1921. One student also affected. Was attributed to rhubarb. One other nurse was ill for a couple of days during the last week in October. These were the only cases reported during a period extending over 30 years.

*Maternity Hospital, Edinburgh.* No cases during recent years. Years ago some cases were reported, but after the hospital had been put into a sanitary condition there has been no recurrence.

*Maternity Hospital, Leeds.* Recently experienced a serious outbreak of gastro-enteritis among the babies, the latter being due to carelessness in dealing with infected napkins.

*Rotunda Hospital, Dublin.* None recently. Years ago trouble of this nature was occasioned through the water supply, found to be due to the water having been obtained from old contaminated tanks.

### III. EPIDEMIC MILK-BORNE ENTERITIS IN ABERDEEN—JUNE, 1923.

In opportune fashion the Scottish Board of Health, having reference to the interest aroused by the tragic experience of botulism at Loch Maree, requested Local Authorities in a letter dated 13th October, 1922, to report forthwith to the Board all cases of food poisoning with a view to their fuller investigation. The response of the medical practitioners of Aberdeen to a circular letter from the Health Department indicating the Board's requirements in this connection has been of the best description. By means of this cordial co-operation, it was brought to the knowledge of the Health Department within a few hours of the appearance of the first of the cases that an outbreak of acute enteritis suspected to be due to food poisoning had occurred in Aberdeen on 6th June, 1923.

*Milk infection.* On first inquiry, it was ascertained that all the known cases had received milk from a retail shop of one of the largest dairies in the city. The milk supply of this dairy, amounting on an average to about 2000 gallons of milk per day, received from some 34 farms in the surrounding districts, is commonly pasteurised on delivery; but on inquiry it was ascertained that on 6th June the retail shop in question had run short of milk, and that ten gallons of a 20-gallon consignment of milk from a farm in the vicinity of Aberdeen had been retailed directly without pasteurisation. Concurrent investigation later elicited the fact that certain cases of enteritis typical of the cases in the outbreak under review had occurred in families which received milk from an entirely distinct source, namely, from a farmer who retailed milk by cart directly from his farm, and accordingly it appeared at first that so far as milk supply was concerned there could be no connection between the two groups of cases, although both groups of enteritis cases were determined to have exactly similar symptoms and approximately the same time of onset of illness. Further inquiry, however, elicited the fact that on 6th June the retailing farmer in the course of his distribution had run short of milk, and in order to supply his remaining customers had obtained one and a half gallons of milk from the premises of the dairy in question. Only those customers of the retailing farmer who received part of the one and a half gallons of milk from this source contracted the enteritis. It further appeared that the one and a half gallons of milk so obtained was taken from the receptacle from which raw milk was pumped to the pasteurising plant of the dairy, and which at the time contained in addition to other milk the remaining ten gallons of the 20-gallon consignment under suspicion. The remainder of this milk was subjected to pasteurisation in the usual fashion. There can be no reasonable doubt, therefore, that the 11½ gallons of milk which was retailed without pasteurisation was wholly



responsible for the infection. No other food was common to the infected households; and of the 43 families known to have received the infected milk, no family escaped infection, although 127 individuals escaped infection out of a total of 237 thus exposed. The ten gallons of infective milk in the dairy was exposed for sale about 10 a.m. on 6th June, and had been completely disposed of by 5 p.m. The additional one and a half gallons of unpasteurised and presumably infected milk was retailed between 8.30 a.m. and 9.30 a.m. on the same day.

*Incidence and distribution.* Of the total of 110 persons known to have contracted the enteritis, 14 were found to have sickened within 12 hours of consuming the infected milk, the shortest incubation period determined being five hours. An additional 47 persons were found to have sickened in from 12 to 24 hours after taking the milk; nine persons sickened in from 24 to 36 hours; and five persons were found to have sickened within from 36 to 48 hours; leaving 35 persons concerning whom the interval elapsing between the time of the consumption of the milk and the onset of illness was not determined. Of the 110 known cases of enteritis, eight sickened on the 6th June, 87 on the 7th, nine on the 8th, one on the 9th, and one on the 10th. The two latter cases were probably cases of contact infection, since original cases in these families occurred on the 6th or 7th June. In four cases the date of onset was not accurately determined.

As regards sex distribution, 47 of the 110 cases were males, and 63 were females, giving a proportion of 43 per cent. of males to 57 per cent. of females.

With reference to age distribution, four of the total cases were under 2 years of age; seven were in the 2 to 5 year age-period; 27 in the 5 to 15 year age-period; 21 in the 15 to 25 year age-period; 31 in the 25 to 45 year age-period; 17 in the 45 to 65 year age-period; and three above 65 years.

*Source of infection.* Inquiry and examination at the dairy supplying the milk revealed no evidence that the  $11\frac{1}{2}$  gallons of milk causing the enteritis could have been infected on the dairy premises. Inquiry at the farm producing the 20-gallon consignment of milk from which the  $11\frac{1}{2}$  gallons of infected milk was derived, elicited the fact that all the children of the farmer had suffered from an acute diarrhoea within a fortnight of the time the enteritis had appeared in the city. The farmer's wife and sister living with the children were engaged in the production of this milk, but since the dairyman had intimated to the farmer that his milk supply was under suspicion as a cause of the enteritis outbreak in the city, the reticence of the farmer was such that on inquiry no accurate information could be obtained of the nature or of the distribution of the diarrhoea in the farmer's family.

*Symptomatology and treatment.* The symptoms were remarkably uniform in the case under observation, and clinically were those attributable to bacillary dysentery infections, variation of clinical appearance having reference to intensity rather than to type. There was rise of temperature from 101 to 103° F. with pulse and respiratory rate in proportion. The onset was acute with obvious

shivering or sweating accompanied by abdominal pain localised mainly in the epigastric region. Vomiting, quickly followed by diarrhoea, developed in from one to four hours of the onset of illness, and the epigastric pain thereafter appeared to subside. Headache and backache were present in most cases, and within 24 hours the majority of the cases showed a considerable degree of collapse. Purging was intense in most instances, some patients having as many as 24 stools in the first 24 hours. Intermittent abdominal cramps were noted with occasional rectal tenesmus. Blood appeared in the stools of the vast majority of cases, but the most striking faecal feature was the amount of mucus, some of the stools in many of the cases being almost entirely composed of mucus. In the great majority of cases acute symptoms abated in from 36 to 48 hours. There were no deaths.

In four cases admitted to the City Fever Hospital polyvalent anti-dysenteric serum was given intravenously along with the oral administration of sodium sulphate. The remaining great majority of cases, however, received only aperient treatment and recovered with equal facility.

Opposed to the conclusion on clinical evidence that this enteritis had the essential features of a bacillary dysentery are the facts that out of an ascertained 110 cases none died, and that out of 106 of the 110 cases that received no specific therapy no case manifested the symptoms of chronic bacillary dysentery.

#### BACTERIOLOGICAL INVESTIGATION.

##### 1. *Cases in Aberdeen.*

A. *Faeces from patients.* Thirty samples of faeces obtained from 21 patients at the height of illness gave negative results for non-lactose fermenting colonies of the paratyphoid-dysentery group. As it has been suggested by some British and American workers that streptococci may cause outbreaks of enteritis of this description, films were made from each sample of faeces. Streptococci were seen in some of the films, but in others none were found. Six samples of faeces were plated on blood-agar but only from two were streptococci obtained—*Streptococcus faecalis* and *S. viridans*.

Twenty strains of Gram-negative bacilli were isolated from McConkey plates and blood-agar plates. Some of these strains produced acid in lactose and in others sugars, without the formation of gas; others were non-lactose fermenters which did not conform to the sugar reactions of the paratyphoid group otherwise than in producing acid and gas in glucose and mannite and they did not react to any known serum. The sera of the four individuals in hospital gave negative results against the strains of organisms isolated from the various specimens of faeces.

B. *Blood cultures.* Three blood cultures were taken from patients in the acute stage of the disease. All were found to be sterile.

C. *Agglutination reactions.* Four samples of blood were taken in the second week from cases which had suffered severely from the enteritis. The sera were

tested against *B. paratyphosus* B., *B. paratyphosus* B. (Mutton), *B. paratyphosus* B. (Newport), *B. dysenteriae* (Flexner) V, W, X, Y, Z and *B. dysenteriae* Shiga. No agglutination was obtained in any diagnostic dilution even after incubation at 55° C. for 24 hours.

In view of the fact that in a previous dysenteric outbreak agglutinins had been found to be present in the blood serum of cases in the fourth week of illness although such agglutinins had not been demonstrated at an earlier stage of illness, blood serum specimens were obtained from six typical cases four weeks after they had suffered from the infection, but no agglutinative results of diagnostic significance were obtained in any of the cases. In general, these negative laboratory findings were confirmed by Dr Savage and Mr Bruce White working with similar laboratory specimens delayed in transit.

## 2. Cases at Farm.

A. *Agglutination reactions.* The sera of the five individuals at the farm who were capable of originating directly or indirectly the infection, were tested against paratyphoid, Gaertner, dysentery organisms. No agglutinations were obtained.

B. *Faeces.* The faeces of these five individuals, directly or indirectly capable of milk infection at the farm, were not found to contain any known pathogenic non-lactose fermenting organism.

The nature of the infection in this outbreak of milk poisoning remains, therefore, entirely undetermined, although the cases were subject to complete clinical and bacteriological investigation from their first onset.

Dr Savage is of opinion that this milk-borne enteritis was due to a living bacillus of unrecognised type of a strain allied to *B. dysenteriae*.

## CONCLUSION.

In view of the Aberdeen experience, it seems reasonable to suggest, (a) that, even under the most advantageous conditions, modern bacteriological methods not infrequently fail to provide proof of the nature of Gaertner-dysenteric group infections, or (b) that viruses hitherto undetected can originate diarrhoeal outbreaks simulating clinically Gaertner-dysenteric infections.

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