REPORT ON DYSENTERY OUTBREAK CAUSED BY INFECTED MILK

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On 20 and 21 September 1955 over 90 cases of suspected food-poisoning, including 4 deaths, were reported in a South African town. Food poisoning is not notifiable, and it is possible that an even larger number of persons were affected.

The first cases arose in a non-European crèche-nursery school in the location, where 64 children between the ages of 3 and 8 years, out of a total of 125, and 9 adults of the staff, became ill from 10 p.m. onwards on the night of Monday 20 September. Thus the outbreak assumed an explosive form, as is frequent with such infections.[1] Later enquiry revealed that a number of European residents, one European adult from a neighbouring village, and a European child from further afield, were also affected. Both the latter cases were found to have visited the town on the Monday.

Throughout, the clinical case-histories were uniform in character, varying only in degree in their symptomatology. Common features were pyrexia, nausea, vomiting, headache, abdominal cramps, tenesmus and diarrhoea, accompanied in some cases by a mucopurulent bloody discharge from the rectum. In the more severe cases shock became marked, culminating in the deaths of 3 non-European children and one European child.

Investigation showed that various foods had been consumed by the nursery-school group and other affected groups. Korf, Tabach and Beard,[2] in a co-ordinated investigation of suspected food-poisoning, demonstrated a statistical epidemiological procedure for determining offending foods in an outbreak in the absence of facilities for bacteriological analysis. This method presupposes a reliable history and the consumption of a number of different foods. By judicious elimination of foods eaten by sufferers and non-sufferers and emphasis on the group who had consumed the largest quantity of one single suspected food, the pointer is given to the most likely source of infection. This principle, which is usually adopted in any outbreak, was in fact applied here, with the added facility that laboratory diagnosis was also available.

The result of the investigation showed sour milk to be the common food-factor in all the cases. This sour milk was produced in a milk-depot in the town. The children at the crèche had received their usual quota of the sour milk on the Monday and this was consumed at 2.30 p.m. that day. The first symptoms were noticed some 7 hours later. By midday on the Tuesday, the sale of sour milk from the milk depot in question had been suspended, but not before that day's supply, too, had been sold over the counter to

the general public. The European owner-manager himself developed symptoms of food poisoning about 6 hours after consuming some of the Tuesday's supply, whilst a European child 7 or 8 years old, who died in a distant town, was shown to have only drunk sour milk from Tuesday's supply.

It was evident that the sour milk was the cause of the outbreak, and it remained to establish the source of the contamination. Clearly the fresh milk from the depot could not be implicated, because 20 gallons had been supplied to the hospital and the high school, where no cases had occurred. As only the sour milk sold on Monday and Tuesday, i.e. that prepared on the Sunday and Monday, were under suspicion, it was important to establish the condition of production on those days by comparison with that formerly existing. Interrogation revealed that sour milk was normally prepared in the depot in the following manner:

From the fresh milk obtained either daily or on alternate days from a near-by farm, 18 gallons are skimmed, the rest being sold as fresh milk immediately on arrival. A sterilized 'culture' of *B. cremoris*, supplied by a recognized distributor, is now added in small quantities into 3 separate bottles each containing half a pint of skimmed milk, and these mixtures are then maintained at 50°F. One bottle of this 'starter medium' is then added to 9 gallons of skimmed milk, which is normally first boiled in the back yard of the milk-depot over an open fire for an hour in a sterilized can and allowed to cool to 90°F. After the addition of the starter the mixture is immediately boiled on an open fire in the back yard and left to cool for a variable period, usually between 20 and 24 hours. This mixture, now known as sour milk, is decanted into bottles and sealed for sale to the public. The boiling and cooling processes are normally supervised by the European manager himself assisted by one non-European employee, who shall be named X. On the Sunday in question, at the production of the first batch of sour milk X was apparently in sole charge, and he states that to facilitate the cooling of the milk and starter after boiling, he removed the lids from the containers and left the contents exposed to the air until it was cool. Evidence could not be obtained as to who was responsible for the boiling of the milk before the addition of the starter, though the impression gained was that the European had supervised this part of the process the previous day. Nor could reliable evidence be obtained as to who carried out the above procedures on the Monday.

The investigation revealed that the inside of the depot was reasonably clean. Some 12 to 15 feet from the cooling site, however, there stood an ungauzed unprotected pail-privy and, adjoining the yard of the depot and divided from it by only a wire-netting, a fowl-run. Mice droppings revealed the presence of mice in the depot itself.

Pathological Investigations

Specimens of the following were submitted for repeated investigation:

(*a*) All food eaten at the crèche on the Monday.
(*b*) Gastric contents of one of the deceased children.
(*c*) Fresh milk used in the preparation of sour milk.
(*d*) The 'culture' used to inoculate the milk.
(*e*) Sour milk from both Monday's and Tuesday's supplies.
(*f*) Stools, urines and rectal swabs from all employees at the milk depot.
(*g*) Blood for agglutination tests.
(*h*) Mice and fowl droppings.

Findings. No abnormal bacteriological or chemical findings were revealed in respect of (*a*), (*c*), (*d*), (*g*) and (*h*); but the gastric contents of the deceased child, the stools of 6 non-European employees (including X), and the sour milk yielded a growth of *Shigella Newcastle*, which morphologically and toxicologically is classified in the dysentery group.

Previous outbreaks of food poisoning are reported to have occurred as the result of infection with the organism, and milk and its products appear to be suitable media for its growth. As is common in food poisoning caused by similar organisms, the severity of an outbreak varies proportionately with the amount of organisms ingested and the virulence of the bacterium at the time of ingestion. Symptomless carriers are said to be common, but their existence usually remains unknown until a sporadic outbreak of food poisoning or dysentery draws attention to their presence.

In 1949 Warner[3] submitted a simplified bacteriological classification of food poisonings and excluded from the definition infections by Shigella organisms and *Salmonella typhi* and *paratyphi*. Christie[5] states that the dysentery organisms can survive on dry linen, taps, door-handles, crockery, and lavatory plugs. Where washing facilities are poor, and the staff ignorant, illiterate or badly informed, all the conditions exist for the spread of an infection.

It has been stated that so easily can the *S. Newcastle* be conveyed from carriers to others in close contact that the unveiling of a single carrier has frequently been associated with the presence of the bacillus in the workers closely associated with that employee. As is shown in this report, this was in fact the case here.

Discussion

It is clear that the vehicle in this outbreak was the sour milk prepared on Sunday and Monday, 19 and 20 September, respectively. Contamination most likely occurred during the cooling process while the contents of the cans were left uncovered. It cannot be incontrovertibly asserted that X was the only and original vector, in view of the presence of 5 other carriers discovered working in the depot. This latter group, however, only handled the milk after it had been bottled and was ready for delivery; nor did the virulence and agglutination tests subsequently done assist in specifically incriminating X, for the results were inconclusive. The fact that is indisputable is that X alone handled the sour milk before it was bottled, while the others did not. The possibility of contamination arising from flies infected from the faeces in the open pail-privy could also not be discounted, as it could not be definitely ascertained that flies were not present at the suspected time of contamination.

Course and Control of Outbreak

The epidemic ceased spontaneously on the cessation of supply of sour milk. The Native X was removed to other suitable employment. The hygiene of the depot was improved and offending factors removed. In view of the grave risk that the remaining Native employees might also infect the supply, and the long period that must elapse before these men could be rendered bacteriologically negative, it was decided to find other employment for them also. In an outbreak of Sonne dysentery occurring in the Papworth Settlement, England, positive food-handlers were not allowed to return to work until 6 consecutive negatives had been obtained.[4]

Sensitivity tests were undertaken to ascertain the antibiotic most likely to effect a rapid and possibly permanent cure. These revealed that the organism was sensitive to both Terramycin and Chloromycetin. Instructions were issued to treat all the employees affected by the organism. Unfortunately they 'disappeared', but it is known that they are not employed in food establishments in the town.

SUMMARY

1. An epidemic of Bacillus Newcastle dysentery is described, affecting over 90 persons and resulting in 4 deaths.

2. *Shigella Newcastle* was identified in the suspected carriers, in the sour milk conveying the infection, and in the gastric contents of a deceased child.

3. Views are expressed as to the exact manner in which the infection was conveyed from handler to food substance.

I have to express my thanks to the Secretary for Health for granting permission to publish.

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4. Committee, Papworth Village Settlement (1953): Monthly Bull. Minist. Hlth. (Lond.), **12,** 229.
5. Christie, A. B., *loc. cit.*,[1] p. 673.