

Guidelines for the investigation and management of food handlers during non-typhoidal *Salmonella* outbreaks

Issue

The approach to testing food handlers during *Salmonella* outbreaks and the response to food handlers who have *Salmonella* identified in stool has varied within and between jurisdictions in Australia. A consistent evidence-based approach is desirable.

This paper, prepared by an OzFoodNet working group, reviews the available evidence and makes recommendations to guide those investigating and managing non-typhoidal salmonellosis involving food handlers. Infections with *Salmonella* Typhi and Paratyphi are not considered.

Summary of key points

- Non-typhoidal *Salmonella* outbreaks resulting from infected food handlers are uncommon.
- There are well described *Salmonella* outbreaks involving transmission while food handlers were symptomatic with gastroenteritis.
- There are a small number of published outbreaks that attribute transmission to asymptomatic infected food handlers. This is most convincing when there is good epidemiological evidence implicating specific food handlers. In many cases the attribution is open to question.
- During outbreaks, food handlers are commonly infected with the outbreak strain of *Salmonella* and many will not report symptoms. Most are likely victims of the outbreak.
- About 50% of adults infected with *Salmonella* will continue to excrete for over 5 weeks and 10% will excrete for over 9 weeks.
- It is difficult to reliably exclude infection with *Salmonella* due to intermittent excretion in stool and decreased test sensitivity at low levels of excretion. Multiple negative stool cultures are required to confidently exclude ongoing excretion.
- The natural history of *Salmonella* infection is for spontaneous clearance. Antibiotic treatment may be associated with prolonged carriage.
- For food handlers with asymptomatic non-typhoidal *Salmonella* infection to be excluded from food handling activities under the FSANZ *Food Standards Code*, there would need to be evidence that there was a reasonable likelihood of food contamination as a result of the infection.
- Public Health Authorities in the UK and USA only restrict food handlers infected with non-typhoidal salmonellosis from working while symptomatic with gastroenteritis and for an additional 24 to 48 hours.

Recommendations:

1. Stool testing

Stool samples should not be routinely collected from asymptomatic food handlers during outbreak investigations as the results do not provide a useful basis for a public health response.

In limited circumstances it may be appropriate to collect stool samples from specific **asymptomatic** food handlers, when there is epidemiological evidence that those individuals may be involved in transmission, particularly for prolonged outbreaks. Such evidence may include an association with implicated meals or dishes.

It may be appropriate to collect stool samples from **symptomatic** food handlers for clinical or epidemiological indications.

2. Work exclusion

Food handlers with symptoms of gastroenteritis, including those with confirmed salmonellosis, should not attend work until at least 48 hours after symptoms cease and should be counselled on personal hygiene prior to returning to work.

In addition, for *Salmonella*-infected food handlers who have been excluded from work and who serve vulnerable populations (hospital, aged care or childcare settings) or who are identified during outbreak investigations, a site inspection should be considered to review the premises, including the adequacy of toileting and hand-washing facilities, and to ensure that appropriate hygiene practises are in place prior to return to work.

3. Follow up stool samples

Repeat stool samples to determine clearance of *Salmonella* from food handlers should not be routinely collected.

4. Antibiotic use

Antibiotics for salmonellosis may be indicated for clinical reasons but not for public health purposes.

Background

Current practice for exclusion of food handlers with *Salmonella*

Australia

The Food Standards Australia New Zealand (FSANZ) Food Standards Code prohibits food handlers who are suffering from, or are carriers of, a foodborne disease from engaging in any handling of food where there is a reasonable likelihood of food contamination as a result of the disease, but provides no specific restrictions for salmonellosis or other foodborne diseases (Standard 3.2.2).

The Food Standards Code defines a food handler as a person who directly engages in the handling of food, or who handles surfaces likely to come into contact with food, for a food business (Standard 3.1.1).

State and territory recommendations vary. *Salmonella*-infected food handlers would be excluded from work until symptoms have ceased in Victoria and or for up to 48 hours after symptoms cease in the ACT, NSW, Queensland, South Australia and Western Australia. Infected individuals are excluded from handling food (but not from being in the workplace) until symptoms have ceased in Tasmania and for an additional 48 hours in the Northern Territory. In Tasmania, known carriers of *Salmonella* should not work in food preparation areas without assessment of the premises and individual work practices.

USA

The *US Food Code 2009* (FDA) excludes food workers with gastroenteritis symptoms (vomiting or diarrhoea) with return to work permitted 24 hours after symptom resolution. Additional restrictions apply to symptomatic and asymptomatic workers with *S.Typhi*, norovirus, *Shigella* and EHEC infections but not to non-typhoidal salmonellosis.

The Minnesota Department of Health has additional restrictions for employees with known *Salmonella* infection, who are restricted from working with food or clean equipment/utensils until the Department of Health and the licensing regulatory authority have evaluated the potential for foodborne disease transmission

United Kingdom

The United Kingdom guideline, *Food handlers: fitness to work* (Food Standards Agency, 2009) excludes food workers with gastroenteritis symptoms (vomiting or diarrhoea) with return to work permitted 48 hours after symptom resolution. There are no additional restrictions specific to non-typhoidal salmonellosis.

Literature review

Transmission by food handlers

Outbreaks of salmonellosis due to transmission from infected food handlers are uncommon but there are well substantiated examples involving symptomatic staff ¹⁻⁴.

However, there are few convincing published reports of outbreaks that attribute transmission to asymptomatic food handlers. This attribution is most persuasive when there is strong epidemiological evidence to implicate an individual in addition to isolation of the outbreak strain in stool. Whilst there are numerous examples of food handlers infected with the outbreak strain most are likely victims of the outbreak rather than a source of infection for others.

A review of all outbreaks of gastrointestinal illness on the national OzFoodNet register for the period 2001 – 2009 supports these broad conclusions (unpublished data). Twenty two *Salmonella* outbreaks in which food handler contamination was suspected were identified. The outbreak strain

was isolated from food handlers in 8 outbreaks. Food handlers were reported as asymptomatic for 3 of these outbreaks, symptomatic for 3 and symptom status was not available for 2 outbreaks. No outbreaks reported epidemiological evidence implicating transmission by asymptomatic workers.

Cruickshank's 1987 review ⁵ concluded that the "*evidence fails to implicate asymptomatic foodhandlers with formed stools as sources of outbreaks of Salmonella food poisoning*".

Hundy and Cameron² noted that "*our results question the role of symptom-free non-typhoidal Salmonella excreting foodhandlers in foodborne disease outbreaks*". The reported outbreak was attributed to a foodhandler who prepared an epidemiologically implicated food item while symptomatic (6 days) and was still working when a stool sample (positive for the outbreak strain) was collected 14 days after onset. All infected patrons consumed food during the first 4 days of the foodhandler's illness.

Todd et al reviewed outbreaks where food workers have been implicated in foodborne outbreaks and reported that many workers were asymptomatic ⁶. However, outbreaks were due to over 14 different pathogens, including norovirus. The 3 *Salmonella* outbreaks described in detail all involved symptomatic staff.

In the following prolonged outbreaks the epidemiological evidence suggested a possible role for asymptomatic food handlers in transmission.

Beatty et al ⁷ described a prolonged outbreak amongst visitors to a conference centre in Texas in 2002. An extensive screening program identified the outbreak strain in stool from 7 non-food handling staff (1.3%) and 3 food handlers (2.1%). One of these food handlers had prepared epidemiologically implicated food items (sauces) and worked on implicated transmission days. He had been asymptomatic and his positive stool sample was collected 5 weeks after the onset of the first attendee case. They surmised that he played a role in propagating the outbreak. The outbreak ended after the exclusion of all food handlers with *Salmonella* isolated from stool. They concluded that "*in the setting of an ongoing outbreak, screening of food handlers directly involved with food preparation should be considered as an intervention given the possibility of asymptomatic carriage, especially when other control measures have been put in place and transmission continues*".

Dryden et al ⁸ reported an extended 19 day outbreak in 2 hospitals in 1993. Cases continued despite initial infection control measures. Screening identified asymptomatic infection with the outbreak strain in 9 catering staff (12.3%), 3 ward medical staff (2.2%) and 2 patients (0.8%). One food handler was linked to epidemiologically implicated meals. The outbreak resolved after all infected food handlers were treated with Ciprofloxacin and excluded pending stool clearance.

Ethelberg et al ⁹ described a restaurant-associated outbreak extending over a 3 week period. The outbreak strain was isolated in the stool of one asymptomatic food handler (in stool collected 3 weeks after first patron onset) who had handled epidemiologically and microbiologically implicated food. They concluded that the food handler had initiated or propagated the outbreak. The outbreak resolved after the restaurant closed.

In each of the following shorter outbreaks the attribution of transmission to asymptomatic food handlers is open to question.

Hedican et al ¹⁰ concluded an asymptomatic food worker was the likely source at a restaurant outbreak in 2008. The staff member had commenced work immediately prior to the outbreak and had prepared epidemiologically implicated food items. His first stool sample was collected at least 13 days after ill patrons had eaten and no additional restaurant cases were identified from this 13 day period. A fellow worker also had the outbreak strain isolated from stool and was presumably infected at the venue.

Khuri-Bulos¹¹ described a 1989 outbreak linked to a hospital cafeteria. Eleven kitchen staff were positive for the outbreak strain. They concluded that the outbreak was probably due to one of these food-handlers who had prepared epidemiologically linked food and had been asymptomatic.

Frequency of foodhandler infection during outbreaks

Medus et al¹² reviewed 23 restaurant-associated *Salmonella* outbreaks in Minnesota (1995 – 2003) where there was a policy to collect stool from all food handlers in implicated facilities. Outbreak strain *Salmonellae* were identified in foodworkers for 19 outbreaks (83%) and in 12% of all foodworkers tested (range 0-36% in individual outbreaks). 53% of infected staff reported no recent gastrointestinal symptoms. The median period of documented shedding (symptom onset to last positive stool collection) was 30 days (range 2 to 280 days). Onset dates for at least one infected foodhandler were available for 15 outbreaks. The earliest foodhandler onset preceded the earliest patron onset for 4 outbreaks (27%). Whilst they concluded that foodworkers were likely important reservoirs for propagating outbreaks, this was based on circumstantial evidence.

A large bakery-associated outbreak in Sydney in 2007 was attributed to the use of raw egg mayonnaise¹³. Screening identified 6 of 8 food handlers with the outbreak strain. All were symptomatic. None had onsets prior to food purchase by the earliest infected patrons. The outbreak resolved once the mayonnaise was removed and the business subsequently ceased trading.

Natural history of *Salmonella* excretion

Asymptomatic salmonellosis is common. Jertborn et al¹⁴ prospectively studied 346 Swedish travellers. *Salmonellae* were isolated from 5% and, of these, 59% reported no gastrointestinal symptoms.

Buchwald and Blaser reviewed outbreak and experimental data for 2814 patients and reported that median duration of excretion, without treatment, was approximately 5 weeks and that 10% of adults remained culture positive at 9 weeks¹⁵. Excretion was longer in children under 5 years old, in symptomatic people, and for serotypes other than Typhimurium. Bacterial load (organisms/gram of faeces) tended to be higher in symptomatic individuals but there was overlap with the levels recorded for asymptomatic cases. Faecal culture had a sensitivity of 94% for short term carriage and 91% for long term carriage due to intermittent shedding and reduced sensitivity at low bacterial loads. They concluded that up to 6 negative faecal cultures would be required to rule out asymptomatic carriage.

They reported “Despite the large number of convalescent excretors in the community at any one time, the paucity of outbreaks in which such food handlers or hospital personnel are implicated suggests that their role in transmission of salmonella infection is small. Because convalescent excretion is so common and persistent excretion and transmission so uncommon, follow-up fecal cultures after salmonella infections are rarely necessary”.

They concluded that “Screening for the detection of asymptomatic Salmonella carriers among food handlers or institutional workers is associated with a high cost-to-benefit ratio and is usually not appropriate” and that screening “may be appropriate when there is continuing spread of Salmonellosis despite otherwise adequate control measures.”

Antibiotics for *Salmonella* gut infections

A 1998 Cochrane review concluded that “There appears to be no evidence of a clinical benefit of antibiotic therapy in otherwise healthy children and adults with non-severe *Salmonella* diarrhoea. Antibiotics appear to increase adverse effects and they also tend to prolong *Salmonella* detection in stools.”¹⁶

In comparison to older antibiotics, quinolones may shorten the course of clinical disease but there are conflicting results for their impact on post convalescent excretion of *Salmonella*¹⁷.

Legal basis for exclusion of symptomatic and asymptomatic food handlers

Clause 14(1)(b) of Standard 3.2.2 in the FSANZ Food Standards Code states “A food handler who has a symptom that indicates the handler may be suffering from a food-borne disease, or knows he or she is suffering from a food-borne disease, or is a carrier of a food-borne disease, must, if at work, not engage in any handling of food where there is a reasonable likelihood of food contamination as a result of the disease.”

The FSANZ *guide to the Food Safety Standards*¹⁸ notes that a food handler with asymptomatic salmonellosis would be considered a carrier, and that in each case the decision about “Whether the food handler can safely undertake any duty that involves handling food will need to be assessed on a case-by-case basis. The relevant authority, together with the food handler affected and the supervisor of this food handler, should conduct this assessment, taking into account the [following] factors:

- What disease the food handler is suffering from or carrying — a food handler who is suffering from an active illness caused by any one of the following four pathogens, *Salmonella* Typhi, *Shigella* spp., enterohaemorrhagic *Escherichia coli* and hepatitis A, is considered to pose the most risk due to the high infectivity and virulence of these pathogens;
- What duties the food handler undertakes — duties that involve direct contact with ready-to-eat food, or eating and drinking utensils would be considered higher risk than duties that do not involve these things;
- Whether the food handler works at a business that provides food to a susceptible population — if the food business provides food to the young, the elderly or the immuno-compromised, such as occurs in hospitals, nursing homes and child care centres, greater precautions need to be taken.”

The Guide notes “Generally, it would not be acceptable for a food handler to be at work while suffering vomiting and/or diarrhoea. Food handlers should not return to work until they have been symptom-free for 48 hours and have formed stools.”

The Food Standards Code thus supports exclusion of a symptomatic food handler but for a food handler with asymptomatic non-typhoidal *Salmonella* infection to be excluded from food handling activities under the Code, there would need to be evidence that there was a reasonable likelihood of food contamination as a result of the infection. Such a risk may be present if there was good epidemiological evidence implicating a specific food handler and the food handler was in direct contact with ready-to-eat food or eating and drinking utensils. The risk would be further increased if the food handler provided food to a susceptible population.

State and territory recommendations for excluding *Salmonella*-infected food handlers were detailed previously. No additional legislation specifically relating to non-typhoidal salmonellosis was identified however general powers to control outbreaks could potentially extend to the management of an infected food handler.

Limitations and Gaps

The identification of symptomatic disease often relies on a subjective report by affected individuals. There is likely some misclassification of symptomatic and asymptomatic disease.

We have not identified evidence that specifically supports the exclusion of food handlers for 24 to 48 hours after symptom resolution. This appears to be based more on pragmatic considerations than a documented reduction in transmission risk.

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