

Fowl Typhoid (*Salmonella Gallinarum*)

Information for Farmers and Vets in Great Britain

Introduction

Fowl typhoid has recently been detected on two commercial poultry premises in Northern Ireland after almost 30 years without cases, and was last reported in Great Britain during 2005/2006 following a gap of 20 years (Cobb and others, 2005; Parmar and Davies, 2007; OIE, 2012). It is a potentially devastating disease that can cause substantial losses and can persist on affected farms. The affected sites in Northern Ireland have been voluntarily depopulated and subject to intensive cleansing and disinfection to control the disease.

Fowl typhoid is not a notifiable disease in the United Kingdom (UK), but the current outbreak represents a re-emergent threat to UK poultry. It can cause substantial losses and persist on farms, sometimes leading to their closure because of the high cost of eradication on large, complex poultry units. Confirmed cases of Fowl typhoid must also be reported to the World Organisation for Animal Health (OIE) through Defra. Where an exporting breeding flock is involved in Great Britain (GB) holding will be suspended from the Poultry Health Scheme until the premises has been depopulated, effectively cleaned and disinfected and replacement flocks shown to be free of infection. This could mean a loss of trade for the affected holding for several months, or longer if recurrent infection is not prevented.

Prevention and control of Fowl typhoid relies on the maintenance of high biosecurity and hygiene standards. Veterinarians and flock owners/managers should consider Fowl typhoid as a differential diagnosis of significant and increasing mortality in poultry flocks, especially in adult chickens, and arrange for appropriate diagnostic testing to be carried out as soon as practically possible. The possibility of avian notifiable disease should also be considered.

Veterinarians and flock owners/managers should also be mindful of the risks associated with movements of birds and chicks (including fancy breeds), hatching eggs and table eggs and associated equipment (eg. egg trays) from areas where *S. Gallinarum* infection is present onto poultry premises. It should also be remembered that Red mites (*Dermanyssus gallinae*) carrying *S. Gallinarum* can also be transmitted on people's clothing or equipment previously used on an infected holding with appropriate precautions taken accordingly.

What is Fowl typhoid?

Fowl typhoid is a bacterial disease of chickens (and other poultry) caused by *Salmonella Gallinarum* biovar *Gallinarum* (*S. Gallinarum*). It is a well-recognised disease with a wide geographical distribution. However, *S. Gallinarum* was eradicated from commercial poultry in many parts of the world including the UK, Western Europe and North America through extensive *S. Pullorum* test and slaughter programmes in breeding and laying flocks.

S. Gallinarum is closely related to *S. Gallinarum* biovar *Pullorum* (*S. Pullorum*), but Fowl typhoid has a different epidemiology and disease presentation to *Pullorum* disease. Fowl typhoid is principally associated with an acute septicaemic illness of high morbidity and mortality in birds during the later growing period and in adults. This contrasts with *Pullorum* disease which manifests as severe, acute losses in chicks.

Public health

S. Gallinarum is host-adapted to birds (with chickens being the natural host) and is therefore not considered to pose any zoonotic risk and has no implications for human health (Shivaprasad, 2000; Davies, 2012).

Clinical signs

Fowl typhoid most commonly affects chickens, but the disease has been reported in other poultry species including turkeys, ducks, pheasants, guinea fowl, peafowl, quail and grouse. Outbreaks in commercial flocks are rare in the UK and other parts of the world where the causative organism has been controlled in commercial poultry. The disease may be under-reported from backyard flocks.

S. Gallinarum is closely related to *S. Pullorum*, but Fowl typhoid has a different epidemiology and disease presentation. Specifically, Fowl typhoid typically presents as an acute septicaemic illness of high morbidity and mortality in birds during the later growing period and in adults. This contrasts with *Pullorum* disease which manifests as severe, acute losses in chicks. Flocks affected by Fowl typhoid can suffer losses in excess of 50% and the disease may also be seen in chicks. Therefore, the disease may present clinically in a number of ways:

- **Acute disease:** Affected birds normally die within 2-3 days of clinical onset and watery/mucoid yellow diarrhoea may be seen. Other non-specific clinical signs include reduced feed intake and egg production, weakness, apathy, closed eyes and ruffled feathers.
- **Chronic disease:** Affected birds are likely to show a progressive loss of condition and severe anaemia, which will be evident as pale shrunken combs and wattles. Subacute disease may be the cause of sporadic mortality over a prolonged time.
- **Disease in chicks:** Vertical transmission may result in small, weak or dead chicks, or 'dead in shell' chicks (embryo mortality). In addition to high chick mortality and morbidity, pasty yellow droppings may be seen resulting in sticky vents.

Treatment

Treatment with antibiotics is generally not advisable or effective and is not likely to eliminate infection. Clinically recovered birds may be carriers, and therefore cause perpetuation of infection, either horizontally within a flock or, in the case of breeders, vertically to subsequent generations.

Diagnosis

Veterinarians and flock owners/managers should consider Fowl typhoid as a differential diagnosis of significant and increasing mortality in poultry flocks, especially in adult chickens, and arrange for appropriate diagnostic testing to be carried out. The possibility of avian notifiable disease should also be considered in differential diagnosis. Post-mortem findings include typical signs of acute septicaemia with enlargement of the spleen and enlargement and bronzing of the liver (after exposure to air). Whilst clinical and pathological features of the disease may be suggestive of a diagnosis of Fowl typhoid, it is necessary to confirm disease by isolation of the causative organism. Serological tests can also be used to investigate the presence of infection in a flock, but there may be some cross reaction caused by exposure to *S. Enteritidis* or vaccination. Suitable serological screening tests are available through AHVLA.

S. Gallinarum is difficult to culture from faecal and environmental samples. Therefore, investigation of suspected disease in flocks should include post-mortem examination and separate culture of liver and spleen of casualties, dead-in-shell embryos or birds which react to the Pullorum serum agglutination test, by direct plating on MacConkey medium and selective enrichment in selenite broth. If faecal and environmental samples are also taken then these should not be pre-enriched, but direct enriched in selenite broth and plated on brilliant green agar. The organism also does not produce typical colonies on newer chromogenic media such as Rambach agar.

Epidemiology

Vertical and horizontal transmission are key features of the epidemiology of Fowl typhoid with recovered birds capable of acting as carriers. The movement of contaminated equipment including egg trays, people, hatching eggs, chicks, birds, manure and environmental persistence are all important factors. Wild birds may also be involved. Red mites that have ingested blood from septicaemic birds are also an important feature in both horizontal transmission and environmental persistence of *S. Gallinarum* infection. In addition, the movement of contaminated equipment that may harbour infected red mites, such as recycled cages or feeding equipment should be considered to be a risk.

Recent outbreaks of Fowl typhoid in Europe have mainly originated in housed commercial layer flocks rather than other poultry sectors or smaller, backyard flocks. In contrast, in developed countries, Pullorum disease is more frequently associated with a reservoir of infection in backyard flocks. It is also recognised that the lower financial value of laying hens may mean that veterinary consultation is not always immediately sought. Other factors may also further compound this problem, including financial pressures on commercial producers and awareness of the risk of rare diseases such as Fowl typhoid amongst producers or keepers of small flocks.

S. Gallinarum survives in the environment and can remain viable for months within dormant red mites. It is therefore very difficult and costly to eliminate, even after the birds are removed from the site. Prolonged intensive heat treatment of houses is needed to guarantee elimination of infected red mites which may be ingested by birds or transmit infection when taking a blood meal from newly introduced birds. Therefore, all efforts should be made to identify possible sources and routes of spread when outbreaks occur.

Prevention & Control

Fowl typhoid is a devastating disease when it gains entry to a susceptible poultry population, and, as described previously, can be very difficult and costly to eliminate. Once infection has been identified, either through necropsy and culture or serology, voluntary depopulation of the affected flock followed by thorough cleansing and disinfection (C&D) is likely to be necessary in order to control the infection. Only Defra-approved disinfectants should be used in accordance with specified dilution rates and manufacturers instructions. In addition, red mites are recognised to be of epidemiological significance (Davies, 2012). Therefore, it is very important to eliminate them from poultry houses before restocking after Fowl typhoid infection. Deep heat treatment of houses during a prolonged down time is often required, to eliminate infected red mites that are present in inaccessible niches, as well as immature stages, and kill them by desiccation.

Whilst vaccines are available, they have only a minor role to play in the control of the disease as protection is typically short-lived. The *S. Gallinarum* 9R live vaccine is no longer licensed in GB, but there may be some low level cross-protection afforded by *S. Enteritidis* vaccines. Such vaccines can only reduce the risk of disease, not eliminate it, and no vaccine will protect against a high level of challenge.

Therefore, in common with other infectious diseases of poultry, preventing the introduction and spread of *S. Gallinarum* is best achieved by close attention to good biosecurity, sensible sourcing policies, and high hygiene and management standards. This involves the following considerations:

- Care in the selection of sources of replacement birds/chicks, hatching eggs or table eggs with consideration of the risk of disease in the area of origin. Where necessary, it is advisable to request a veterinary report detailing disease status of the supplier flock.
- Only [Defra-approved disinfectants](#) should be used in accordance with specified dilution rates and manufacturers instructions.
- Provide good facilities for cleaning and then disinfection of all vehicles and essential equipment brought on to the site. This includes having pressure washers, brushes, buckets/containers, hoses, water and an approved disinfectant available. Make sure they are used by visitors to clean vehicles, equipment and boots both before entry and on leaving.
- Ensure recycled egg trays and other equipment are effectively cleaned and disinfected.
- Minimise the number of visitors and their vehicles to the site and strictly limiting and controlling access to poultry flocks. As far as possible, visitors should be kept away from poultry, farm buildings and their surroundings, and ranges.
- Ensure that visitors cannot enter the site unescorted and that log book records of all visitors are kept. If possible, the site should be fenced with a controlled entry/exit point.
- Ensure all visitors are provided with farm-specific protective clothing, including boots and hair covers, and hand washing/drying facilities.
- Ensure visitors' personal clothing and hair has been washed since the last visit to a poultry farm.
- For all staff and visitors ensure that, as a minimum, hands are sanitised and boots and tools changed or disinfected on entry to each poultry house.
- Source bedding material from low risk suppliers, especially in the case of straw, which may originate from farms with other livestock.
- Controlling access of wild birds, as well as dogs, cats, rodents or other livestock to poultry houses and feed/manure stores.
- Control rodent populations and minimising red mite, fly and litter beetle populations.

Further information and advice is also available on the Defra website, including:

- Defra's [Biosecurity leaflet for poultry keepers](#).
- Defra's Guide and Code of Practice for the control of Salmonella: <http://archive.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/zoonoses/salmonella-cop.htm>

Raising Awareness

In addition to raising awareness for the presence of Fowl typhoid in the UK, veterinarians and flock owners/managers should also be mindful of the risks associated with movements of birds and chicks (including fancy breeds), hatching eggs and table eggs and associated equipment (eg. egg trays, chick trays, etc.) from areas where *S. Gallinarum* infection is present onto poultry premises. As described previously, the movement of contaminated equipment that may harbour infected red mites, such as recycled cages or feeding equipment should also be considered to be a risk.

Taking steps to prevent the introduction and spread of infection, and the prompt investigation and diagnosis of suspect disease are advised to both minimise the risk of bringing in the disease and the impact of an outbreak. This is particularly important for exporting breeding flocks in Great Britain. Whilst Fowl typhoid is not notifiable, detection of *S. Gallinarum* infection in such breeder flocks will result in the affected holding being suspended from the Poultry Health Scheme until the premises has been depopulated, effectively cleaned and disinfected and replacement flocks have been shown to be free of infection. Therefore, this would mean a loss of trade for the affected holding for several months, or longer if recurrent infection is not prevented.

If infection with *S. Gallinarum* is confirmed it is advisable to seek specific advice from your poultry veterinary advisor or AHVLA, since standard *Salmonella* control measures are unlikely to be effective in the case of Fowl typhoid. We would also be interested to hear of any suspected cases of Fowl typhoid. Please contact your local [AHVLA laboratory](#) or [Surveillance Centre](#).

References

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