

CHOLERA EPIDEMICS IN BURMA AND THE TYPE OF VIBRIO ASSOCIATED WITH THEM

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CHOLERA has been known to exist in Burma for many years. Its seasonal prevalence was also recognized, as the Burmese word for it—*Kala-Wun-Yoga* (*Kala* = Time, *Wun* = Intestine, *Yoga* = Disease)—literally means periodical intestinal disease. Beyond this very little is known about its aetiology, spread, and control among practitioners of indigenous medicine. A vague belief, however, exists that the disease was first introduced by Indian labourers who came to build pagodas (Buddhist temples) at Pagan. On the other hand, there is every probability that epidemics occasionally spread from southern China where cholera was described by the very name it now bears, over two thousand years before the Christian era (Maxwell, 1929).

A systematic record showing the mortality rate for cholera in Burma (Bozman, 1937) is only obtainable since 1872 after the country had passed under British control. Rogers (1928) refers to this record and, correlating the mortality rate with figures of absolute humidity deduced from various meteorological data, arrived at the conclusion that Lower Burma is 'a typically endemic' area. But there is still some doubt in certain quarters about accepting this view, as frequent reference to importation of cholera from neighbouring provinces by immigrants is found in annual reports of provincial health authorities.

This confusion has been largely due to lack of facilities for investigating outbreaks by modern scientific methods. In a busy port like Rangoon where such facilities exist, the result is vitiated to a great extent by frequent admission

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when the jaundice was intense, gave an indirect positive result and a delayed direct result. This suggested that the jaundice was of the hæmolytic type.

Summary

1. A case of cholera, in which on the third day of the disease there occurred an acute enlargement of the liver with the development of jaundice, is recorded.

2. From the material obtained by puncture of the enlarged liver *Vibrio cholerae* was isolated. This strain was indistinguishable in its biochemical, serological and bacteriophage reactions from the vibrios found in the patient's stools.

of persons from hyperendemic areas in India, some of whom are probably 'carriers', and are capable of starting a fresh outbreak if placed in suitable environments. A striking example of this type of epidemic was first described by Greig (1913) in Puri jail. On this occasion the carrier was a convict who had acquired the disease before imprisonment and recovered from it.

About the middle of July 1936 a small and sharp outbreak of cholera occurred in a big jail within easy reach of Rangoon. This afforded us an excellent opportunity to study the epidemic from beginning to end under controlled conditions. The jail being specially set apart for habitual offenders, the inmates were mostly convicts serving long sentences.

The first case was a prisoner who had been in jail for several months past and as such could not have associated with outsiders or obtained food and drink from outside sources. He succumbed to infection within a few hours of onset, and a portion of his small intestine was sent to the Pasteur Institute laboratory for examination. The congestion and inflammation of the mucosa were so great that the tip of the little finger could scarcely be passed into its lumen. A smear from the submucosa showed a large number of 'comma' vibrios and cultures taken from the same situation gave a pure and profuse growth of a vibrio, serologically confirmed as the true cholera vibrio. This was followed by two more cases, of which one was severe and required saline transfusions. Cholera vibrio was isolated from both the cases.

All prisoners employed in the jail kitchen and contacts of actual cases were examined, and two were detected as carriers of true cholera vibrio. They were isolated until declared free by repeated bacteriological examinations. The whole jail population was given protective inoculation, and adequate steps were taken to disinfect fresh faeces and urine by chlorinated lime. These measures completely controlled the epidemic and no more cases occurred. The outbreak is remarkable in that all reasonable possibilities of importation from outside sources were excluded proving that the disease originated locally and quickly showed a tendency to assume epidemic proportions.

Characters of vibrios isolated from cholera cases in Burma

Since 1935, cultures of vibrio recovered from stools of acute cases have been collected for study as to their detailed characters, particularly to help in selecting suitable strains for preparing vaccine used in preventive inoculation in Burma. Though the majority of strains were isolated from patients admitted into the Contagious Diseases Hospital, Rangoon, a few were also recovered from cases which occurred in the delta area, e.g., Pyapon and Twante. In recent years a vast amount of work has been done by Linton and others (1932-1934) on the chemical

composition of vibrios, especially with regard to their protein and carbohydrate contents. Owing to obvious limitations in this laboratory we could not go into these details. We concentrated mostly on the biochemical reactions described by Heiberg (1934) and serological reactions with sera raised against stable 'O' antigens of 'Inaba' and 'Ogawa' type cultures. Altogether 56 strains were studied and most of them, when freshly isolated, agglutinated well with 'HO' serum prepared in our laboratory against type cholera vibrios received from the National Collection of Type Cultures. Four were inagglutinable or reacted partially (20 to 25 per cent of the full titre) with the 'HO' serum. All 56 were further titrated with pure 'O' sera. The results of agglutination tests, nitroso-indol reaction and hæmolysin production for sheep cells have been summarized in the following table :—

before the results were noted, and they may be summarized as follows :—

TABLE II

	Saccharose	Mannose	Arabinose	Heiberg's group
Agglutinable 52.	+	+	—	I
Inagglutinable 4.	+	—	—	II

+ Acid production. — No acid production.

The type of reaction obtained in sugar media is clear-cut and brings out that all sero-positive strains come under Heiberg's group I. The association of this serological type with a spring disease culminating in epidemics was observed and recorded by Maitra (1925) and Tomb and

TABLE I

	AGGLUTINATION REACTIONS WITH								Nitroso-indol test		Hæmolysin for sheep cells	
	H. T. serum prepared locally				* Inaba serum		* Ogawa serum					
	'HO'		'O'		'O'		'O'		+	—	+	—
	+	—	+	—	+	—	+	—	+	—	+	—
Agglutinable ..	52	0	51	(1) 1	51	(1) 1	1	51	52	0	0	52
Inagglutinable	0	4	0	4	0	4	0	4	4	0	4	0
TOTAL ..	52	4	51	5	51	5	1	55	56	0	4	52

* Supply received by courtesy of the Director, Central Research Institute, Kasauli, India.
(1) Rough.

It will be seen that all 'HO'-agglutinable strains, except one, reacted with the Inaba 'O' serum. The non-reactor on further test was found to have become rough. Of the Inaba-serum reactors, only one strain gave a positive reaction with the Ogawa 'O' serum. Owing to the rarity of this type in India and Burma a brief history of the case in which the strain was isolated is given below :—

One Mr. W., an employee of the British India Steam Navigation Company, was on his way to Rangoon. After a long voyage from Mauritius his boat touched at Colombo for a short time, but he did not go ashore. From Colombo he travelled to Calcutta by boat in a week. In Calcutta, though he remained on board for two days, he had occasion to land for taking meals in restaurants. He then transferred himself to another boat plying between Calcutta and Rangoon. On the second day of the voyage from Calcutta the usual symptoms of cholera developed and on arrival at Rangoon he had to be sent to the Contagious Diseases Hospital for treatment. From his stool collected in the acute stage the 'Ogawa' strain was isolated.

Biochemical reactions studied were based on observations recorded by Heiberg. The inoculated sugar tubes had been incubated for a day

Maitra (1927) in their observations in the Bihar and Bengal coal-fields.

Summary

1. An autochthonous epidemic of cholera confirmed by bacteriological study has been described.
2. The prevailing type of cholera vibrio isolated from acute cases in Burma has been recorded.
3. A case of cholera due to the 'Ogawa' type of vibrio has been detected in the course of routine examinations.

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OBSERVATIONS ON THE MOTTLED CONDITION OF HUMAN TEETH ENDEMIC IN A CERTAIN LOCALITY OF NAGERCOIL IN TRAVANCORE, S. INDIA

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It has been observed that a section of the people residing at one end of the town of Nagercoil in South Travancore is afflicted with

members of the community, would appear to have been subjected to a sort of corrosion followed by pigmentation (figure 1).

In addition to the pigmented condition and the consequent disfigured appearance, the mottled teeth have also been found to be defective in structure and strength.

It has also been found that almost the entire population in that locality (consisting of about a hundred families), irrespective of sex, has this dental defect, although its degree of severity varies with age and other conditions.

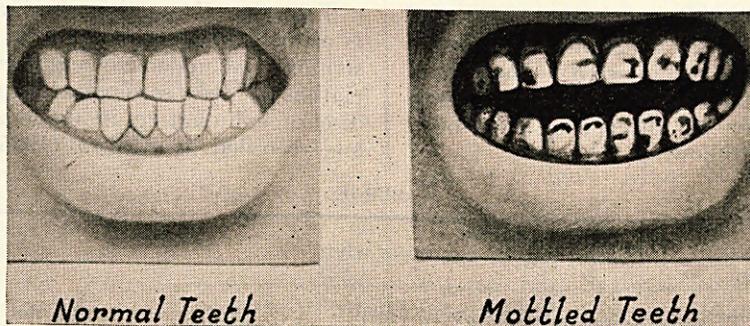


Fig. 1.

TABLE I

Chemical analysis of samples of drinking water from different sources

PARTS PER 100,000													
Sample *	pH	Total solids	Loss on ignition	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Chlorides	Oxygen absorbed in 4 hours	Total hardness	Permanent hardness	Temporary hardness	Fluorine †
I	7.5	50.4	21.6	0.02	0.01	Nil	0.02	9.6	0.30	16°	12.8°	3.2°	0.4-0.5
II	7.2	42.1	25.4	0.01	0.01	Nil	0.02	7.3	0.20	18°	13.2°	4.8°	0.07
III	7.2	45.0	20.8	0.02	0.01	Traces	0.01	3.8	0.25	15°	11.4°	3.6°	Nil.
IV	6.8	35.8	23.7	0.01	0.01	Traces	0.02	5.3	0.18	14°	10.1°	3.9°	Nil.

* I. From the public well which is the drinking water supply for the persons afflicted with the dental defect of mottled enamel.

II, III and IV. From the adjoining areas where there is no occurrence of this dental defect.

† Determined according to Sanchis (1934).

the dental defect known as mottled enamel. The enamel of the teeth of these people, particularly in the case of the adults and the older

A comparative study of the conditions in that place and those in the adjoining areas would show that the sectional incidence of mottled enamel can be correlated with the occurrence of fluorides in the drinking water supplies. Thus, the analysis of the drinking water supply of the afflicted persons shows the presence of 0.4 to 0.5 parts (per 100,000) of fluorine, whereas the water supplies for the other sections of people contain practically no fluorides (table I).

It may be observed from the results that the presence of fluorine is the distinctive character of the water used by those having mottled

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