Diarrhea in U.S. Troops Deployed to Thailand

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Ninety-five (28%) of 333 U.S. military personnel deployed to Ubonratchathani, Thailand, for 1 month in February 1993 developed diarrhea. Campylobacter jejuni was identified in 6 (25%), attaching and effacing Escherichia coli was identified in 3 (13%), nontyphoidal Salmonella spp. were identified in 2 (8%), and rotavirus was identified in 1 (4%) of 24 persons who had diarrhea and submitted specimens.

Diarrheal disease has historically been a problem for military personnel deployed overseas. In a survey of 2,022 troops during Operation Desert Shield, 20% were temporarily unable to perform their duties because of diarrheal disease. Enterotoxigenic Escherichia coli (ETEC) and Shigella spp. were the most common bacterial pathogens identified. The incidence and etiology of diarrheal disease in U.S. troops deployed in training exercises outside the United States have varied (1, 2, 3, 5, 6, 11, 14, 15). This, in part, reflects the soldiers' or sailors' exposure to indigenous populations, the prevalence of enteric pathogens in the country in which the exercises were held, the time of year, and whether military personnel ate food obtained locally (14).

In February 1993, a group of U.S. Air Force (USAF) and U.S. Army (USA) Special Forces personnel were deployed to northeastern Thailand for 1 month. Stools collected from U.S. military personnel with diarrhea were examined for enteric pathogens. The exercise, called Balance Torch, was a combined operation involving the Royal Thai Air Force, the USA, and the USAF. Three hundred thirty three U.S. military personnel (108 in the USA group and 225 USAF personnel) were at risk of developing diarrhea during Balance Torch. No attempt was made to determine the etiology of diarrhea in the Royal Thai Air Force. U.S. personnel received 100 mg of doxycycline daily for malaria prophylaxis. Activities varied between military training exercises and medical and engineering assistance projects. These activities conducted in the surrounding villages brought U.S. military personnel into close contact with the Thai population.

USA officers and enlisted personnel ate most breakfasts and evening meals at a dining facility located on the Royal Thai Air Force base, which served food catered by a local hotel. Prepackaged meals (ready-to-eat meals) were given to both USA and USAF personnel for lunch. All USAF personnel obtained their meals in a variety of restaurants in Ubonratchathani, Thailand. Both USAF and USA personnel frequently exchanged ready-to-eat meals for Thai food, such as barbecued chicken, sold by street vendors near the Royal Thai Air Force base.

USAF and USA personnel were instructed to go to their respective battalion aid stations if they developed diarrhea; clinical histories were obtained by medical personnel at these stations. Patients were instructed to submit a stool specimen, which was transported at 4°C and initially processed within 2 h of collection at a laboratory established nearby. Stools were processed as previously described (2). Up to 10 lactose-fermenting (Lac+) and up to 10 non-lactose-fermenting (Lac−) E. coli isolates, as identified on a MacConkey plate, were saved on Dorset egg yolk medium slants. Isolates were tested within 1 month of isolation for enterotoxin production (4, 13). The same isolates were fixed on Whatman 541 filters and examined for hybridization with 32P-labeled DNA probes coding for attaching and effacing E. coli (11), Shiga-like toxins I and II, enteroinvasive E. coli, and enteropathogenic E. coli adherence factor, as previously described (7).

Diarrhea occurred in 15 (14%) of 108 USA and 80 (36%) of 225 USAF personnel. All 15 of the USA group but only 9 (11%) of the 80 USAF patients with diarrhea submitted stools. For the 24 personnel who had diarrhea and submitted specimens, the mean number of diarrheal stools passed in the previous 24 h was 7 (range, 1 to 25), and the mean duration of diarrhea prior to culturing was 34 h (range, 6 to 120 h). Of the 24 patients, 18 (75%) had abdominal cramps, 16 (67%) had anorexia, 15 (63%) had fatigue, 12 (50%) had nausea or vomiting, and 12 (50%) had a history of fever; stools were described as watery by 13 (54%) patients, loose by 8 (33%) patients, and dysenteric by 3 (13%) patients; and 7 (28%) had ≥10 fecal leukocytes per high-power field. Five (2%) of 225 USAF personnel developed diarrhea on the same day; this development had an adverse effect on operations. Three (3%) of 108 USA personnel could not work for 24 h because of diarrhea.

Campylobacter jejuni was identified in 6 (25%), attaching and effacing E. coli was identified in 3 (13%), nontyphoidal Salmonella spp. were identified in 2 (8%), and rotavirus was identified in 1 (4%) of 24 individuals with diarrhea. ETEC, enteroinvasive E. coli, Shigella spp., Shiga-like toxin, E. coli adherence factor, and intestinal parasites were not found. Of six Campylobacter isolates, five were type 36 and one was type 11. One Salmonella sp. was Salmonella agona, and the other was S. enteritidis.

In previous investigations performed over the last 12 years in Thailand to define the etiology of diarrheal disease among U.S. military groups, the incidences of ETEC, Shigella spp., and Campylobacter spp. have varied considerably (1, 2, 11, 15). The current surveillance of diarrhea was conducted with U.S. military personnel who had contact with the Thai population at a time of year when Shigella and ETEC...
infections are known to occur in northeastern Thailand (8). However, ETEC and Shigella infections were not identified in this group of soldiers, despite extensive microbiological investigations.

In 1988, Taylor et al. (15) suggested that doxycycline, which soldiers were receiving for malaria prophylaxis, was responsible for the higher rate of isolation of Campylobacter spp. than in previous studies of groups not receiving doxycycline. In a subsequent study, in which soldiers were receiving doxycycline or mefloquine for malaria prophylaxis (2), the rate of isolation of Campylobacter spp. was similar in soldiers receiving either drug. C. jejuni and nontyphoidal Salmonella spp. were subsequently identified as the most common causes of diarrhea in U.S. troops deployed to central Thailand in May 1990 (12). Attaching and effacing E. coli isolated from 13% of military personnel with diarrhea was identified with a recently developed DNA probe (11). Further studies are needed to determine whether attaching and effacing E. coli is a cause of diarrhea in other populations.

Campylobacter and nontyphoidal Salmonella spp. frequently isolated from food, primarily chicken sold in markets in Thailand (12), were important causes of diarrhea in this and previous exercises (11, 15). A case-control study of Campylobacter and nontyphoidal Salmonella infections in U.S. troops should be performed to formulate recommendations to reduce these food-borne infections in U.S. troops or other travelers.

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