

## CONTROL OF ENTERIC FEVER

By B. Cvjetanovic

The epidemiology of enteric fevers and the methods for their control<sup>1</sup> are well known and need not be discussed here. However, in the rapidly changing world of today, economic problems are gaining prominence and the ill effects that enteric fevers have on the economy, namely the loss of trade in exports and tourism, lost wages, costs of treatment, etc., are often considered at the same time as the health aspects. The prevention and control of enteric fevers are important both for health and the economy in Singapore.

*The frequency of enteric fevers in Singapore* has apparently been increasing in recent years (Table I).

It is probable that the rise in the number of reported cases reflects the intensification of surveillance and field enquiries since the Epidemiology Unit was established in 1973, rather than an actual increase of infections.

When I compare the Singapore of 7 years ago with the city as it is today with its improved water supplies, sewage treatment plants, and, in particular, its improved and new food establishments and hawkers' centres and markets, I am impressed by the rapid progress that has been made and I have no doubts that the risks of enteric infections must have diminished. I am therefore convinced that the in-

crease in the number of reported cases is the result of better surveillance. *The epidemiological investigations* and surveillance carried out by the Epidemiology Unit in 1974 have demonstrated the importance of food handlers and hawkers in the transmission of disease. Active searches for cases and carriers in outbreaks such as those at Kelantan Lane/Jalan Besar and Tana Rata have revealed considerable numbers of mild cases and carriers which would have been missed were it not for the thorough epidemiological enquiry supported by bacteriological examination. In many instances, the source of infection was traced to food and to hawkers, and accordingly attention was centred on them. Sporadic cases also occur in Singapore as anywhere else in the world which cannot always be traced to outdoor eating and to food as the vehicle of infection. Occasional outbreaks occur in the kampongs due to the poor sanitary conditions in which people live in this type of settlement. With the modern housing and development schemes that are extending throughout Singapore these foci of infection will disappear. The remarkable differences in incidence rates between some constituencies are probably due primarily to differences in environmental sanitation and hygienic facilities although the way of life and the hygienic habits of the people living in the various constituencies also play a role. These differences clearly show where the high-risk groups are (Table II).

Among these high-risk groups, school and high school children are at particular risk, as shown in Table III:

The investigations performed by the Epidemiology Unit further indicate that the high-risk foods

TABLE I  
INCIDENCE OF ENTERIC FEVERS

Year	Enteric Fevers	Typhoid	Paratyphoid A B C			Incidence rates per 100,000
1970	158	150	6	2	0	7.61
1971	224	218	2	3	1	10.61
1972	167	161	3	3	0	7.77
1973	154	145	5	4	0	7.04
1974	301	294	4	2	1	13.56
1975	513	500	11	1	1	22.80

TABLE II  
ENTERIC FEVERS BY CONSTITUENCIES  
1970-1974

Constituency	Rates per 100,000
Kampong Kembangan	214.3
Kampong Ubi	152.5
Kampong Pagar	150.7
Kampong Chai Chee	93.1
Geylang Serai	66.6
Jurong Town	38.6
Havelock	29.2

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TABLE III  
AGE SPECIFIC MORBIDITY RATES, 1974

Age (years)	0—4	5—14	15—24	25—34	35—44	45—54	55—64	65—74	75+
Rate per 100,000	9.3	19.3	21.3	14.5	10.3	4.6	2.6	3.8	0

and beverages are cold dishes, fresh fruits, and cold drinks, especially those that are prepared with much ice and handling.

In accordance with the above findings of the Epidemiology Unit, control measures should be directed towards the protection of the high-risk groups and the prevention of transmission through food and beverages.

A search for carriers has been made by screening patients and known carriers recorded in an enteric fevers register. Computerization of the data on carriers, contacts, and cases will certainly facilitate quick retrieval by the Epidemiology Unit and enable future enquires to be carried out even more efficiently.

The control and prevention of enteric fevers have to be based on epidemiological enquiries as only these give solid grounds for effective action. In Singapore this is the case. Emphasis is rightly put on environmental hygiene—water supplies and waste disposal, food hygiene and control and education of food handlers and hawkers. The construction of modern centres for hawkers and their control are measures that cannot fail to reduce the transmission of disease. While routine screening of food handlers has little effects, the regular examination of those food handlers serving high-risk groups, i.e., school children, is advisable.

If the recently developed mathematical model<sup>2</sup> is applied in the study of typhoid in Singapore, the present rate of incidence (taking into account the fact that some cases are not detected because their symptoms are very mild) indicates that the number of chronic carriers that have accumulated in the city throughout the years could be around 1,500—2,000. It is quite possible that these carriers will produce some sporadic cases or localized outbreaks in the future, despite the control measures that are applied.

However, already the rates of infection and carriers seem to have reached such levels that an irreversible downward trend will follow provided the development of environmental sanitation continues and the standards of education and living keep rising. With the present pace of improvement of sanitation, the frequency of enteric fevers in Singapore is likely to become so low that there will be no menace to economic development namely trade and tourism.

Nevertheless, although the prospects to my mind are bright, there is no room for complacency. There are always possibilities for further improvements for even better containment of enteric fevers. Control measures should be constantly reviewed in the light of new epidemiological data and information on high-risk groups and vehicles of transmission.

A detailed study of the relative importance of certain ingredients in incriminated food eaten both at home and outside would permit a better definition of high-risk foods and/or drinks and facilitate their control.

The cooperation of the population and the medical profession, including the sinsehs and bomohs, in reporting suspected cases to the health services would facilitate early detection and prompt application of control measures.

In view of the special importance of hawkers in the transmission of disease, they should be encouraged and given the opportunity to contact the health services in the event of an illness that might prove to be enteric so that they can be treated and other appropriate measures taken.

As there is a high incidence among children, school teachers could play a very important role by notifying suspected infection in this population group at particularly high risk.

The addition of phage typing to the laboratory examinations for *Salmonella typhi* that are under way in Singapore would add another dimension to the elucidation of the mode and pathways of spread and enable specific measures to be applied to contain the infection.

As nearly 70% of the population are served by sewers, the examination of sewage for *S. typhi*, using Moore's method<sup>3</sup>, would be useful, as well as the examination of night soil, for the tracing of foci of infection.

Anti-typhoid vaccine<sup>4</sup> is effective. However, in Singapore there is no place for mass immunisation since the incidence of the diseases is relatively low and other control measures are being used efficiently. On the other hand, vaccination could be useful for well defined high-risk groups such as school children living in unsanitary conditions.

As Singapore is making rapid progress in the control of enteric fever the majority of cases may eventually turn out to be imported and therefore international cooperation in the area is indicated.

#### REFERENCES

1. Cvjetanovic, B: Typhoid fever and its prevention Public Health Reviews, 2, 229-246, 1973.
2. Cvjetanovic, B., Grab, B. and Uemura, K.: Epidemiological model of typhoid fever and its use in the planning and evaluation of antityphoid immunisation and sanitation programmes. Bull. Wld. Hlth. Org., 45, 53-75, 1971.
3. Moore, B., Perry, F. L. and Chard, S. T.: A survey by the Sewage Swab. Method. J. Hyg. (London), 50, 137-156, 1952.
4. Cvjetanovic, B. and Uemura, K.: The present status of field and laboratory studies of typhoid and paratyphoid vaccines. Bull. Wld. Hlth. Org., 32, 29-36, 1965.