protection for aeroplane pilots, greenhouse sprayers, or those handling concentrated parathion in enclosed spaces. Moreover, up to 16 mg. of parathion may filter through in an eight-hour period, and this together with absorption through the skin around the mask may constitute a fatal dose. Several accidents, some fatal, have occurred where faulty or untested respirators have been used.

Protective clothing, including socks and underclothing, must be laundered each day. Adequate facilities for washing must be available and persons exposed to parathion are advised to remove all working clothes and take a bath at the end of each day's work. If parathion is splashed on to clothing this must be changed completely, and all areas of the skin which have been in contact with the soiled clothing must be washed immediately. The hands and face should be washed thoroughly in hot water and soap before eating and smoking. Whereas these precautions may be enforced in factories it is almost impossible to ensure that they are carried out in the field.

Routine estimations of cholinesterase activity of plasma and red blood cells should be made at weekly intervals in all persons exposed to parathion, H.E.T.P. and T.E.P.P. Davies and Rutland (1950) have investigated the variation in cholinesterase activity of plasma and red blood cells in 200 healthy adults of both sexes. Normal activity may vary from the mean by as much as 40% (see Table). Moreover,

Plasma and Red Blood Cell Cholinesterase: Normal Limits of Variation in Healthy Adults (Mean = 100)

Group	Coefficient of Variation	Mean Normal Limits %
Plasma cholinesterase:		
Service	19.9	60.2-139.8
Males (G.P.)	19.1	61.8-138.2
Females (G.P.)	23.7	52.6-147.4
All Groups	21.2	57.6-142.4
R.B.C. cholinesterase:		
Service	11.8	77.2-122.8
Males (G.P.)	14.4	71.2-128.8
Females (G.P.)	12.1	75.8-124.2
All Groups	15.7	68.6-131.4

After Davies and Rutland (1950).

there is an individual variation of up to 26% for red blood cell cholinesterase and 37% for the plasma enzyme. There may also be a seasonal difference. It is therefore obvious that the significance of reduced cholinesterase activity in random samples of blood is difficult to assess. Every effort should be made to estimate cholinesterase activity in each individual before exposure to organic phosphorus insecticides occurs, and subsequently at weekly intervals. Clearly a more decisive and a more simple test of exposure to these substances is urgently required. Organic phosphorus insecticides should be used only by experienced operators who fully understand the hazards and who are adequately protected and constantly supervised in their work.

I am indebted to the Medical Research Council and particularly to Dr. Donald Hunter for the opportunity to study the toxicity to man of the new insecticides. Special acknowledgment is due to Dr. A. McGhee Harvey and Dr. David Grob, Department of Medicine, Johns Hopkins Hospital, Baltimore, and to Dr. D. R. Davies, Chemical Defence Experimental Establishment, in the United Kingdom.

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FOOD-POISONING IN SHEFFIELD IN 1949

BY

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During the long hot summer of 1949 seven small outbreaks of food-poisoning in Sheffield produced 36, 4, 20, 37, 9, 1, and 1 cases of illness respectively. Of these 108 cases only 13 were notified by general practitioners and three by hospitals. The remainder came to light through a few of the victims contacting the public health department direct and by the staff of the department making inquiries among other persons likely to be affected.

A food preparer with a septic hand was found to be associated with each of the four outbreaks described below, but the association was not necessarily the cause of the third and fourth outbreaks.

First Outbreak

At 10 p.m. on Wednesday, July 27, 1949, the superintendent of the Infectious Diseases Hospital informed the medical officer of health that he had admitted two patients who were very ill with food-poisoning. A visit was paid immediately to their home and the possible cause of the trouble was ascertained to be a chicken-and-rabbit preparation bought from a near-by shop the previous day.

The shop was visited the following morning and the source of the meat product was traced to a small local food factory which was very clean and well equipped. The chicken and rabbit had been prepared the previous Saturday by two men who boiled the carcasses in a large cauldron, removed the flesh from the bones by hand, and immediately reheated the flesh before packing it into moulds, adding melted gelatin, and then pressing. After cooling, the preparation was stored in a refrigerator until the Monday evening, when it was distributed to five shops where it was kept in refrigerators until sold on the Tuesday and Wednesday. The manufacturer estimated that between 500 and 700 persons would eat the meat.

Although food-poisoning is notifiable in accordance with the Food and Drugs Act, 1938, the great importance of immediate notification seemed not to be generally realized. Inquiry was therefore made at the shops, and lists of customers were obtained. When these were visited, a total of 36 persons who had been supplied from one or other of four of the five shops were found to have been affected. Of these, 35 had eaten the chicken and rabbit, and one had eaten black-pudding from the same food factory. Of other persons who had eaten the chicken and rabbit in company with those who were later affected, only three groups (comprising one, two, and three persons respectively) remained unaffected. Two dogs in different households fed on the leavings of the victims remained well.

Of those persons affected, 13 had consumed the meat on the day of purchase and 23 on the following day. One man was unaffected after eating the product on the

day of purchase but had a moderately severe attack of illness when he ate a further portion 20 hours later. There were no complaints regarding taste or appearance. In every case between 1 and 4 oz. (28 and 113 mg.) of meat was eaten.

On the whole the symptoms were severe, five persons being admitted to hospital and several others being in bed at home for some days, with the doctor in attendance. The seven most severely affected persons had all consumed the food about 24 hours after purchase.

Every case suffered from diarrhoea or vomiting, or both. Only five cases did not vomit and in these the illness began 5, 7½, 8½, 10, and 22 hours after eating the food. All but four cases had diarrhoea, and in these four the illness began ½, 2, 5½, and 5½ hours after the food was eaten.

Of the 36 persons affected, five had symptoms beginning within an hour, 21 in one to five hours, and nine in five to ten hours after eating, the longest period between eating the food and the onset of symptoms being 22 hours. This victim was the only one in whom the period was over 10 hours. In the worst cases the period between eating the food and the onset of symptoms was less than 2½ hours and there was pyrexia, dizziness, collapse, abdominal pain, and muscular cramp. One woman was affected even though she had cooked her meat by making "hash."

A total of 13 unaffected households were visited. In 10 of these families the meat had been eaten on the day of purchase, and in three on the following day. In no case had a domestic refrigerator been used.

The weather was exceptionally hot at the time of this outbreak, the maximum and minimum shade temperatures on the Tuesday and Wednesday being 76 and 61° F. (24.4 and 16.1° C.) and 76 and 64° F. (24.4 and 17.8° C.) respectively.

One of the two men who made the galantine was found to have a mild dermatitis of the hands and wrists. The condition had been present since infancy, and he had been employed in his trade for over 30 years. His hands and nose were swabbed at the time of investigation, though an interval of five days had elapsed since he helped to make the galantine. A heavy growth of *Staphylococcus aureus*, coagulase-positive, phage type 6/47/53/54 (that is, the strain was attacked by phages Nos. 6, 47, 53, and 54) was obtained from the hands, but *Staph. aureus* was not isolated from the nose.

Hand and nose swabs were also taken from the four remaining persons employed in the factory. *Staph. aureus* was isolated from the nose and hands of one of these and from the nose of another. Their strains proved untypable, but neither of them had had any contact with the food in question.

Staph. aureus of the same phage type was isolated from portions of galantine removed from the homes of the victims. The number of bacteria per gramme exceeded 20 million, staphylococci predominating. An untypable strain was isolated from a paper bag in which one of those affected had taken the meat in sandwiches for lunch.

From one specimen of vomit and six specimens of faeces, *Staph. aureus*, coagulase-positive, was isolated. Some of these proved untypable, but the following were typed: vomit: phage type 6/47/53/54 (staphylococci numerous on primary plates); faeces: 6/42E/47/53/54 (staphylococci numerous on primary plates); faeces: 6/47/53 and 53/54 (staphylococci isolated only after cultivation in 10% salt broth).

The staphylococci isolated from the faeces were considered by the Central Public Health Laboratory to be probably of the same type as that in the food and as that from the hands of the food preparer. After a week's treatment with penicillin ointment the staphylococci were still present on his hands, but none were isolated after a second week's treatment, though the clinical appearance had altered very little.

Second Outbreak

The second outbreak, on Tuesday, August 23, was associated with an ox tongue brought home from his shop by a butcher on the previous Saturday evening. It was partially cooked the same evening in a domestic pressure-cooker, and cooking was completed the next morning (Sunday) in the same vessel. The butcher's wife then skinned the tongue, and the family of three, consisting of the butcher, his wife, and their adult son, had meals of tongue on the Sunday and Monday, and the wife also had some for Tuesday's lunch, all without ill effect.

On the Tuesday afternoon about ¼ lb. (113 g.) of the cooked tongue was given to a neighbouring family of three persons who ate it between them for tea at 5.15 p.m. The butcher and his wife also had some of the remainder at about the same time. Between 9 and 10 p.m. that evening the butcher's wife and her three neighbours were all seized with severe diarrhoea and vomiting, but the butcher himself escaped. Two of the victims were admitted to hospital and *Staph. aureus*, coagulase-positive, was isolated from the faeces of one of them but unfortunately was not phage typed.

Apart from some weakness, the four victims had recovered by the Thursday morning, when the butcher and his wife and son (who also worked at the shop) were examined. The butcher had a cut on his left thumb which was covered with adhesive plaster; it was very soddened and would not heal. The wife had a slowly healing shallow ulcer the size of a lentil on one of her knuckles. It had been caused by a burn. There were also a few papules on her face. The son appeared healthy.

The bacteriological results were as follows:

Tongue.—Approximately 2,520 million organisms per g. were found, rather more than half of the colonies being *Staph. aureus* coagulase-positive. Three strains were all of phage type 53.

Butcher's Wife.—*Staph. aureus* of phage type 53 was isolated in large numbers from swabs of her hands and nostrils and in smaller numbers from her face. *Staph. aureus* was not isolated from her faeces. She was in fact quite well again by the time a faeces specimen was obtainable.

Butcher.—*Staph. aureus* phage type 53 was obtained in small numbers from swabs of his hands, including the cut, but there was a heavy contamination of faecal organisms which he alleged arose through handling offal. His nose and faeces were negative.

Butcher's Son.—*Staph. aureus* phage type 53 was found on his hands but was not numerous, and *Staph. aureus* of phage type 52A was present in fair numbers in the nostrils.

Staph. aureus could not be isolated from the brine in which the tongue had been salted.

One suspects, therefore, that the butcher's wife was probably the source of the staphylococcal infection which, on the one hand, contaminated the tongue and produced toxin from which the food-poisoning arose, and, on the other hand, infected her husband and son. We particularly noted that this home was exceptionally clean. There was no domestic refrigerator and the weather at the time was very hot.

Third Outbreak

A third outbreak of food-poisoning occurred among a group of 80 probationer nurses who on September 14 consumed a lunch between 12 noon and 1.15 p.m. consisting of braised mutton, gravy, creamed potatoes, boiled dried peas, and sponge pudding with custard. Between 1 and 5 a.m. the next day 20 of them were seized with diarrhoea, colic, vomiting, and dizziness, and a further 40 had mild abdominal pain with no other symptom.

The whole of the food had been prepared by five people on the morning of consumption and it was found that the only items which all the victims had eaten were the meat and gravy and the peas.

When the investigation was made the man who prepared the meat and gravy was not at work; it was later found that he had septic fingers. Apparently he had sustained a small burn on a finger a month previously. This had healed but still remained somewhat inflamed. In addition, two days before the food-poisoning outbreak he had again burned his fingers, and septic blisters had developed, which resulted in his absence from work. A fairly heavy growth of *Staph. aureus*, coagulase-positive, was isolated from each hand.

Unfortunately none of the suspected food remained for examination, and it is unlikely in any case that many organisms would have been found in it as it was eaten hot almost immediately after cooking. The stool specimens from the affected nurses were also negative.

Fourth Outbreak

The fourth outbreak of food-poisoning followed an evening dinner at a café on October 15. The menu comprised soup, roast chicken, stuffing and bread sauce, potatoes, cauliflower, carrots, apple tart with synthetic cream, and coffee. There were 55 diners, of whom 37 were taken ill during the early hours of the following morning, the symptoms being diarrhoea and vomiting. Owing to a delay of almost three days in the notification of this outbreak, nearly a week elapsed before faeces specimens could be obtained from all those persons affected. No *Staph. aureus* or pathogens of the coli-typhoid-dysentery group were isolated from any of the 35 specimens submitted.

None of the food suspected could be obtained, but it was ascertained by interviewing all the diners that only the soup and chicken had been eaten in common by all the victims. The soup had been made entirely from a powder immediately before the meal. A sample of this powder gave a satisfactory bacteriological result.

The chickens were all prepared by one woman who received, cleaned, cooked, and sliced them on the afternoon before the meal. The slices were distributed on plates and remained in a hot chamber for two hours until they were served at about 7.45 p.m. The woman who prepared the chickens was constantly sustaining cuts and scratches from the chicken bones. All swabs of her hands and nostrils taken five days after the dinner gave a fairly heavy growth of *Staph. aureus*, and when one of us examined her nine days after the dinner she was found to have a deep septic puncture wound in the web between two fingers. This she had had for 10 days.

Conclusions

Four outbreaks of food-poisoning in Sheffield during 1949 were associated with *Staph. aureus* infection of the hands of the food preparer. In one outbreak we traced the organism through the food and through the victims. In another we traced the organism to the food, but in the last

two outbreaks the specimens required for bacteriological proof of the cause were not available. *Staph. aureus* strains are very common in the nose and septic lesions of people who have never given rise to food-poisoning, and indeed they are not very uncommonly found in the faeces of normal persons. For this reason cultures for phage typing should be made from separate staphylococcal colonies, and more than one colony from each specimen should be examined. From our own cases staphylococci of phage types other than the one incriminated were also obtained. Before concluding that an outbreak of food-poisoning is due to *Staph. aureus*, a strain of a type generally associated with food-poisoning should have been isolated from a number of victims or from one or more victims and food. This evidence was forthcoming only in the first two outbreaks here described.

It is evident that the immediate notification of an outbreak, together with speedy investigation, in which attention is paid to the hands which prepared the food, is important for successful elucidation.

Summary

Four outbreaks of food-poisoning are described, all associated with *Staph. aureus* infection of the hands of the food preparers.

Our thanks are due to Dr. R. E. O. Williams and Miss J. E. Rippon, of the Central Public Health Laboratory, who phage typed the staphylococcal cultures and from whom we obtained most valuable advice. We thank also the sanitary inspectors of the Sheffield Public Health Department for their team-work in obtaining information and specimens for examination.

THROMBOCYTOPENIC PURPURA DUE TO QUINIDINE

BY

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Although there is a recognized association between quinine and purpura (Wintrobe, 1946), it is very rare for a haemorrhagic state to result from quinidine therapy. In fact, so far as can be ascertained, this is the first case to be reported in England, though five cases have been published in foreign journals.

Case Report

A married woman aged 48 was admitted to hospital on December 28, 1949, in early congestive failure following the onset of auricular fibrillation. She was found to have mitral stenosis, and gave a history of paroxysms of regular tachycardia and paroxysms of auricular fibrillation. There was no past or family history of allergic diseases or of any haemorrhagic diathesis. She asserted that she had not previously received quinidine, and this was checked with other hospitals that she had attended. The auricular fibrillation was confirmed by electrocardiograms and the patient rapidly responded to "digoxin."

Quinidine sulphate, 3 gr. (0.2 g.), was given on December 30 and 31 and regular sinus rhythm resulted. Ten days later (see Chart) a daily maintenance dose of 3 gr. of quinidine sulphate was started after three attacks of paroxysmal regular tachycardia. A slight epistaxis began on January 12, 1950, before the third dose was given, and continued all day. In the evening the patient had a slight vaginal haemorrhage and developed purpura; quinidine was then discontinued, after 9 gr. (0.6 g.) had been given. At first numerous petechiae were present on the legs and the mucous membranes of the lips and gums, with isolated ones on the face, trunk, upper arms, and thighs. During the next twelve hours the rash became more profuse and several ecchymoses developed.

On January 13 a blood smear showed: platelets greatly reduced (fewer than 20,000 per c.mm.); white cells, 5,100 per