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An Outbreak of Food Poisoning Caused by an Enteropathogenic *Escherichia coli* O115:H19 in Miyagi Prefecture

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Outbreaks of mass food poisoning due to enteropathogenic *Escherichia coli* (EPEC) have been rare in Japan.

In this report, we describe an outbreak of food poisoning considered to have been caused by EPEC O115:H19 in 103 individuals at the site of a training camp in Miyagi Prefecture in August 2004.

On August 10, there was connection of the purport "high school student plurality presents food poisoning symptoms in a sports park, and were conveyed by the ambulance" at the jurisdiction public health and welfare office from the fire-fighting headquarters. An investigation initiated by the public health and welfare office revealed that a total of 148 persons, 131 students from 9 high schools and 17 game leaders, gathered in a sports park at a summer camp 2 days before. Among them, a total of 103 persons, including 100 students and 3 game leaders (attack rates of symptoms: 69.6%), developed symptoms, such as stomachache (83%), diarrhea (82%), nausea (27%), headache (24%), and fever (19%). Based on interviews of the infected individuals, the outbreak was considered due to some cause other than direct person-to-person transmission. The drinking water at the site of the training camp was supplied by the waterworks, and contained the proper concentration of chlorine. Since the infected individuals had a common dinner on the 8th, and a common breakfast, lunch, and dinner on the 9th, it was suspected that the food poisoning was caused by one of these meals. Although the greatest number of infections in one 2-h

period was 20 (19.4%), from 4 a.m. to 6 a.m. on the 10th, 14 individuals (13.6%) developed symptoms between 6 p.m. and 8 p.m. on the 9th. Unfortunately, we could not determine the causative common meal.

To identify the causative pathogens in the case, a total of 118 samples of 54 foods, 59 stool specimens from infected individuals, and 5 stool specimens from the food preparers were inspected in our laboratory for bacteria such as diarrheagenic *E. coli*, *Shigella* spp., *Salmonella* spp., *Yersinia enterocolitica*, *Campylobacter* spp., *Staphylococcus aureus*, *Bacillus cereus*, *Clostridium perfringens* and *Vibrio* spp., and for viruses such as norovirus, rotavirus, astrovirus, and adenovirus. As a result, although 20 strains of *E. coli* O115 were isolated from the 59 stool specimens, other food poisoning bacteria and viruses were not isolated. The 20 isolated strains of *E. coli* O115 were examined for their biochemical properties, H serogrouping, antibiotic susceptibility, possession of virulent factors and/or genes and pulsed-field gel electrophoresis (PFGE) analysis.

The main results of the isolates are shown in Table 1. The biochemical properties of the isolates were shown to be the same as those of typical *E. coli*, and H serotyping was H19. The isolates were evaluated by PCR for identification of the virulence genes of diarrheagenic *E. coli*. Although the isolates were positive for the *eae* gene by PCR, they were negative for *stx1*, *2*, *invE*, *ipaH*, *st*, *lt*, *aggR* and *astA* (1). It was herefore concluded that the isolates did not correspond to

Table 1. Properties of the isolated *E. coli* O115:H19

Items	Comments
Gram staining	Gram-negative rod
Oxidase test	Negative
TSI agar	A/A
LIM agar	Lysin (+), Indol (+), Motility (+)
Pathogenic genes or factors	<i>lt</i> (-), <i>st</i> (-), <i>invE</i> (-), <i>ipaH</i> (-), <i>stx1</i> (-), <i>stx2</i> (-), <i>aggR</i> (-), <i>astA</i> (-), <i>eae</i> (+)
Antibiotic susceptibility	sensitive to all 17 antibiotics: ABPC, PIPC, CEZ, CTM, CAZ, CCL, FOMX, CPDX, AZT, IPM, MEPN, GM, AMK, MINO, FOM, LVFX, ST

ABPC, ampicillin; PIPC, piperacillin; CEZ, cefazolin; CTM, cefotiam; CAZ, cefazidime; CCL, cefaclor; FOMX, flomoxef; CPDX, cefpodoxime; AZT, aztreonam; IPM, imipenem; MEPN, meropenem; GM, gentamicin; AMK, amikacin; MINO, minocycline; FOM, fosfomycin; LVFX, levofloxacin; ST, sulfamethoxazole-trimethoprim.

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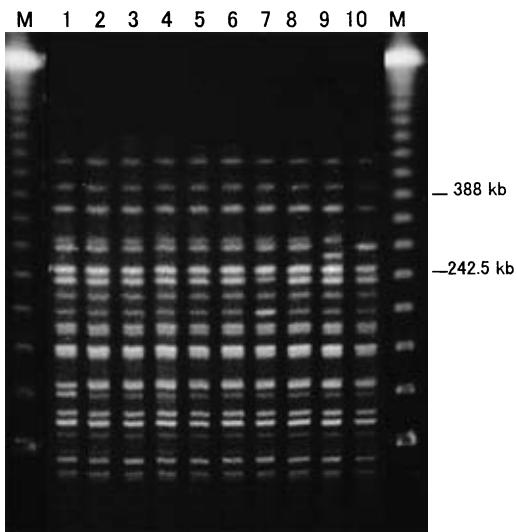


Fig. 1. PFGE patterns of *E. coli* O115:H19 digest with *Xba*I.
Lanes 1 to 10 : respective *E. coli* isolated from 10 sick persons.
M: λ DNA ladder.

enterotoxigenic *E. coli* (ETEC), enteroinvasive *E. coli* (EIEC), enterohemorrhagic *E. coli* (EHEC), or enteroaggregative *E. coli* (EAggEC), but that they were likely to be EPEC.

Moreover, in the antibiotic susceptibility examination by the micro-dilution broth test using a dry-plate (Eiken Chemical Co., Ltd., Tokyo, Japan), 20 isolates were sensitive to all 17 antibiotics, i.e., ampicillin, piperacillin, cefazolin,

cefotiam, ceftazidime, cefaclor, flomoxef, cefpodoxime, aztreonam, imipenem, meropenem, gentamicin, amikacin, minocycline, fosfomycin, levofloxacin, and sulfamethoxazole-trimethoprim.

The isolates were examined by PFGE (Nippon Bio-Rad, Tokyo, Japan) analysis using the restriction enzyme *Xba*I. The PFGE patterns of 10 of the 20 strains are shown in Fig. 1. The lack and/or addition of a band were seen in the domain of 242.5 to 388 kb of the two strains (lanes 9 and 10), while the remaining 18 strains showed the same pattern.

In conclusion, we considered that this case of food poisoning was caused by a single strain, EPEC O115:H19. However, we could not determine the causative food and meal for the case, since no isolates were detected either from the stool samples of the food preparers nor from the food itself.

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