

Isolation of *Salmonella* Typhimurium from Zebra Finches (*Poephila guttata*)

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ABSTRACT. *Salmonella* Typhimurium was isolated from a fresh fecal sample of zebra finches (*Poephila guttata*) in December 1992 on an aviary where a large scale outbreak of *S. Typhimurium* infection among bengalees (a variety of *Lonchura striata*) in 1991 had been recorded. The isolates from zebra finches were examined for antibiotic sensitivity and plasmids, which were 60 Mdal, then they showed the same pattern as those of *S. Typhimurium* isolated at the previous outbreak. This is the first report of *S. Typhimurium* isolation from zebra finches.—**KEY WORDS:** aviary, *Salmonella* Typhimurium, zebra finch.

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The incidence of *Salmonella* infection in pet birds is very important to public health, because these birds are reared in close contact with humans. There have been many reports concerning isolation of *Salmonella* from pet birds since 1895 [1, 3–6]. We recently reported an outbreak of *Salmonella choleraesuis* subspecies *choleraesuis* serovar Typhimurium (*S. Typhimurium*) infection in bengalees (a variety of *Lonchura striata*) [4]. However, so far as we know, there has been no report concerning isolation of *Salmonella* from the zebra finch (*Poephila guttata*) which is one of the most popular pet birds in Japan. This report deals with the isolation of the *Salmonella* serovar from zebra finches, and the comparison of this isolate with previous ones derived from bengalees in the same aviary.

The aviary involved was in Nagano Prefecture in Japan. There were 50 wooden breeding cages on the aviary set up in a pen as shown in Fig. 1. Each cage was made of wooden plates except for the front which was made of wire and size of the cage was 35 cm in length, height and width respectively. A breeding pair of mature birds was kept in each wooden cage while young birds, after leaving a nest, were transferred into large wooden cages in groups of 15 to 20 per cage. The floor of each cage was covered with pieces of newspaper that were changed every week.

A large scale *S. Typhimurium* infection broke out among bengalees in June 1991 on the aviary. Then, 198 out of 268 birds died within 6 months as we reported [4]. However, no symptoms were found among 34 zebra finches and 4 gouldian finches (*Chloebia gouldiae*) which were kept with bengalees on the aviary. As the epi-

zootiological surveys suggested that the outbreak was caused by the introduction of the bengalees originating from an aviary in Kanagawa Prefecture [4], no bird had been introduced from other aviaries since the outbreak.

The owner of the aviary found clinical symptoms similar to the previous outbreak such as ruffled feathers, severe watery diarrhea, wagging the tail, loss of appetite and general weakness among a part of bengalees and zebra finches in October 1992. Fifteen of 120 bengalees and 5 of 45 zebra finches died within 3 months of the outbreak. No clinical symptoms and mortality were observed among the 10 gouldian finches within the aviary during the same period. Since there was no request for laboratory examination from the owner during this period, no examination of the dead birds was made for *Salmonella* isolation.

In December 1992, at the end of the outbreak, 3 fresh fecal samples from 3 cages of nondiseased zebra finches (Z1–Z3) as shown in Fig. 1 were collected from solid floor using sterile cotton-tipped swabs. There were parent birds and 3 to 5 immature birds in each cage. Nine fresh fecal samples from 9 cages, 5 from diseased (B1–B5) and 4 from nondiseased bengalees (B6–B9), were collected from solid floor similarly (Fig. 1). These fecal samples were cultured in Hajana tetrathionate broth at 37°C for 24 hr. Subcultures from the broth cultures were made on DHL agar plate.

Two fecal samples, one from apparently healthy zebra finches (Z3) and one from diseased bengalees (B1), gave *Salmonella* suspect colonies. These isolates were examined biochemically for *Salmonella* and serotyped with Diagnostic *Salmonella* Antisera for O and H (Denka Seiken Co., Tokyo, Japan) and *Salmonella* H sera for Phase Induction (Denka Seiken Co.) according to the manufacturer's instructions. The isolates possessed *Salmonella* antigens of 4, 5, 12, 27: i: 1, 2, and finally these isolates were serologically identified as *S. Typhimurium*.

Six isolates mentioned above, 3 from the bengalee sample and 3 from the zebra finch sample, were examined for antibiotic sensitivity with 15 Monodisks (Showa, Tanabe, Tokyo, Japan) in sensitivity test agar. They were strongly sensitive to ampicillin, amoxicillin, oxolinic acid and fosfomycin; moderately sensitive to kanamycin, gentamicin, chloramphenicol, nalidixic acid and colistin; slightly sensitive to streptomycin, tetracycline and fra-
diomycin; and resistant to cloxacillin, oxytetracycline and

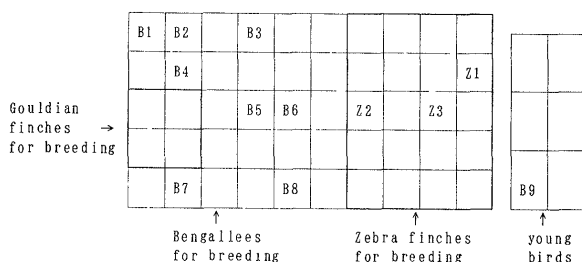


Fig. 1. The number of wooden cages where fecal samples were collected in December 1992. *S. Typhimurium* was isolated from 2 cages of the zebra finch (Z3) and bengalee (B1).

sulfadimethoxine.

Analysis of plasmids was done for 4 isolates of *S. Typhimurium*, 2 from bengalees and 2 from zebra finches, according to the modified method of Kado and Liu [2]. Standard strains of *S. Typhimurium*, *S. Dublin* and *S. Enteritidis* supplied by the National Institute of Animal Health were used. The isolates examined contained a 60 Mdal plasmid, then they showed the same pattern as those of *S. Typhimurium* isolated at the previous outbreak.

The results obtained indicated that a small scale outbreak of *S. Typhimurium* infection re-occurred among the bengalees and zebra finches on the aviary again in October 1992. Soon after the diagnosis, control measures such as medication, cleaning and disinfection of the pen environment were conducted as mentioned before [4].

In March 1994, more than one year after the latest outbreak, 160 bengalees, 190 zebra finches and 20 gouldian finches were still being kept at the aviary and no clinical symptoms were observed among them. Fourteen fecal samples were collected from 7 cages of zebra finches, 5 cages of bengalees and 2 cages of gouldian finches. These fecal samples when cultured gave no *Salmonella* isolates.

Although no examination of dead birds was made during the outbreak in 1992, diseased birds showed the same symptoms of salmonellosis as these of the previous outbreak in 1991 and the same *Salmonella* showing the same antibiotic sensitivity and plasmid patterns as those of the previous outbreak was isolated from diseased as well as normal birds. These facts suggest that the latest outbreak in 1992 was caused by the contamination of *S. Typhimurium* lasting in the aviary from 1991. Moreover, the isolation of *Salmonella* from fresh fecal sample from

normal birds indicates that both bengalees and zebra finches were under carrier state.

As intestinal carriers of the *Salmonella* are very common in birds [3], eradication of carriers from the aviary is important for the control of salmonellosis. Although the examination in March 1994 revealed no active carriers among these birds, further repeated examinations are required to detect intermittent excretors.

The same symptoms of salmonellosis as reported in bengalees were observed in the zebra finch and intestinal carrier state was proved in these birds. This indicates that the zebra finch is susceptible to *S. Typhimurium*. Further investigation to reveal the prevalence of the disease among zebra finches is needed.

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