An Outbreak Of Campylobacteriosis Amongst Directing Staff And Students At The Infantry Training Centre, Brecon, Wales, March 2004

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ABSTRACT

A cohort study was undertaken to determine the source of an outbreak of gastrointestinal illness affecting a number of military personnel at ITC, Brecon during the period 19-30 March 2004. Of 105 soldiers on a field training exercise over the period 15-19 March 2004, 36 subsequently developed symptoms. Nine patients had *Campylobacter* sp identified in their stool. Water was provided from a single source. This water was used for washing, shaving, drinking and the preparation of rations. Although not statistically significant, epidemiological investigation suggests that the water may have been the vehicle of infection.

Introduction

The Infantry Training Centre (ITC) at Brecon provides a number of courses for Infantry Officers throughout the year. The Platoon Commander's Battle Course (PCBC) is designed for recently commissioned subalterns who are joining Infantry Battalions. In addition, newly commissioned RAF Officers who are joining the RAF Regiment attend the course as well as a number of overseas students. The students are divided into 3 platoons. The course is run by the Platoon Commanders Division (PCD) at ITC, Brecon.

In March 2004 the Health Unit at AMD was informed of an outbreak of gastrointestinal illness amongst the students on PCBC 0303, following Exercise DARK MIST/SHORT DASH that took place during the period 15-19 March 2004 on Sennybridge Training Area (SENTA). In addition, a number of Directing Staff (DS) of the PCD who were on the exercise were also exhibiting similar gastrointestinal symptoms.

Methods

Epidemiological investigation

A cohort study was undertaken utilising a questionnaire that was drawn up using EpiInfo 6.04 software, and data were entered onto a laptop computer. The information collected was:

- Demographic data (e.g. name, age, rank, date of birth, platoon number).
- Information about water consumption on exercise.

- Information about food consumption.
- Symptoms suffered.
- Onset date of symptoms.
- Information about hand-washing practices on exercise.

A case definition was formulated:

"Any person presenting during the period 19-30 March 2004 with diarrhoea or any two symptoms from abdominal pain, fever or nausea".

Microbiological sample from cases

Stool samples were sent from those individuals meeting the case definition (36 people) for microscopy and culture. About half of these samples were taken after individuals had ceased to be symptomatic. The samples were analysed for enteric pathogens by routine bacteriological methods.

Environmental investigation

Water samples were taken on 31 March 2004, for microbiological analysis, by a civilian sub-contractor.

Results

Epidemiological investigation

A hundred and five personnel (students and DS) took part on Exercise DARK MIST/SHORT DASH over the period 15-19 March 2004. Whilst on exercise individual ration packs were used exclusively with no fresh food or fresh milk being provided. Water came from a single source, a borehole on SENTA, which supplies a water point known as "The Elephant's Trunk". No other exercising troops used this water source during the period in question. The water goes via a water treatment plant where it is chlorinated. A bowser was filled from the water point, and jerrycans were filled from the bowser to provide those on the exercise with water. The water was used to wash, shave, drink and prepare rations. Nobody reported using puritabs in the water that was supplied. Handwashing prior to the preparation of rations was poor with most people reporting that they did not wash their hands.

All personnel on Exercise DARK MIST/SHORT DASH answered the questionnaire. Thirty-six people exhibited symptoms that met the case definition. The first probable case reported that they had symptoms on 19 March 2004. The last

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probable case reported symptoms on 30 March 2004. The first confirmed case reported symptoms on 20 March 2004. The epidemic curve is shown in Figure 1. The illness was spread evenly throughout all platoons and DS.

Fig 1. Epidemic curve of gastrointestinal illness, ITC, Brecon, March 2004.

The commonest symptom was diarrhoea (35 people), followed by abdominal pain (24 people). Other symptoms reported included nausea, fever, and vomiting. Four people reported blood in their stool.

There is no statistical significance associated with the amount of water consumed and the development of illness. For those drinking 3 or more water bottles a day the relative risk was 1.23 (95% confidence interval 0.72-2.12, $p = 0.46$). There was no association between handwashing and developing illness, the relative risk was 0.97 (95% confidence interval 0.37-2.54, $p = 0.95$).

Microbiological samples from cases

Nine stool samples tested positive for *Campylobacter sp.*, no other pathogens were isolated.

Environmental investigation

Microbiological analysis of the water sample taken on 31 March 2004 indicated no coliforms or *Campylobacter*. Previous results of routine testing of the water indicated that it was free of coliforms in previous months. The water company responsible for the treatment of the water, reported that chlorine levels at "The Elephant's Trunk", although in the range set by national standards, were lower than the company wished and they would increase the level of chlorination to the upper part of the range. It was stated that it was company policy to maintain levels in the upper part of the range, although levels in the lower part of the range were sufficient to disinfect the water.

Discussion

Campylobacter causes diarrhoeal and systemic illness in humans and animals. *Campylobacter*s are the most commonly reported bacterial causes of gastroenteritis in most developed countries (1).

Campylobacteriosis is a zoonosis. It is found world-wide in the gastrointestinal tract of birds and mammals. Many animals develop a life long carrier state. Transmission from animals to man occurs predominantly via ingestion of faecally contaminated water or food. Most *Campylobacter* infections occur sporadically. Risk factors identified for sporadic *Campylobacter* infections include drinking unpasteurised milk, drinking untreated water, eating undercooked chicken and barbecuing (2, 3).

Large outbreaks have occurred from the use of untreated water or when there have been failures in "treated" water supplies (4-9). Outbreaks have also been associated with the consumption of raw milk or when there has been a failure of the pasteurisation process (10, 11). Person-to-person spread may occur but is rare. Most cases occur within 2-5 days of exposure, with an average of three days, but a range of 1-10 days is possible (12).

The epidemiological data suggests that this was a point source outbreak. The epidemic curve does appear to show a second peak but this may be due to the small numbers involved rather than another illness, as the symptoms described by those affected later are the same as those reported at the start of the outbreak.

Only 9 stool samples tested positive for *Campylobacter sp.* and no stool sample was positive after the 25 March 2004. About half of these samples were sent from individuals who had not reported sick. These individuals were identified through active case finding and had ceased to be symptomatic by the time a sample was taken, and this might account for the samples being negative.

It is thought that the most likely vehicle of infection was the water. Although microbiological analysis of the water was not positive for coliforms or *Campylobacter*, this cannot exclude the possibility of the water being contaminated during the period 15-19 March 2004. In most outbreaks in which an epidemiological link to a contaminated water supply was established, *Campylobacter* was not isolated from the water supply (13). The concentration of *Campylobacter* in the water may be low and, although remaining viable, may lose their culturability with time (14), making isolation difficult. The water source may be contaminated intermittently, or for a short period. Water samples are, therefore, often taken too late. In this case water samples were taken 12 days after the onset of symptoms.

Handwashing was poor before preparation of rations and it is possible that contamination of hands with animal faeces may have led to accidental ingestion of *Campylobacter*. It is felt unlikely that this is

the mode of infection, as when cases of campylobacteriosis occur in this manner it follows direct contact with excreting animals (15), which did not occur in this instance.

Although contamination of the water supply was not proven, it is possible that heavy rainfall could have resulted in the infiltration of bacteria from animal faeces into the ground water. During the exercise, the weather conditions were such that this may have occurred, and there is an abundance of sheep faeces on the training area. Weather conditions have been shown to be a contributing factor in outbreaks (4, 16). Anecdotal evidence suggests that gastrointestinal illness is a common problem amongst exercising troops on SENTA, although numbers affected are usually smaller. It might be that intermittent contamination of the water supply on SENTA does occur during periods of heavy rain and this may contribute to this problem of gastrointestinal illness amongst exercising troops.

Military medical history has shown that infectious disease is responsible for more morbidity and mortality than trauma. For example, Table 1 shows the burden of infectious disease in the Crimean war of 1853 to 1856 (17), which resulted in major changes in military medical practice and the establishment of preventative medicine within the Army Medical Services.

Table 1. Crimean war casualties amongst European forces (17).

	Wounded	Killed in action/ died of wounds	Sick	Died of disease
French	39,869	20,356	196,430	44,815
English	18,283	4,947	144,390	17,225
Russian	92,381	37,958	322,097	37,454

More recently Soviet troops deployed to Afghanistan during the Soviet-Afghan War experienced major problems with infectious disease, 75.76% of Soviet troops who served in Afghanistan were hospitalised, of which the vast majority, 88.56%, were hospitalised for infectious disease (18). The main reasons for the high rate of disease among Soviet servicemen were lack of sufficient supplies of clean drinking water, lack of enforcement of basic field sanitation practices (a historic Soviet problem, partly due to a lack of a professional NCO corps), and failure to wash their hands after defecation. Up to 10% of the cooks had pathogenic intestinal bacteria at any given time. Soviet troops often drank untreated water, sometimes due to a lack of treated water, or because they simply did not like the taste of the treated water (18).

On Op TELIC, gastrointestinal illness was the single largest cause of morbidity,

accounting for 26% of all illness during the period 19 February - 26 April 2003 (19).

In this outbreak there was an attack rate of 34% and this had an effect of halting of training on the PCBC for those affected, with the possibility of a number of personnel missing the important final exercise of the course in Kenya. An outbreak such as this on operations can significantly reduce the effectiveness of units with added workload for those not affected.

Recommendations

It is important to ensure that water provided to troops, either on exercise or operations, has come from a reliable source that is subject to regular monitoring at periods that can identify intermittent contamination to make sure that outbreaks such as this do not occur.

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