Salmonella infections in garden birds and cats in a domestic environment

Short Communications

Salmonella infections in garden birds and cats in a domestic environment

D. J. Taylor, A. W. Philbey

WILD bird strains of *Salmonella enterica* serovar Typhimurium, including phage types (definitive types) DT40 and DT56v, have been associated with disease in finches (Family Fringillidae), cats and human beings in the UK and Sweden (Tauni and Österlund 2000, Pennycott and others 2006, Hughes and others 2008, Philbey and others 2008, 2009). Salmonellosis in wild finches in the UK is related to congregation of birds around feeding tables in gardens in the cooler months of the year (Pennycott and others 2006). Cats are thought to become infected with wild bird strains of *S Typhimurium* by catching small birds at these feeding stations (Philbey and others 2008), but a direct link between salmonellosis in birds and cats has not been demonstrated. This short communication describes a study to investigate the occurrence of *Salmonella* species in wild birds, cats and the environment in a domestic setting.

The study site comprised a household and two adjoining village gardens in Lennoxtown, near Glasgow, with three human occupants and two male neutered domestic shorthair cats (cat 1: five years old; cat 2: 10 years old). Feeders containing mixed seed, niger seed, peanuts or fat were provided at two feeding sites in each of the gardens. Sick birds were observed in both gardens over an eight-week-period from late December 2008 to early February 2009 (Fig 1a). During this period, cat 1 caught 14 goldfinches (*Carduelis carduelis*) and eight siskins (*Carduelis spinus*), and later caught several greenfinches (*Carduelis chloris*) and chaffinches (*Fringilla coelebs*) (Fig 1b). Many of these birds were taken from cat 1 by cat 2 and, apart from intact birds retrieved for postmortem examination, the birds were mostly eaten indoors by either of the two cats. In the previous year, cat 1 had caught only a few small rodents.

Six uneaten or partially eaten carcases (two siskins, two chaffinches, one goldfinch and one greenfinch) were retrieved from the cats in January and February 2009 (Table 1, Fig 1c). On gross examination, all six carcases had pale yellow foci, 1 to 2 mm in diameter, in the liver and spleen (Fig 1d). Histological examination revealed that these foci were necrotising inflammatory lesions containing colonies of bacteria (Fig 1e). Samples of tissue from these birds, along with tissue from one wood mouse (*Apodemus sylvaticus*) caught by one cat, were submitted for *Salmonella* species isolation. Faecal samples were collected from each cat on two occasions, along with 22 swabs from various sites in the gardens and the household, from January to March 2009, and also cultured for *Salmonella* species.

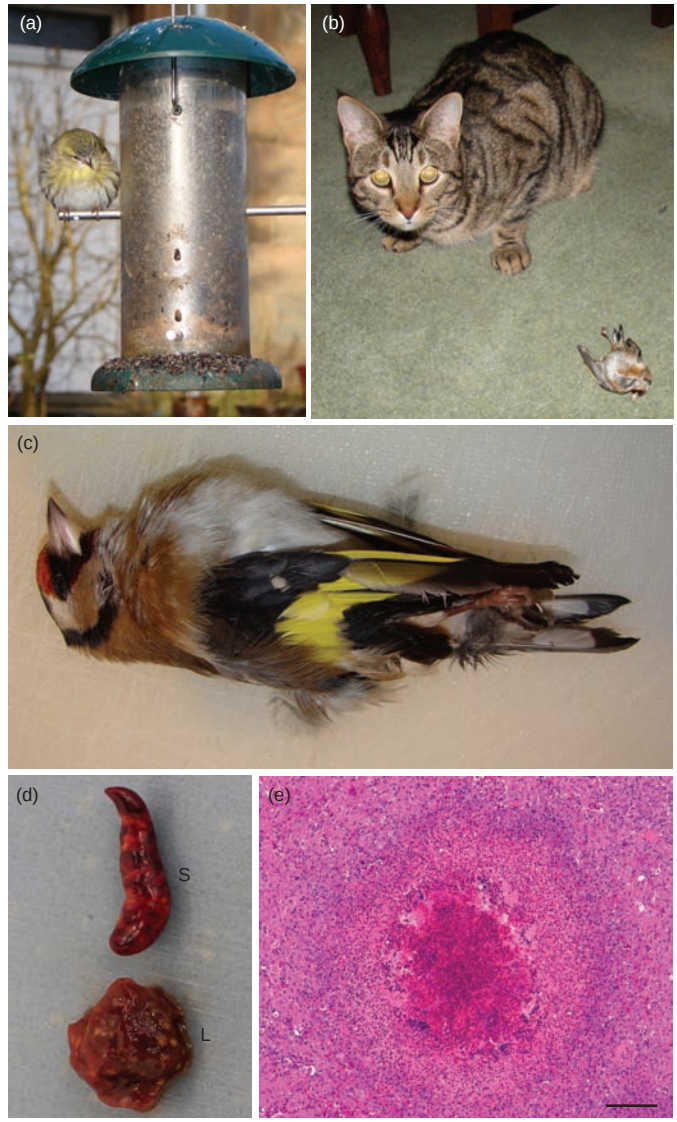

FIG 1: (a) Sick siskin (*Carduelis spinus*) on a niger seed feeder at feeding site 1. (b) Cat 1 with a goldfinch (*Carduelis carduelis*) inside the house. (c) Goldfinch 1 that had been caught by cat 1; *Salmonella enterica* serovar Typhimurium DT40 was isolated from this bird. (d) Multiple pale yellow foci in the liver (L) and spleen (S) of goldfinch 1. (e) Histological section of the liver of goldfinch 1, showing focal necrotising hepatitis. Haematoxylin and eosin. Bar=100 μm

Tissues, faecal samples and swabs from the environment were inoculated into tetrathionate broth and incubated overnight at 37°C aerobically, then subcultured on to Salmonella Shigella agar and desoxycholate agar (Oxoid). Bacterial colonies typical of *Salmonella* species were subcultured and identified by slide agglutination and biochemical testing (API 20 E; bioMérieux) as *Salmonella* species. The serovar and phage type of the isolates were determined at the Scottish Salmonella Reference Laboratory.

S Typhimurium phage type DT40 was recovered from the liver, spleen, intestine or partially eaten viscera of the six bird carcases submitted for postmortem examination, from one faecal sample from each cat, from the sample of mouse viscera and from the ground under the four bird-feeding stations in the main garden, as well as the ground under two feeding stations in the neighbouring garden (Table 1). However, samples from the bird feeders, the contents of a vacuum cleaner in the house, the sewerage drain of the house, and

Veterinary Record (2010) 167, 26-28 doi: 10.1136/vr.c3156

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Provenance: not commissioned; peer reviewed

TABLE 1: Isolates of *Salmonella enterica* serovar Typhimurium DT40 from wild birds, pet cats and the garden and household environment at a site in Scotland

Source (type of sample)	Date positive
Garden birds	
Goldfinch (*Carduelis carduelis*) 1 (liver, spleen and intestine)	January 8, 2009
Siskin (*Carduelis spinus*) 1 (liver, spleen and intestine)	January 13, 2009
Siskin 2 (liver)	January 19, 2009
Chaffinch (*Fringilla coelebs*) 2 (liver, spleen and intestine)	February 2, 2009
Greenfinch (*Carduelis chloris*) 2 (carcase)	February 5, 2009
Chaffinch 3 (liver, spleen and intestine)	February 25, 2009
Cats	
Cat 1 (faecal swab)	January 19, 2009
Cat 2 (faecal swab)	January 19, 2009
Rodents	
Mouse 1 (intestine)	January 27, 2009
Environment	
Ground under feeding station 1 (swab)	January 19, 2009
Ground under feeding station 2 (swab)	January 19, 2009
Ground under feeding station 3 (swab)	January 26, 2009
Ground under feeding station 4 (swab)	January 26, 2009
Ground of neighbour's garden 1 (swab)	January 26, 2009
Ground of neighbour's garden 2 (swab)	January 26, 2009

other debris from birds brought into the house by the cats were all negative. A chaffinch with foot lesions and a chaffinch killed by a sparrowhawk (*Accipiter nisus*) were also both negative for *Salmonella* species. Faecal swabs from both cats and from the ground under the feeding stations were negative for *Salmonella* species when resampled on February 3, 2009. The two cats and all three human occupants of the house remained clinically healthy.

This study demonstrates that *S* Typhimurium DT40 can be isolated from cats that have preyed upon infected wild birds in a suburban garden. Finches with clinical disease during outbreaks of salmonellosis are more likely to be caught and eaten by cats around feeding stations. Contamination of garden environments with *S* Typhimurium DT40 can occur when there is clinical disease in birds during the winter months. Although wild rodents can harbour *Salmonella* species (Jones and Twigg 1976), the infection of the field mouse with *S* Typhimurium in this study is likely to have resulted from exposure to bird faeces under the feeding stations, since DT40 is a wild bird host-adapted strain (Rabsch and others 2002). The presence of contaminated partially eaten tissue from birds and a mouse brought into the house confirms that infected material was ingested by both cats, although in this case without obvious clinical effect. Infection within the house could be demonstrated only in faecal samples from the cats and in the carcases of their prey. The three human occupants of the house did not experience any symptoms attributable to infection with *Salmonella* species, and a sample from a sewerage drain from the house was negative. Potential exposure to *S* Typhimurium would have gone unnoticed without informed monitoring.

S Typhimurium DT40 and DT56v have been isolated from human beings with enteric salmonellosis in the UK (Philbey and others 2008). Among avian strains of *S* Typhimurium typed at the Scottish Salmonella Reference Laboratory from 2001 to 2007, it is notable that 18 of 47 (38 per cent) DT40 and 15 of 29 (52 per cent) DT56v isolates were from children under five years of age (Philbey and others 2008). Human beings, particularly children, may be exposed to wild bird strains of *S* Typhimurium through the hunting activities of their cats or by contact with the environment around bird-feeding stations in gardens.

These findings confirm that cats can be infected with *S* Typhimurium DT40 by catching and eating garden birds, and that both cats and the garden environment are a potential source of infection for human beings.

Acknowledgements

The authors thank Richard Irvine for gross photography, Lynn Stevenson for processing histological sections and Kathleen Reynolds and Manuel Fuentes for culturing and identifying the *Salmonella* species isolates. The authors also thank John Coia and Henry Mather at the Scottish Salmonella Reference Laboratory for determining the serovars and phage types.

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Veterinary Record 2010 167: 26-27
doi: 10.1136/vr.c3156