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The Routes of Cholera Spreading in Kenya

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Abstract: The routes of cholera spreading in Kenya was guessed by the type classification of Vibrio cholerae isolated in 1980 and 1981. The strain classification was made by serological type and phage–prophage type. Three main routes of spreading, from Turkana to the South along the Rift Valley, from Western Kenya around lake Victoria to highland cities and from the South Coast to highland cities, were suspected.

INTRODUCTION

Since African continent was invaded by the seventh cholera pandemic, it has passed already more than 10 years. But there are no signs of decline, on the contrary, it is still spreading further. In Kenya, it is likely that cholera is steadily present in the North-West district facing the border of Sudan and Uganda, in the Western district around lake Victoria and in the South Coast area facing the border of Tanzania. Although cholera is not steadily present in the central highland having some big cities, cholera outbreak or sporadic cases have occasionally been seen there. Kenya has a long border facing 5 countries. The quarantine work at the rural border in the present situation may be too difficult to control the people for communicable diseases. But cholera is always ready to spread out from the epidemics. In this situation, the epidemiological features of cholera should be studied at least inside of the country. This paper describes on the routes of cholera spreading from the peripheral to the central of Kenya.

MATERIALS AND METHODS

Strains examined: Two hundred and eighty eight strains of Vibrio cholerae sent to National Public Health Laboratory Services, Kenya, from the places of epidemics and

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This study was carried out under the project "Communicable Disease Research and Control programme in Kenya" by Japan–Kenya Medical cooperation, sponsored by Japan International cooperation Agency.
sporadic cases were examined. The places of V. cholerae isolation were Turkana, Kap-
deo, Kisumu, Nakuru, Nairobi, and South Coast area including Taveta and Mombasa. All strains were isolated from rectal swab, following the enrichment culture in the alkaline peptone water and subculture on the TCBS agar plates. They were stocked in the Carry-Brair media.

Serotyping: The colonies on the nutrient agar plate were routinely examined with the slide agglutination method. Non-agglutinable organism against 0-group-I antisera were autoclaved at 121°C for 15 minutes, and then reexamined.

Phage-prophage typing (Takeya and Shimodori, 1963): The strains to be ex-
aminied were cultured in the yeast extract enriched peptone water (Bacto peptone 1%,
yeast extract Bacto 0.5%, NaCl 0.5%, pH 7.5) at 37°C for 8 to 16 hours. The culture
was killed by chroloform. The supernatant of killed culture and the over night culture
of strain H218 (V. cholerae, classic, Inaba), 0.1 ml respectively, were mixed. The
mixture was added to 3 ml of soft agar (0.6% agar in the above peptone water) at 44
to 48°C, and layered on the agar plate. After the over night incubation at 37°C, the
lysogeny was judged by the plaque formation. Before killing the culture by chroloform,
0.1 ml of the culture was mixed with 3 ml of soft agar, and layered on the agar plate
for the examination of the sensitivity against kappa type phage. Routine test dilution
of kappa type phage solution was spotted on the layer.

RESULTS

Sixteen strains of Vibrio cholerae non-agglutinable against 0-group-I antisera
were found in the examined 288 strains. These 16 strains were omitted from the study
for guessing the spreading routes. The results of the strain typing were summarized in
Table 1.

DISCUSSION

In Kenya, cholera is almost steadily present in some area close to some borders.
It is not likely possible to study epidemiology of cholera across the border in the present
situation. But cholera is ready to spread out from the epidemic places, so the epi-
demiology should be studied inside of the country at least. When cholera outbreak
occurs in the area where cholera is not usually seen, we have to clarify where did it
come from, and how did it come, in order to control the further spreadings. Cholera
is not usually present in the central highland of Kenya, but the epidemics were seen
in 1980 and 1981. Considering the reason why the outbreak occured in the central
highland, the data in table 1 are interpreted with mapping the places and the routes.
In 1980, serotype of the strains examined were all Ogawa with some exceptions.
In phage–prophage typing, 2 strains from an epidemic in Turkana(1) were identified as Celebes type (CBS). These 2 strains were randomly collected. This suggested that many of the epidemic strains in Turkana(1) belonged to CBS. The strains from Busia (3), Western Kenya, revealed 98% of CBS and 2% of Cured type (CRD). Ubol type (UBL) was not found in Western and North-Western Kenya. On the contrary in the Coast area, CRD was not found but 78% of CBS and 22% of UBL. In the same year, big outbreak of cholera was seen in Nairobi (Capital of Kenya, central highland), and all 3 types (CBS, CRD, UBL) were isolated. This finding suggested that the outbreak in Nairobi where cholera was not usually present, came from both Busia(3) and the Coast(7). In the end of the year, a big outbreak suddenly developed in Kapedo(2), and all strains examined indicated CRD, which suggested that the disease came from Turkana(1) along the Rift Valley.

In 1981, the epidemic in Kapedo(2) continued since the year before. And the pathogen showed the same type. In Kisumu(4), Western Kenya around lake Victoria, outbreak of cholera with the strains serotype Inaba and CBS in phage–prophage type started in March. While in the Coast area, the epidemic started in April with the strains serotype Ogawa and CBS in phage–prophage type. In the central highland, there was no big outbreak but small or sporadic ones. In July and August, several cases were found in Nairobi, and the pathogens indicated the serotype Inaba and CBS in phage–prophage type. It was strongly suggested by this typing that the pathogen came

<table>
<thead>
<tr>
<th>place of isolation</th>
<th>No. of strains</th>
<th>serotype</th>
<th>phage–prophage type</th>
<th>date of isolation</th>
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<tbody>
<tr>
<td>(1) Turkana</td>
<td>2</td>
<td>2 Ogawa</td>
<td>2 Cured</td>
<td>Aug. 1980</td>
</tr>
<tr>
<td>(2) Kapedo</td>
<td>27</td>
<td>27 Ogawa</td>
<td>27 Cured</td>
<td>Dec. 1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Ubol</td>
<td></td>
</tr>
<tr>
<td>(3) Busia</td>
<td>50</td>
<td>50 Ogawa</td>
<td>49 Celebes</td>
<td>May–Aug. 1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Cured</td>
<td></td>
</tr>
<tr>
<td>(5) Nakuru</td>
<td>7</td>
<td>7 Inaba</td>
<td>7 Celebes</td>
<td>Aug. 1981</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Inaba</td>
<td>2 Cured</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Hikojima</td>
<td>2 Ubol</td>
<td>1980</td>
</tr>
<tr>
<td>Nairobi</td>
<td>7</td>
<td>7 Inaba</td>
<td>7 Celebes</td>
<td>Aug. 1981</td>
</tr>
<tr>
<td>(7) Coast</td>
<td>18</td>
<td>18 Ogawa</td>
<td>14 Celebes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 Ubol</td>
<td>1980</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 Cured</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Ubol</td>
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Figure 2. Serotype distribution in 1980. O: Ogawa, I: Inaba, H: Hikojima. The numerals indicate the number of stains examined.

Figure 3. Phage-prophage type distribution in 1980. CBS: Celebes, CRD: Cured, UBL: Ubol.

Figure 4. Serotype distribution in 1981.
Figure 5. Phage-prophage type distribution in 1981

from Kisumu(4), and this was proved by tracing the footsteps of the patient. In August, there was a small epidemic in Nakuru(5) which is located at about the same distance from Kisumu(4) and Kapedo(2). The pathogens indicated the same type with those in Kisumu(4).

Illustrating the type distribution on the map, we can guess the routes of cholera spreading in Kenya as shown in Figures 2 to 5.

One strain of UBL was found in Kapedo(2) in 1981, and 2 strains of CRD were isolated in the Coast area(7) in the same year. But the transmission between Kapedo and the Coast was not likely present. Serotype and phage-prophage type are not always steady (Barua and Burrows, 1974, Gangarosa, 1967, Sheehy et al, 1966, Takeya, 1967). Therefore, in order to define the spreading route of cholera, the other proof such as tracing the footsteps of the patients etc. are always required.

REFERENCES

ケニア国内におけるコレラの伝播経路
岩永正明・森 賢治（長崎大学熱帯医学研究所，細菌学部門）
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1980年および1981年にかけてケニア各地で分離したコレラ菌の型別によって、ケニア国内におけるコレラの伝播経路を推定した。菌の型別は抗体検とカッパファージによって行なった。その経過3つの主要経路が推定された。即ちツルカナ地区からリフトバレーに沿って南下する経路、ビクトリア湖周辺部から中央高原都市へ、また南部海岸地区から中央高原都市へ至る経路である。

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