the weight of the afferent loop suspended on the gastric remnant.

4. The early post-gastrectomy syndrome can be prevented by suitable reconstruction of anatomical support for the stomach and the anastomosis.

5. In cases in which the syndrome is severe, surgical intervention is worth while and is curative.

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PHAGE-TYPING AND EPIDEMIOLOGY OF SHIGELLA DYSENTERIAE SONNE

BY

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Sonne dysentery continues sporadically, with epidemic outbursts, in this country, and is a recurring nuisance in mental homes, hospitals, and other institutions. The hardness of the organism when excreted leads to its persistence in unexpected situations. Green and MacLeod (1943) recorded its survival for longer periods than *Bact. coli* in a chlorinated water, and Hutchinson (1947) isolated it from utensils washed in hotel kitchens. The large numbers of ambulant cases with very mild symptoms in any outbreak result in the existence of many unrecognized sources of infection in the community. With this disease, therefore, it becomes more important than in the more severe enteric infections to be able to trace individual strains of organisms from patient to patient, and to identify a particular infection as originating from one particular source among a number of possible alternatives.

Serological methods—so useful in the *Salmonella* group—are unable to distinguish different strains of Sonne dysentery, and biochemical methods have offered little further success. The phage-typing of Sonne strains, however, by Hammarström (1947), in Sweden, was claimed to have achieved this differentiation. We had found the phage-typing of typhoid strains of considerable use in a Bristol outbreak (Cooper, 1950) because of the number of different types capable of identification (Felix and Pitt, 1934), though the phage-typing of paratyphoid B strains in 1941 (Davies *et al.*, 1942) was of no assistance owing to the widespread incidence of the strain concerned. One of us had previously compared the serological typing of *Ps. pyocyanea* (Mayr-Harting, 1948) with the method of phage-typing (Mayr-Harting, 1949), and it was felt that in Bristol we were in a particularly favourable position to examine the possibility of using Hammarström's phage-types for epidemiological purposes. Hammarström very kindly sent us his type strains and type phages.

Experimental Results

The following is a preliminary report on seven months of phage-typing, with these phages, on strains of Sonne

dysentery isolated in Bristol. Even in this brief survey we hope to show that (a) new infections occurring during the whole of this period in certain blocks of a mental home, well isolated from the introduction of outside infection, were all of one type; (b) that an outbreak in a hospital due to one type was completely cleared up, but the introduction of a patient with a different type at a later date resulted in a new outbreak of this new type; and (c) that sporadic apparently unconnected cases in the city often yielded still further types of infection.

The types found and their distribution were as follows:

Type	No. of Strains	Type	No. of Strains
3	30	17a	1
81	13	Coleman	1
66	2	Powell	1
82	2		
			50

Types 81 and 82 had so far not been isolated in Sweden and have been given their numbers by Dr. Hammarström. The types "Coleman" and "Powell" have not yet been compared with the Swedish types.

Early Outbreak

We found a very marked difference in the distribution of types before and after the summer holidays. All strains of type 81 were isolated early in summer. Four of them were from people unconnected except in so far as they all lived in the more crowded eastern districts of the city. One of these patients was transferred to hospital, and within a few days there was an outbreak in another ward of this hospital involving about a dozen people. A member of this staff has subsequently given a history suggestive of infection, and, though no proof has been obtained of the method of transfer, no other strain of this type has been isolated since early summer except the nine cases typed at that time.

Isolated Infections

After the summer holidays five other types were found in the city which had not been isolated in the few months preceding the holidays.

(1) Type 66 was isolated from a young man who fell ill with dysentery the day after his return from a cycling tour through France. A few months later the same strain in mixed infection with paratyphoid B was isolated from a little girl. The source of both infections in this child is rather obscure, but one factor deserves consideration: the diet of the household included large quantities of mussels and other shellfish.

(2) Strain 17a was isolated from a girl and probably was imported from Weymouth. Some time before the onset of the girl's illness her mother fell ill with diarrhoea after a visit to Weymouth, and from then onwards there was a chain of infections of gastro-enteritis in the family. Dr. Hammarström informs us that he has not isolated this type in Sweden, but that he has obtained a strain of this type from Czechoslovakia.

(3) The two strains of type 82 were isolated from a little boy and his father. This family had not been outside the Bristol district for weeks.

(4) and (5). The Coleman and Powell strains were both isolated from students in a teachers' training college, and were of different types. But the movements of the students concerned and the time-table of their illness allow the possibility that their cases are not connected

epidemiologically. Mr. Coleman probably acquired his infection at the college, which had a history of earlier cases of diarrhoea. In the case of Mr. Powell there is very strong support for the assumption that his infection was acquired at his home, where his brother fell ill on the same day, a few days after Mr. Powell returned to college.

Outbreak II

Twenty-three of the 30 cases from May to December due to type 3 have been found in a colony for mentally defective people at intervals over the whole period of this investigation. No other type has been isolated from this colony, and it is a fair assumption that all these infections have been acquired at the colony. By the nature of living conditions and habits of the mentally defective it will be very difficult to do more than confine the outbreak to the particular blocks affected.

Previous records showed that there had been a severe outbreak of Sonne dysentery at a babies' home, involving almost all the babies and staff. One strain of that outbreak had been kept, and was also found to belong to type 3.

Outbreak III

Type 3 was also responsible for an outbreak in the hospital which had suffered earlier in the year from type 81. On this occasion, however, a patient was admitted into the ward with infection due to this type, and the other three cases in this ward were close contacts and obviously infected by him. One other case in another ward had positive cultures of this type on admission.

So far 29 cases of type 3 have been accounted for; the remaining one was an isolated case in the city.

Conclusions

From the foregoing, although the number of strains typed is very small, some conclusions about the kind of information that Sonne phage-typing will yield may be drawn already. The types are very numerous and the isolation of seven different types in a town of moderate size like Bristol during seven months shows that the epidemiological unit is very much smaller than the town. It is indeed very small in space—family or institution—and also seems to be of short duration, unless the circumstances are exceptional, as amongst the mentally defective.

The multiplicity of types and the smallness of the epidemiological unit will make it possible to trace some of the strands in the tangle of the pathways of infection. We hope to obtain strains from outside Bristol and from other parts of the country, to follow in detail such phenomena as, for instance, the appearance of new types after the holidays.

Much remains to be done to establish the degree of stability of the types *in vivo* and *in vitro*. Many technical difficulties, which may occasionally upset the type determination, must have their importance assessed. The influence of the composition of the medium on the phage titre makes some difficulties in correlating results obtained in Bristol and in Sweden. The occurrence of phage-carrying and lysogenic strains may confuse the appearances unless care is taken to avoid these organisms for the propagation and standardization of the phages used. Many of these difficulties have been described by Hammarström in very clear detail, and it seems likely that they do not destroy the main epidemiological importance of type determination on most occasions. Whether examination over a longer period will give rise

to important exceptions to the belief that type identity is the result of recent close genetic relationship, or that type dissimilarity necessarily means lack of such relationship, has yet to be shown.

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AUREOMYCIN AND CHLORAMPHENICOL IN INFANTILE DIARRHOEA

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The purpose of this communication is to describe briefly a preliminary trial of "aureomycin" and chloramphenicol in the treatment of infantile diarrhoea, or gastro-enteritis. Although diarrhoeal diseases of infancy have long been responsible for a considerable proportion of deaths in the first year of life, there is still no true understanding of their aetiology. Indeed, even definitions are difficult in the light of the diversity of views upon their pathogenesis. It is arguable whether diarrhoea of purely dietetic origin exists, and all cases which cannot unequivocally be assigned to other causes (such as coeliac disease or irritant poisons) should be regarded as infective even though the infective agent is as yet unknown. Nevertheless the acceptance of the infective nature of diarrhoea in infancy does not wholly solve the problem. It is usual to describe two groups: one in which the presumed infective agent is located in the alimentary tract (enteral infection) and for which there is very little direct pathological evidence, and the other in which it is located outside the alimentary tract (parenteral infection) and for which there is even less.

When one considers that the parenteral infection which is supposed to cause diarrhoea must apparently resolve itself into one of the upper respiratory tract, and that infections of the meninges and bones are not associated with diarrhoea, and even primary pneumonia and infections of the urinary tract by no means consistently so, it would appear that this distinction begs too many questions to be of real value. In all, there seems little justification for any more precise term than that of infantile diarrhoea, which is used here to indicate the non-specific diarrhoea of infancy. In this connexion it may be stated that only such established specific organisms as the *Shigella* and some *Salmonella* are excluded by this definition, and neither *Proteus vulgaris* nor the more recently incriminated varieties of *Bact. coli* are regarded as specific for the purposes of this communication.

Where a disease cannot be precisely defined it is particularly difficult to establish criteria of cure. Assessment of the result of any series of cases will inevitably depend to some extent upon largely subjective factors, such as the degree of severity and the presence or absence of parenteral infection, as well as upon factors that are administrative or social, such as the type of case admitted and the nature of the population from which the cases