

## Typhoid and Paratyphoid

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### Introduction

Typhoid fever is a systemic disease contracted by ingestion of contaminated food or water. It is caused by the bacterium *Salmonella enterica* serovar Typhi, which is only a pathogen of humans. The illness may be mild or severe.

Paratyphoid is a clinically similar illness (though often less severe), caused by *Salmonella enterica* serovar Paratyphi A, B or C.

These conditions are sometimes referred to collectively as enteric fever.

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### Epidemiology

Data from the Travel Health Surveillance Section of the Health Protection Agency Communicable Disease Surveillance Section

#### Global epidemiology

Typhoid and paratyphoid mainly affects poorer regions of the world, where sanitation and clean water are lacking. The World Health Organization (WHO) currently estimates the global annual incidence of typhoid fever to be around 0.3%,<sup>1</sup> which, with the current global population of nearly 6.4 billion,<sup>2</sup> equates to 19.2 million cases per year. The case fatality rate is estimated at nearly 4%, leading to an estimated 768,000 deaths per year globally. (This data are based on 1984 figures and exclude China.<sup>3</sup>) A more recent estimate places the total number of cases at 21.7 million with 216,510 deaths per year (a case fatality rate of 1%).<sup>4</sup> This estimate is based on the global population in 2000 and accounts for improvements in water safety and sanitation, changes to data collection methods, and population changes since the 1984 WHO estimate. It was based however, on a small number of incidence studies, and extrapolations were made to cover countries without eligible studies, particularly in Africa. The same study estimated the global annual incidence of paratyphoid fever to be 5.4 million.<sup>4</sup>

A high proportion of typhoid occurs in Asia, Africa, and South America where the case fatality also tends to be higher than in richer countries. Recent outbreaks of typhoid (in 2004) have been reported from countries in eastern Europe such as

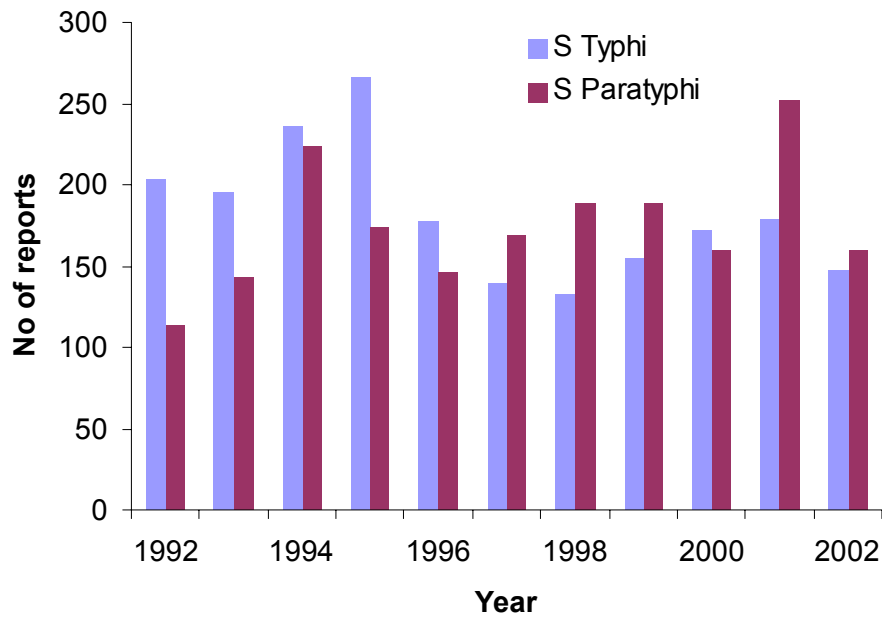
Kyrgyzstan, Tajikistan, The Ukraine and Russia, and are frequently reported from Asian and African countries. <sup>5</sup>

From its introduction in 1948, chloramphenicol was the drug of choice to treat typhoid, <sup>6</sup> but in the early 1970s, chloramphenicol-resistant strains of *Salmonella* Typhi began to emerge. Large outbreaks of resistant *S. Typhi* occurred in Mexico and India, and became endemic in many countries of south and south east Asia. <sup>7</sup> Other antibiotics have since been used to treat typhoid cases such as ampicillin and co-trimoxazole, but multi-drug resistance subsequently developed from 1987 onwards in many typhoid-endemic regions such as China, south east Asia and the Indian sub-continent. <sup>8</sup> In 1997, a large outbreak of multi-drug resistant typhoid fever was reported in Dushanbe, Tajikistan involving 8901 cases and 95 deaths. <sup>9</sup> Drug-resistant strains have spread rapidly and have been seen in the UK in returning travellers. <sup>7</sup>

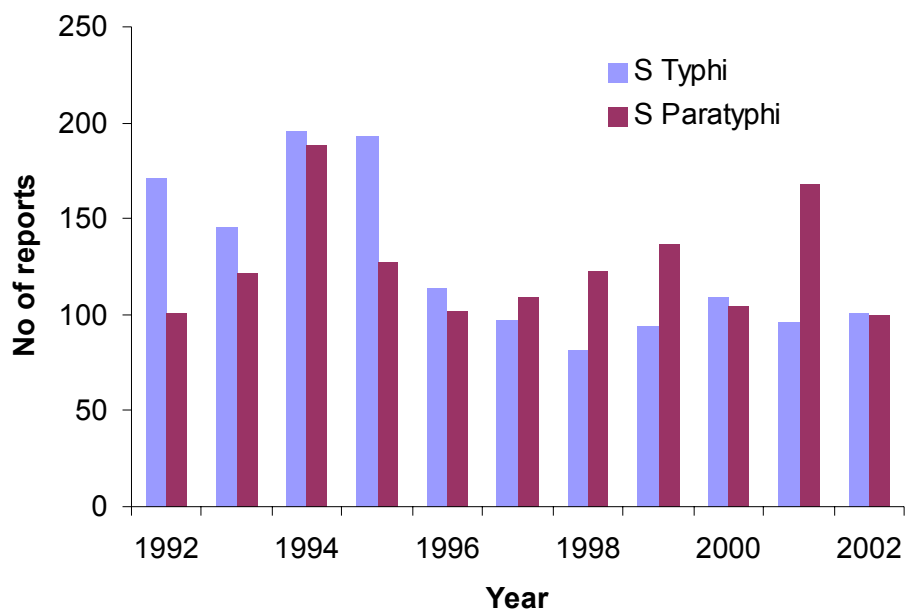
### **Typhoid and paratyphoid in travellers from England and Wales**

Typhoid and paratyphoid in England and Wales is usually associated with foreign travel, although indigenous transmission may occur after contact with a carrier or a case, especially in family settings. Annually, there are reported between 150 and 200 cases each of typhoid and paratyphoid. There has been a general decline in typhoid cases reported since the early 1990s and slight increase in reports of paratyphoid. (Figure 1) Around 100 cases of typhoid each year report recent foreign travel but there has been a decline in such cases since 1993. (Figure 2) The use of typhoid vaccine may have been a contributory factor to this, as the decline is less evident for paratyphoid cases. However, in 1993 active ascertainment of travel history for typhoid and paratyphoid ceased due to lack of resources, which led to more cases with an unknown travel history being reported since then (Figures 3, 4). The decline in the number of cases reporting recent foreign travel may therefore partly be a reporting artefact.

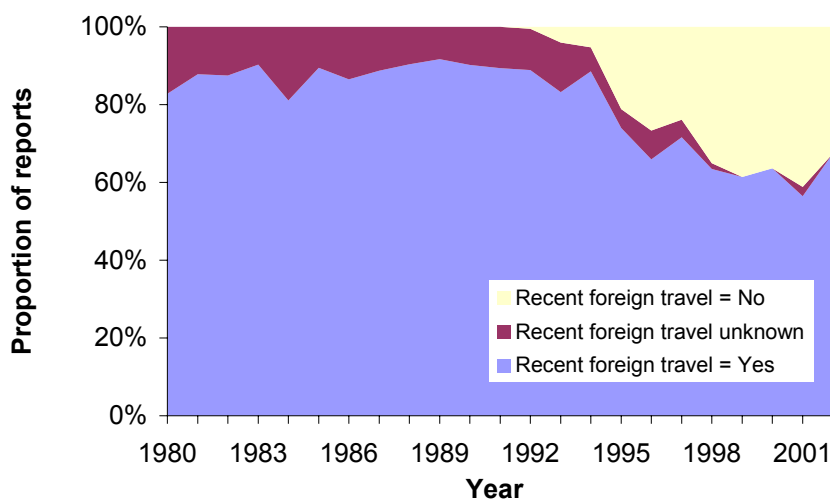
**Figure 1 Total laboratory reports of *Salmonella* Typhi and Paratyphi, England and Wales: 1992 to 2002.**



**Figure 2 Laboratory reports of *Salmonella* Typhi and Paratyphi that stated recent foreign travel, England and Wales: 1992 to 2002.**



**Figure 3 Proportion of laboratory reports of *Salmonella* Typhi by reported history of recent foreign travel, England and Wales: 1980 to 2002**



**Figure 4 Proportion of laboratory reports of *Salmonella* Paratyphi by reported history of recent foreign travel, England and Wales: 1980 to 2002**

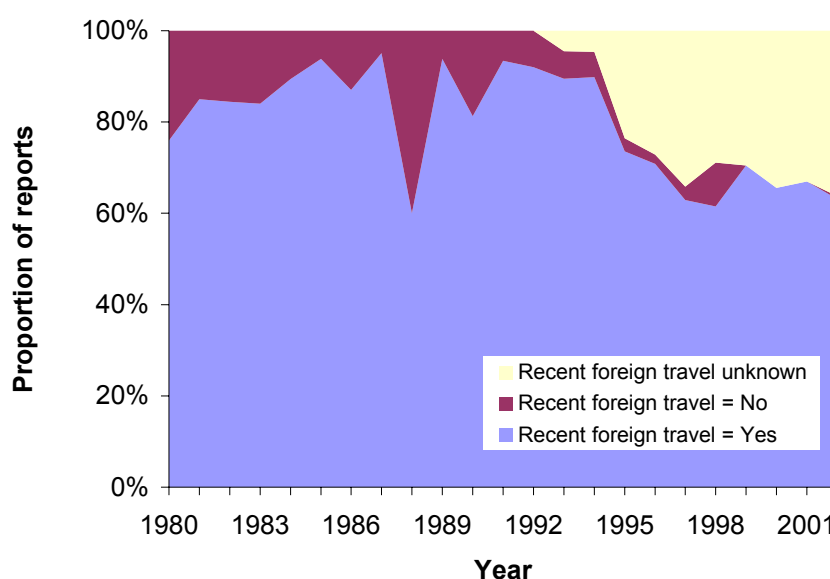


Table 1 shows the countries and regions where typhoid cases that have reported recent foreign travel are presumed to have been acquired. The Indian sub-continent has remained the most reported region of acquisition of typhoid; in particular India and Pakistan were the most reported countries since 1990. The ISC was the most reported region of acquisition for paratyphoid A and travel to countries surrounding the Mediterranean, such as Spain, Turkey, Morocco and Egypt accounted for most paratyphoid B.

**Table 1 Laboratory reports of typhoid by area of acquisition, England and Wales: 1990 – 2002**

| Presumed area of infection        | 1990       | 1995       | 2000       | 2001       | 2002       |
|-----------------------------------|------------|------------|------------|------------|------------|
| Indian sub-continent (total)      | 139        | 162        | 81         | 75         | 66         |
| India                             | 56         | 39         | 34         | 24         | 26         |
| Pakistan                          | 74         | 101        | 34         | 39         | 26         |
| Mediterranean (includes Portugal) | 3          | 4          | 1          | 4          | 4          |
| Middle east                       | 0          | 2          | 0          | 1          | 0          |
| West Africa                       | 7          | 12         | 13         | 7          | 8          |
| East Africa                       | 2          | 1          | 0          | 1          | 3          |
| Africa other                      | 0          | 1          | 0          | 2          | 0          |
| Far east                          | 3          | 5          | 7          | 2          | 4          |
| Other/>1 country                  | 10         | 3          | 1          | 0          | 1          |
| Abroad (country unknown)          | 2          | 6          | 2          | 4          | 5          |
| <b>Total acquired abroad</b>      | <b>166</b> | <b>196</b> | <b>105</b> | <b>96</b>  | <b>91</b>  |
| Unknown travel history            | 0          | 56         | 60         | 70         | 44         |
| Total acquired in England & Wales | 18         | 13         | 0          | 4          | 0          |
| <b>Total (all reports)</b>        | <b>184</b> | <b>265</b> | <b>165</b> | <b>170</b> | <b>135</b> |

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## Risk for Travellers

In endemic countries, risk-factors for contracting enteric fever include eating or drinking contaminated food or water, inadequate sanitation and living conditions, poor personal hygiene, and close contact with those infected with *Salmonella* Typhi or Paratyphi.

The risk of contracting typhoid fever is highest for travellers to the Indian sub-continent (India, Pakistan and Bangladesh), SE Asia, and parts of Latin America and Africa. In these regions, the attack rate for travellers has been estimated at 10 per 100,000 travellers (10). The risk of typhoid and paratyphoid fever in resource-rich countries such as Europe, North America and Australasia is low, less than 1 case per million visits

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## Transmission

Transmission occurs following the ingestion of food or water that has been heavily contaminated ( $10^5$  or more organisms may be required to cause illness) by the bacterium *Salmonella* Typhi (typhoid) or *Salmonella* Paratyphi (paratyphoid). *S.* Typhi can be passed in the faeces of persons who are acutely ill with typhoid fever, or are chronic carriers. The bacteria may then enter the food chain and water supply if personal and food hygiene measures are poor and/or sanitation is primitive.

Direct faecal-oral transmission may occur. Ingestion of raw vegetables fertilized with human waste (night soil) and eaten raw, shellfish harvested from sewage-contaminated beds, and milk products contaminated by workers' hands all may result in typhoid infection (11).

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## Signs and symptoms

### Typhoid

Typhoid is a systemic disease that varies in severity, but nearly all patients experience fever and headache. Some young children will experience a mild illness that is treatable with antibiotics, but they may also suffer from severe disease.

The incubation period for typhoid fever is usually 7-14 days, but can be shorter or longer depending upon how many bacteria are ingested. Symptoms include low-grade fever (which typically becomes higher as the illness progresses), chills, headache, myalgia, malaise, anorexia and nausea. There may be abdominal discomfort and constipation, and diarrhoea may occur early in the course. Moderate enlargement of the liver and/or spleen occurs in about 50% of cases. In some cases, rose spots will appear on the trunk, but they may be difficult to see in dark-skinned individuals.

Complications are more likely in untreated cases or cases that present late in the course and occur in 10-15% of all cases. Complications include intestinal haemorrhage and perforation, toxic myocarditis, pneumonia, seizures, typhoid encephalopathy, and meningitis (usually in young children).

The case fatality is usually less than 1% with prompt antibiotic therapy, but may be as high as 20% in untreated cases.

Following recovery, convalescing patients may continue to excrete *Salmonella* Typhi in their faeces. Between 1-3% will become long-term carriers, continuing to excrete the organism for more than one year after the initial illness (12). Carrier state is more common in women and those with biliary tract abnormality (11). Chronic carriers require prolonged courses of antibiotics to clear the organism.

## Paratyphoid fever

Paratyphoid is clinically similar but the disease is usually milder and of shorter duration. It often manifests as acute gastroenteritis.

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## Treatment

Typhoid can be successfully treated with antibiotic therapy. However, in some parts of the world *Salmonella* Typhi has become resistant to the traditional antibiotic treatments (chloramphenicol, amoxicillin and trimethoprim-sulfamethoxazole). Treatment is usually with fluoroquinolones, cephalosporins (13), or azithromycin in resistant cases.

Relapse will occur in less than 10% of patients treated with antibiotics. It is usually milder and of shorter duration than the original illness. Those treated with fluoroquinolones are less likely to suffer relapse or to go on to become chronic carriers.

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## Prevention

All travellers should exercise food and water hygiene precautions to prevent all types of enteric fever.

### Typhoid

Vaccination is recommended for travellers to areas where sanitation and food hygiene is likely to be poor, for household contacts of typhoid carriers and for laboratory workers who may have contact with the bacterium.

### Paratyphoid

There is currently no vaccine available against paratyphoid.

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## Further reading

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