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National case-control study of *Salmonella* Enteritidis Phage Type 14b infection in England and Wales implicates eggs used in the catering trade

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Following an increase in detection of *Salmonella* Enteritidis Phage Type (PT) 14b in 2003 in England and Wales (1), analysis of the main exposure variables in an initial case-control study suggested that food consumed outside the home, and from specific types of catering establishments in particular, was the most likely source of infection. These hypotheses were tested in a second, larger, national case-control study.

An unmatched prospective study was undertaken. Cases were adults, resident in England and Wales, who had not travelled abroad within the incubation period, with laboratory confirmed *S. Enteritidis* PT14b infection. Structured interviews were conducted over the telephone. Asymptomatic controls were recruited through systematic sequential dialling, based on the cases' telephone numbers. Interviews were conducted in the early evenings and at weekends to maximise case response and to ensure that controls represented the population from which the cases arose.

Fifty five cases and 102 controls were included in the analyses. In the single variable analysis, cases were more likely to report:

- travel within the UK (estimated odds ratio (OR)=4.42; 95% confidence intervals (CI)=1.50-13.05; P Value = 0.003)
- consuming eggs away from home (OR=5.27; 95%CI = 2.12-13.12; P= 0.0001)
- consuming food from commercial catering premises (OR=2.93; 95%CI=1.39-6.16; P=0.003)
- consuming sandwiches bought outside the home (OR=3.07; 95%CI=1.39-6.77; P=0.003)
- consuming egg sandwiches outside the home (OR=4.09; 95%CI=0.90-18.60; P=0.05)
- eating food from Chinese restaurants (OR=3.56; 95% CI=1.19-10.64; P=0.02)
- eating eggs in Chinese restaurants (OR=3.80; 95% CI=1.17-12.27; P=0.02)
- eating chicken dishes in Chinese restaurants (OR=4.17; 95%CI=1.16-14.95; P=0.02)

They were less likely to report:

- consumption of 'Lion marked'* eggs (OR=0.35; 95% CI=0.16-0.94; P=0.03)
- eating chicken in the home (OR=0.45; 95%CI=0.22-0.93; P=0.03)
- cooking raw chicken in the home (OR=0.29; 95% CI=0.12-0.72; P=0.005)

Logistic regression analyses were employed to allow for confounding variables such as age and sex. Three models were used to examine the hypotheses concerning egg consumption and types of premises. When the premises type was examined alongside consumption of eggs outside the home, eating eggs away from home was independently associated with being a case of *S. Enteritidis* PT14b infection (OR=5.02; 95%CI= 2.09-12.05; P<0.001).

Prior to 2001, *S. Enteritidis* PT14b accounted for less than 200 laboratory confirmed cases a year. Since 2001 the annual totals have risen sharply, the provisional total for 2003 being 922 cases. In 2002 a large national outbreak of *S. Enteritidis* PT14b was associated with buying food from local bakers' shops, eating from sandwich bars and buying food from local butchers' shops (2). During the investigation of a number of *S. Enteritidis* outbreaks in 2002, *S. Enteritidis* PT14b was isolated from eggs originating from Spain (3). Molecular typing by plasmid analysis and pulsed field gel electrophoresis showed that clinical isolates from outbreak cases of PT14b in 2003 were indistinguishable from outbreak related clinical and egg isolates of this phage type in 2002. This suggests that the PT14b outbreak in 2003 might have been a continuation of the 2002 situation, probably resulting from the same source.

The United Kingdom Food Standards Agency's advice to caterers is that raw shell eggs should not be used in any food that will not be cooked (or will only be lightly cooked) (4).

***Editor's note:** The lion mark on British eggs certifies that the egg laying flock has been vaccinated against *Salmonella*. For more information, see the British Egg Information Service's website: <http://www.britegg.co.uk/lionsection/startsection.html>

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