

# Setting standards for the prevention and management of travellers' diarrhoea in elite athletes: an audit of one team during the Youth Commonwealth Games in India

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## ABSTRACT

**Objective:** Devise and implement evidence-based guidelines for the prevention and management of travellers' diarrhoea (TD), and establish the incidence of TD during an elite sporting trip to India.

**Design:** Literature review and audit.

**Setting:** Youth Commonwealth Games in India 2008.

**Participants:** All members of the Team England Squad.

**Main outcome measures:** Hygiene guidelines included only drinking bottled water, eating hot food and regular hand washing with alcohol gel. Ciprofloxacin was offered to non-athlete team members as prophylaxis but not to athletes due to its possible association with tendon disease. Following implementation of these guidelines, the incidence of travellers' diarrhoea (TD) in the whole squad was 24/122 (20%), compared with 7/14 (50%) on the reconnaissance trip (preguidelines). In those taking prophylactic ciprofloxacin, the incidence was 4/33 (12%), compared with 20/89 (23%) in those not taking ciprofloxacin. No athlete missed their event due to TD.

**Conclusions:** The incidence of TD was less during the event than on the reconnaissance trip. The relative contribution to this reduction in strict hygiene guidelines as compared with potentially improved catering hygiene arrangements is unknown. Prophylactic ciprofloxacin also reduced the incidence of TD but it is probably not appropriate for use in elite athletes. Rifaximin may be an alternative for this group.

There is little in the way of detailed guidance for the prevention and management of travellers' diarrhoea (TD) in elite sporting teams.<sup>1-3</sup> We therefore set out to establish what happens in practice and how we might take an evidence-based approach when looking after this particular group of travellers. In 2008 Team England travelled to the Youth Commonwealth Games in Pune, India. During the preceding reconnaissance trip undertaken by the management team, there was a 50% incidence of TD. Two of the seven cases experienced high fevers along with diarrhoea and abdominal pain, and were out of action for at least 24 h. The prevention and management of TD therefore became a high priority for the medical team.

Travellers' diarrhoea has an incidence of 20-60%.<sup>4-7</sup> The aetiology of TD is bacterial in 50-80% of cases<sup>4-7</sup> and viral in approximately 20% of cases.<sup>4</sup> In up to 50% of cases it is not possible to isolate a pathogen.<sup>4</sup> Reported methods of reducing pathogen exposure include drinking only bottled water,

eating freshly prepared, thoroughly cooked, hot food and avoiding eating raw fruit and vegetables.<sup>4-5-7</sup> In addition, frequent hand washing, especially before eating, is advised.<sup>4-7</sup> Ciprofloxacin is an appropriate antibiotic for prophylaxis against the likely pathogens in India, but it has a possible association with tendon disease<sup>8-12</sup> and is therefore usually avoided in athletes. Most courses of TD are self-limiting and only require fluid and electrolyte replacement.<sup>4-6-7-13</sup> If symptoms become intolerable, then antidiarrhoeal agents may be used.<sup>4-7</sup> For those exhibiting more severe symptoms that are suggestive of a bacterial origin, such as high fever and bloody diarrhoea, stool culture followed by empirical (and later directed) antimicrobial treatment may be required.<sup>4-6-7-13</sup>

The aims of this audit were:

1. To develop an evidence-based protocol for the prevention and management of TD in an elite sporting team, which would form the basis of the audit standards.
2. To record the incidence and spread of TD in an elite sporting team competing in a high-risk country.
3. To compare the incidence of TD among those taking and not taking antibiotic prophylaxis.
4. To audit the prevention and management of TD against the standards set.
5. To modify the protocol on the basis of the results to provide more specific advice for future travelling teams and to allow further audit.

## METHODS

Literature pertaining to TD and elite sporting team travel was reviewed in order to develop an evidence-based protocol for its prevention and management. From here, audit standards were set (box 1).

The definition of TD is usually taken as three or more loose stools in a 24 h period.<sup>3</sup> However, with mild TD there may only be one or two loose motions in a 24 h period.<sup>4</sup> The diarrhoea may occur with or without abdominal cramping, nausea and vomiting, fever and blood in the stools.<sup>3-4</sup> Even mild symptoms may significantly impair an athlete's performance, so for the purposes of this study we included anyone presenting with the onset of one or more loose motions following arrival, in whom there was no other obvious explanation. "Significant" TD was defined as the diarrhoea being associated with one or more of the

**Box 1 Audit standards for the prevention and management of travellers' diarrhoea in an elite sporting team****Prevention standards:**

- ▶ all team members have access to written advice regarding the prevention of TD;
- ▶ all team members receive verbal advice regarding the prevention of TD;
- ▶ all team members issued with alcohol hand gel and instructed in its use;
- ▶ no athlete required to withdraw from their event due to TD;
- ▶ no team official required to withdraw from their duties for more than 24 h due to TD;
- ▶  $\leq 5\%$  cases of TD presenting within 24 h of another case occurring in the same room;
- ▶  $\leq 5\%$  cases of TD presenting within 24 h of another case occurring in the same sporting team.

**Management:**

- ▶  $\geq 95\%$  cases of TD managed according to the protocol (box 2).

following: temperature  $>37^{\circ}\text{C}$ , blood in the stools, constant or severe abdominal pain, rebound or guarding tenderness. "Simple" TD was defined as loose motions, with or without mild intermittent abdominal cramping, temperature  $\leq 37^{\circ}\text{C}$  and no blood in the stools. The management protocol for simple and significant TD is summarised in box 2.

Upon selection, all team members were required to register with the team website, following which they were prompted to review the guidelines on TD. Verbal advice was scheduled to be given at the airport prior to departure, along with the issuing of a personal supply of pocket alcohol hand gel which they could have on their persons at all times. A written record was kept of those who had received hand gel and written advice. All team members were asked to report any TD symptoms to the doctors, and consultations were recorded on a standardised medical sheet. Information about the onset, type and duration of symptoms, the obtaining of stool cultures, symptomatic and antibiotic treatment were recorded. In addition, the sport and room number of each person presenting were recorded to try and establish any patterns of spread. A history of eating and drinking outside the athletes' village was also sought. All team officials were offered antibiotic prophylaxis (ciprofloxacin 250 mg once a day) which was commenced on the day of

**Box 2 Management protocol for travellers' diarrhoea****Simple TD**

- ▶ fluid replacement;
- ▶ solid food when tolerated; start with simple to digest and reintroduce more complex foods as diarrhoea improves;
- ▶ loperamide if symptoms interfering with training/competition (two stat then one with every loose motion) or codeine phosphate (especially if abdominal pain is present).

**Significant TD**

As for simple TD plus:

- ▶ obtain stool culture;
- ▶ antibiotics;
- ▶ isolate the infected person.

departure and continued until return to the UK. Significant cases were treated with trimethoprim with sulfonamide (septrin), as advised by local medical opinion. On return to the UK, all the data were entered into an Excel spreadsheet for analysis by one member of the medical team (ET). Minitab was used for  $\chi^2$  analysis comparing the rates of TD in the antibiotic prophylaxis group and the non-prophylaxis group.

**RESULTS**

All 122 team members (athletes and officials) had access to written advice regarding TD, and all received their own supply of alcohol hand gel. It was not possible to ascertain if everyone accessed the written advice on the website. Fifty per cent of the team received verbal advice prior to travel.

Of the 122 team members, 25 presented with new onset of diarrhoea. One had a sterile stool culture and turned out to have inflammatory bowel disease. Therefore, 24 cases were included in this study, giving a rate of TD in the team of 20%. Two members had significant symptoms. Table 1 shows that those taking antibiotic prophylaxis had a lower incidence of TD, though this was not significant ( $p = 0.2$ ). No athlete had to withdraw from competition, and no official was required to be absent from their duties.

The median time of onset was 9 days after arrival (range 5–14). Ten of the 24 cases presented during the last 2 days after athletes had finished competing. Only two cases presented within 24 h of someone else presenting in the same room. Ten cases presented with 24 h of someone else presenting from the same sport. However, six of these cases presented after competition when one team ate at the same restaurant outside the athletes' village.

Ninety-one per cent of cases were managed according to the treatment protocol. The two significant cases deviated from protocol because it proved unfeasible to culture stool samples or isolate individuals.

**DISCUSSION**

The strategies implemented resulted in a 20% incidence of TD during this trip to the Youth Commonwealth Games in India. This compares favourably with the 50% incidence during the reconnaissance trip and is consistent with the lower range of incidences reported in the literature.<sup>4</sup> However, this rate could have underestimated the true incidence, as some team members may have self-managed despite being encouraged to seek medical attention. While no athlete was forced to withdraw from competition, it is impossible to say whether the performance of any of those who developed TD prior to or during their competition period was compromised.

However, factors other than the team's strategy may have affected the results. If the potential for exposure to pathogens

**Table 1** Comparison of the incidence of travellers' diarrhoea in those taking and not taking antibiotic prophylaxis

Group	Rate of travellers' diarrhoea (%)
Whole team	24/122 (20%)
Athletes	20/81 (25%)
Officials	4/41 (10%)
Not taking prophylactic ciprofloxacin	20/89 (23%)
Taking prophylactic ciprofloxacin	4/33 (12%)
Officials not taking prophylactic ciprofloxacin	0/8 (0%)
Officials taking prophylactic ciprofloxacin	4/33 (12%)

**Table 2** Guidelines for the prevention and management of travellers' diarrhoea (TD)

	Strength of recommendation
Guidance: prevention	
All team members receive written advice regarding the prevention of TD prior to travel (to cover hygiene, food and drink choices)	Strong
All team members receive oral advice regarding the prevention of TD (to cover hygiene, food and drink choices)	Strong
All team members issued with alcohol hand gel and instructed in its use	Strong
Ciprofloxacin prophylaxis for all non-competing team members	Strong
Rifaximin prophylaxis for all competing team members	Consider (good evidence in non-athletic populations)
Probiotics for all team members	Consider (but no clear supporting evidence)
Guidance: management	
Simple TD managed with fluid and electrolyte replacement with or without loperamide	Strong
Significant TD managed as for simple TD with the addition of empirical antibiotics as per local advice, after a stool culture is obtained	Strong
Isolate cases of TD where possible	Strong

was lower between the reconnaissance and main trips, then, irrespective of the preventive measures instigated, the rate of TD was likely to have fallen. Common sense would dictate that the hygiene standards in the catering facilities within an elite multisport international games would be higher than those found for the general tourist in a developing country. However, there are no clear studies to confirm this. In 2003, Ericsson<sup>6</sup> found no evidence in the literature of a difference in incidence of TD in those staying in low- or high-budget hotels. It was even suggested that very-high-budget hotels might expose their guests to a higher level of risk by preparing "more fancy, cold foods by hand." More recent studies, while providing further data on the relative risk of travelling to different parts of the world, have not yet clarified the situation relating to how the standard of accommodation and catering affects TD incidence.<sup>14</sup>

There was a positive, though non-significant, trend towards the incidence of TD being lower in the group taking prophylactic ciprofloxacin compared with those not taking ciprofloxacin. However, as there were only four cases in the prophylaxis group, this result should be treated with caution. Of note, the only two significant cases occurred in persons not taking antibiotic prophylaxis.

Antibiotics have been quoted as being up to 95% effective in preventing TD,<sup>6,7</sup> with ciprofloxacin commonly being used. Due to potential side effects, prophylaxis is only usually advised for those at high risk (eg, immunocompromised, chronic heart, lung or gastrointestinal disease) or those for whom even a brief illness would be intolerable (including elite athletes).<sup>7</sup>

This argument must be balanced with the issue of antibiotic resistance.<sup>7</sup> Resistance to the trimethoprim/sulfonamethoxazole combination has already emerged,<sup>6</sup> and this antibiotic is no longer a first choice for prophylaxis. There is also concern that a resistant form of *Campylobacter* may develop.<sup>6</sup> However, some experts argue that it is the short-term use of subtherapeutic antibiotic courses by indigenous persons that is more responsible for resistance than prophylactic courses taken by tourists.<sup>6</sup> Other complications may be experienced with prophylactic antibiotics—for example, *Candida* vaginitis.<sup>6,7</sup> More serious but rare complications should also be considered, such as allergic reactions,<sup>7</sup> photosensitivity<sup>7</sup> and the overgrowth of *Clostridium difficile*.<sup>6,7</sup> Nevertheless, it should be noted that no antibiotic side effects were reported in this study.

Despite the issue of resistance, in the situation of the elite athlete (and their support staff) it would seem appropriate to offer antibiotic prophylaxis. Whereas ciprofloxacin is a reasonable

choice for staff, offering this antibiotic to athletes remains controversial. There are several reports in the literature of tendon pathology, including rupture, presenting after taking ciprofloxacin.<sup>9–11,15</sup> Most of these reports are in the older population, though some are younger and presented associated with exercise.<sup>10</sup> In addition, the evidence is from case reports rather than trials. However, since studies show that ciprofloxacin can effect tenocyte development *ex vivo* and in rats,<sup>12,16</sup> it would seem to be a sensible precaution to avoid ciprofloxacin in elite athletes.

More recent reviews are promoting rifaximin as an alternative antibiotic prophylaxis.<sup>13,17</sup> As a non-absorbed (<0.4%) agent,<sup>12</sup> it has fewer side effects,<sup>18</sup> though it may not be as effective as ciprofloxacin. One double-blind randomised controlled trial<sup>18</sup> showed 72% protection against TD using rifaximin, whereas ciprofloxacin is quoted as being 90–95% protective.<sup>7</sup> This difference may be due to rifaximin not being effective against invasive pathogens.<sup>18</sup> Nevertheless, it remains an option for antibiotic prophylaxis in elite athletes, as it is well tolerated.<sup>17</sup> Alternative prophylactic agents that may be considered are bismuth subsalicylate and probiotics. Bismuth subsalicylate has only a 60–65% efficacy against TD and must be administered four times per day,<sup>7</sup> making it an unsuitable choice in the elite competitive environment. Probiotics are becoming an increasingly popular choice, although evidence for their efficacy is limited.<sup>19–21</sup> We therefore decided against formally recommending this event. We were aware of several athletes who did choose to take them, but it was not possible to formally record and analyse this information. However, anecdotally, we noted that one sport, consisting of four athletes who were all taking probiotics, had a 75% incidence of TD.

Four of the eight audit standards were met; all had access to written advice, all received alcohol hand gel, no athlete missed their competition, and no official was absent from duty. There are various discussion points surrounding those audit standards which were not met. Only 50% of the team received verbal advice regarding preventing TD, due to the limited time and space available to deliver this. Despite this, team members generally displayed a good awareness of how to minimise their risk. For future trips, we would ensure that the time for a medical briefing prior to departure was safeguarded and that we also put in place a method of recording whether team members have accessed the online written information.

We attempted to elicit data regarding the possible spread of TD among team members by looking at the presentation rates amongst those sharing a room or from the same sport.

## What is already known on this topic

- ▶ Attention to hand hygiene and food/drink choices is recommended when travelling with elite athletic teams to developing countries.
- ▶ The use of ciproflaxin as antibiotic prophylaxis is inappropriate in athletes due to its potential association with tendon disease.

Obviously, this method is open to confounding factors as team members in the same room or sport are likely to be exposed to the same pathogens at the same time. In addition, members may have coincidentally become infected at similar times but from different exposures. More detailed information would be available if stool cultures were obtained, but this would only confirm that persons had the same pathogen, not whether or not there had been interperson spread. Indeed, it would be more likely that they had received the same exposure from the source. However, tracking cases according to sport and room does provide some useful data regarding behaviour and risk. For example, six of the 24 cases occurred in the same team who chose to eat outside the athletes' village after their competition had finished. They also ate food types that they were advised to avoid. This represented a rate of TD in this sporting group of 67%. While advice about only eating cooked food and avoiding exposure to unbottled water was strictly enforced during the competition period, it was left to individual sporting teams' discretion as to whether they wanted to travel outside the village after competition. The high rate of TD in those that ate out not only reinforces the advice given but also suggests that these recommendations should be enforced throughout the trip, not just prior to and during competition.

The last audit criterion that was not met related to the management of TD. All simple cases were managed according to the protocol, but neither of the two significant cases were isolated or had stool cultures obtained. Space was very limited in the athletes' accommodation, so it was not feasible to isolate athletes. In addition, stool culture analysis was difficult to obtain. Both cases were classified as "significant" due to having a low-grade fever but they did not have severe abdominal cramping or bloody diarrhoea. Given that neither was severely unwell, the team doctors deemed that stool cultures would be unlikely to change management and that isolation was not essential, providing strict hygiene standards were observed. It may be appropriate to modify the management protocol to advise obtaining stool cultures only if it is likely to change management; however, should the condition of the athlete then deteriorate, culturing any pathogens would become more difficult.

In summary, through implementing a strict hygiene protocol, along with clear guidance on fluid and food choices, the incidence of TD dropped from 50% during the reconnaissance trip to 20% during the event itself. Though the relative contribution of improved catering arrangements is unknown, it still appears logical to do everything possible to prevent TD in elite athletic teams given the potentially significant effects of illness on competition performance. Therefore, based on our results and the current evidence, we present the following guidelines for the use of elite sporting teams travelling to areas that are high risk for TD (table 2). From here we plan to address

## What this study adds

- ▶ It is feasible to implement strict hygiene strategies in an elite sporting setting.
- ▶ Within an elite sporting team, the rate of travellers' diarrhoea in those taking antibiotic prophylaxis was lower than in those not taking antibiotic prophylaxis.
- ▶ The hygiene standards of an elite sporting environment would appear to confer some protection against the exposure to travellers' diarrhoea pathogens.

the issues surrounding those audit standards that were not met and reaudit during the Commonwealth Games in Delhi 2010. In addition, future studies should also address in more detail the risk/benefit ratio of antibiotic prophylaxis in this group of travellers.

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