FOOD poisoning is here taken to mean an acute illness, usually involving a number of people within a short space of time, and associated by direct or indirect evidence with the ingestion of food. Though the cause may differ widely from chemical to bacterial agents the pattern of symptoms is usually similar, predominantly gastro-intestinal. Botulism is included here because it is derived from food, though the symptoms are neuro-toxic in nature. The various types of food poisoning are grouped thus: (1) epidemic diarrhoea, proven or suspected to be due to bacillary dysentery; (2) Salmonella infections; (3) infections by staphylococci or their toxins; (4) other bacterial or possibly viral infections; (5) poisoning by organic or inorganic substances; (6) botulism.

(1) DYSENTERIC INFECTIONS

The value of bacteriological investigations in the field has been shown by occasional outbreaks of bacillary dysentery which simulated other types of food poisoning. In New Guinea in particular outbreaks of an explosive kind have been seen, in which vomiting, diarrhoea and abdominal pain have attacked a number of men within a short period. Though the clinical history has sometimes suggested other forms of food poisoning, by reason of a short incubation period, a rapid course, and simultaneous occurrence in a group of men, cultures of true dysenteric organisms have been grown on occasion.

(2) SALMONELLA INFECTIONS

The group of Salmonella infections causing continued fever has been described in the section on enteric fevers. These differ from the Salmonella infections of the food poisoning type by their longer incubation period and by their longer, more serious course. Some of the Salmonella group such as the aertrycke type were believed to be responsible for numbers of outbreaks of food poisoning in the Services. A technical instruction was issued by the D.G.M.S., Army, on the general subject of food poisoning. In this it was pointed out that Salmonella infections were known to be an important cause, though demonstration of the exact organism and of its method of transmission was often difficult. Massive infection with living organisms probably occurred, through contamination of foodstuffs especially those whose preparation involved handling, such as ham, salt beef, and in particular warmed-up food. In Darwin one outbreak was traced to either mince or rice. Storage of food at temperatures over 65°F. is known to predispose to development of the organisms, and this frequently occurred in tropical climates. Rats and mice have been blamed for spread of this type of food poisoning, and probably flies also. While human carriers have apparently not been specially blamed in all such outbreaks of infec-
tious food poisoning, there was a growing realisation in the services of the importance of looking to the method of handling and preparation of food as a source of trouble.

The symptoms produced were those of a sharp attack of gastro-enteritis, with vomiting and diarrhoea. The incubation period was short, twelve to twenty-four hours, which often enabled the infection to be traced with reasonable certainty. As the organisms are rapidly eliminated such outbreaks usually subsided quickly, and did not spread widely. The greater persistence of *Salmonella enteritidis* and the finding of occasional human carriers of other types as Draper has shown dictate caution where outbreaks have occurred. Sulphaguanidine and other sulphonamides have not been found effective in the treatment of *Salmonella* infections in general, though the former has given good results in some outbreaks of *Salmonella cholera suis* and *paratyphoid A*.

**STAPHYLOCOCCAL POISONING**

Similar kinds of food could also be infected with staphylococci, which caused characteristic symptoms. In *Salmonella* infections it is the living organism which causes the symptoms, but in staphylococcal infections both the living organism and its toxin can cause illness of distinctive kind. Therefore cooking of food is not necessarily a safeguard if it has been previously infected. Here again food handled in preparation especially by anyone with staphylococcal infection of the hands or food stored at too high a temperature may be massively infected, and though the organisms will not survive efficient cooking their exo-toxin may. W. J. Scott and D. F. Stewart, investigating the question of contamination of foodstuffs for the Council for Scientific and Industrial Research, found that in one instance hams stored at 80°F. had been infected with a strain of *Staphylococcus aureus* which produced a potent toxin. Sangster and Constance described an outbreak among troops which illustrated the usually distinctive features. Numbers of similar outbreaks of this kind occurred in the Services, in which the rapid onset, severe initial symptoms and rapid recovery were exemplified. The incubation period was usually a few hours only or even one hour. Abdominal pain was followed by faintness, vomiting and diarrhoea. Vomiting was sometimes exhausting and persisted for several hours. Not infrequently a large loose stool was passed at the beginning of the attack, with signs and symptoms of collapse. Occasionally the onset was one of dramatic severity, and even in less severe attacks physical weakness was often extreme for a short time. In Sangster and Constance’s series 23 men were admitted to hospital within thirty minutes; they were quite well within two or three days. Another outbreak of undetermined but probably similar origin caused the rapid collapse of 170 patients in a United States Army train after eating stew. On an army transport lying at Colombo over 400 men were simultaneously attacked during the night, and lay about the decks in lamentable discomfort, possibly heightened by mass suggestion. This outbreak did not affect officers or N.C.O.’s and some of the affected men had not been ashore. The cause was not ascertained
but was possibly staphylococcal. Another outbreak occurred in an L.S.T. at Tarakan and was traced to meat sandwiches. Though milk foods are supposed to be a commoner vector of this affection than meat, the latter seemed to be the usual source in service experience.

(4) OTHER EPIDEMIC FORMS OF GASTRO-ENTERITIS

Epidemics of gastro-enteritis occurred in many parts of the world during the war years which could not be traced to known bacterial cause. The suggestion has been made that a virus might be the cause. Service experience can shed no light on this suggestion. It was found that even when the bacteriological cause of an outbreak of diarrhoea was proved the organism was isolated only with considerable difficulty in the milder infections, especially towards the end of an epidemic. Civilian experience has also shown how difficult it may be to discover and isolate the causal organism in some of the severe epidemics of diarrhoecal disease in young babies. This form of gastro-enteritis appears to have been occurring in adults also in the civilian community, and with a greater prevalence than before the war.

(5) POISONING OF CHEMICAL ORIGIN

Under this heading are included only conditions whose symptoms simulate infective disease derived from foodstuffs.

An outbreak of a gastro-intestinal disorder in Egypt suggested by its symptoms the possibility of a metallic poison taken accidentally in food, but no evidence was found. All the men recovered quickly.

A number of vegetable poisons were known to exist in Northern Australia and New Guinea. Mostly the toxic effects observed affected the skin by contact, and reference will be made to these in the section on dermatology. Booklets describing the edible and non-edible plants in New Guinea, compiled from intelligence summaries, were published by Land Headquarters for information. Very few instances were encountered of illness due to poisoning by local fruits or nuts. Simple diarrhoea was caused sometimes in New Guinea by an excess of fruit, such as paw paw, and prisoners of war in Japanese camps sometimes suffered from mechanical diarrhoea caused by the eating of indigestible material through sheer hunger. At Lae symptoms of poisoning were observed to follow the eating of some native nuts, such as the “candle nut” which contains croton oil. On one occasion twelve men were affected with severe abdominal pain and tenesmus, passed blood and mucus in the stools, and suffered from severe shock. Six of them required some fluid replacement by glucose and saline solution or blood.

H. Flecker drew attention to the possibility of troops in Queensland being poisoned by the “Finger Cherry” (*Rhodomyrtus macrocarpa*), which has in rare instances caused blindness. As the fruit is only occasionally poisonous it has been suggested that only unripe fruit is toxic, or that
the symptoms are really due to a fungus growth. No instances of poisoning were seen in the Australian Services.

Surgeon-Lieutenant Begg drew attention to the possibility of poisoning by potatoes (solanine poisoning). While H.M.A.S. Warramunga was en route for Noemfoor in June 1944 twelve out of seventeen ratings were suddenly attacked by severe abdominal pain and watery diarrhoea, without the passage of blood or mucus. A conspicuous feature was the extreme weakness of the men, who were unable to walk. The only evidence was circumstantial, but the only men affected were those who had eaten boiled potatoes. These vegetables were the last of a batch a month old; most of them were sprouting, and some had been discarded as bad.

(6) BOTULISM

One outbreak of botulism occurred in the Australian Army in the Northern Territory. Instances of faulty tinned food were occasionally seen in various areas. An Australian mobile bacteriological laboratory reported the growing of an organism consistent with Clostridium botulinum from “blown” tins of ham prepared in Australia. However, it was pointed out in the Technical Instruction No. 61 that in botulism, as in staphylococcal poisoning, the symptoms may not be due to living organisms but to toxins generated in the infected food. In each case sufficient time must elapse between the implantation of the infection and the production of the toxin. For this reason particular care was advised with warmed-up food.

A suspicious series, probably due to the same cause, occurred in United States troops in Iron Range, Queensland. Seven men died as a result, but examination of 400 tins of suspected beetroot did not reveal any Clostridium botulinum.

The Australian cases were undoubtedly due to botulism. Halliday reported the admission of five soldiers to hospital in Adelaide River, Northern Territory, with symptoms of initial gastro-enteritis followed by signs of involvement of the central nervous system. These men made sandwiches of tinned beetroot, but noticing a curious brownish colour and an unpleasant taste they spat it out, only one of them swallowing a mouthful. Two were only slightly upset and recovered without developing any nervous symptoms. Another man vomited and three days later had blurred vision and discomfort on swallowing, but recovered fully in a few days. Two other men were seriously ill and one died. The latter fell ill in thirteen hours with vomiting and cramps, and the following day had difficulty in speaking and swallowing. These signs progressed, ptosis appeared with mental dullness and cyanosis, and he died on the fourth day. The other man had blurred vision as his first symptom on the second day and dysphagia and ptosis followed. There was considerable weakness of the muscles of the limbs. No abnormality was found in the cerebro-spinal fluid. After a month he had practically recovered, but was still debilitated.

Though no organisms were grown from any tins examined there was no doubt about the source of this infection. The use of bent, rusty, swollen or leaking tins was prohibited, and instructions were promptly issued for-
bidding the consumption of tinned beetroot. The canning process was investigated and improved, and the accumulated remainder of unused tins was dumped at sea. No further cases of botulism occurred.

Notes were given to medical officers of points useful in the differential diagnosis of food poisoning, particularly with regard to the incubation period and type of symptoms. The power of food poisoning to light up a dysenteric infection was particularly stressed. Methods were detailed which would help in the investigation of any outbreak, including full clinical details, study of the implicated food, collection of the actual food consumed, and of specimens useful for bacteriological investigation.

REFERENCES

D.G.M.S., Army, Tech. Instr., No. 61.