SHORT COMMUNICATION

COACTION PUBLISHING

A novel *Salmonella* serovar isolated from Peregrine Falcon (*Falco peregrinus*) nestlings in Sweden: *Salmonella enterica enterica* serovar Pajala (*Salmonella* Pajala)

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A novel *Salmonella* serovar was isolated from Peregrine falcon (*Falco peregrinus*) nestlings in northern Sweden in 2006. Three isolates of the same clone was retrieved from three falcon siblings and characterized as *Salmonella enterica* sub-species *enterica*: O-phase 13, 23:-: e, n, z 15 and the H-phase was not present. We propose the geographical name *Salmonella enterica*, sub-species *enterica* serovar Pajala to this novel Salmonella.

Keywords: *Salmonella*; *epidemiology*; *ecology*; *peregrine falcon*; *novel serovar*

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A large number of *Salmonella enterica* sub-species *enterica* serovas have been isolated from wild birds, sometimes in birds with symptoms, but quite often in birds without clinical signs of disease (1). Bird species living in close contact with humans, for instance pigeons, geese, gulls and corvids, are under Swedish conditions most frequently found as carriers of *Salmonella* spp. (2–5). An infected bird is predominantly colonized in the intestinal tract and if the bird succumb to the infection, or is caught by a predator, the bacteria could potentially be transmitted to other animals that consume the carcass (6). In line with this, many predatory birds such as hawks, owls, eagles and falcons have been found to be colonized by *Salmonella* (7, 8).

We collected cloacal swab samples from nestling Peregrine Falcons in the 2006 breeding season in Sweden in a survey of bird-borne pathogens (9). This avian top predator feeds almost exclusively on other birds and the presence of *Salmonella* could therefore potentially reflect the occurrence of these bacteria in their prey (2). We analyzed 97 fecal swabs from a total of 42 nests with average brood size 1–4, 25 from South 58–59° N, 4 from Centre 61–62° N and 13 from North Sweden 65–68° N for the presence of Salmonella. The swabs were stored immediately after sampling in Luria broth (BD, Sparks, USA: phosphate buffered saline, containing 0.45% Na-citrate, 0.1% $MgSO_4$, 1% $(NH_4)_2SO_4$, and 4.4% glycerol). After collection in the field, the samples were frozen at −70°C and transported to the laboratory. Standard procedures for isolation of *Salmonella* strains were applied, including enrichment in Rappaport–Vasiliadis broth (10) and subsequent inoculation on Xylose-Lysine-Desoxycholate (XLD) agar plates (NMKL method no. 71, 2nd ed., 1999). Three samples, from siblings of a single nest, were positive for Salmonella. A full phenotypic identification was performed on these isolates, using standard biochemical tests (11) and the API 20E system (Bio-merieux, Lyon, France). All three *Salmonella* isolates displayed the same serologic type: *Salmonella enterica* sub-species *enterica*: O-phase13, 23:-: e, n, z 15 but lacked the H-phase. The isolates were additionally characterized by serotyping according to the Kauffman–White scheme

(12) at two national reference laboratories in Sweden – the Swedish Institute for Communicable Disease Control (SMI) and the Swedish National Veterinary Institute (SVA) – and the international reference laboratory at Institute Pasteur in Paris, France.

All laboratories confirmed that the isolates were lacking the H-phase and that this particular *Salmonella* had not been described previously. The H-antigen is a protein antigen present in the flagella. *Salmonella* can express two different H-antigens encoded by two different genes that are coordinated so that only one antigen is expressed in a single bacterial cell. The two distinct antigens are referred to as Phase 1 and Phase 2. *Salmonella* subspecies can be monophasic when they express only a single flagellin type and biphasic when they express both Phase 1 and Phase 2 (13).

Salmonella may be present in birds by adaptation to the host as part of intestinal flora or as a result of environmental pollution by accidentally infection (14). In the present *Salmonella* isolates, the antigens that expressed the H phase were probably inactivated, or the genes that encoding it were not present. The detection of a novel *Salmonella enterica enterica* serovar in three Peregrine Falcon nestlings from the same nest indicates that it might be present in other bird species preyed by the falcons. The Salmonella-positive nest was located on a cliff-site (67° 30′N, 23° 00′E) in a habitat dominated by large bogs, lakes and spruce and pine forests in the rural district of Pajala, Norrbotten, Northern Sweden. The area is sparsely populated by humans and the closest village of Pajala is situated 40 km to the south. From bone remains at the nest, the diet of the breeding pair seems to consist mainly of waders (Charadriidae) and gulls (Laridae), especially Black-headed gulls (*Larus ridibundus*). The falcon nestlings were seemingly unaffected by the infection and all three birds were later fledged.

We propose the name *Salmonella enterica*, subspecies enterica serovariant Pajala (*Salmonella* Pajala) for this bacterium reflecting its original isolation from northernmost Sweden.

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Conflict of interest and funding

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