

Salmonella Spotlight:

Exploring Salmonella



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What is Salmonella in poultry?

Salmonellosis, or Salmonella infection, is a bacterial disease that affects the intestinal tract of poultry.

The term 'Salmonella' does not refer to a single bacterium, but rather to any rod-shaped, Gram-negative bacteria of the family Enterobacteriaceae. It's important to note that most Salmonella serotypes (or variations) can affect several animal species, including poultry and humans.

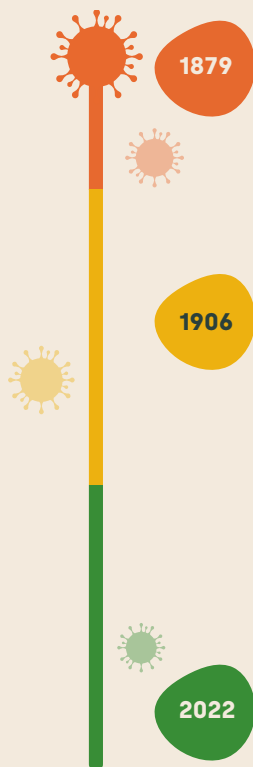
The most common source of Salmonella infections in humans is from infected poultry products such as meat and eggs. Outbreaks within poultry flocks are therefore especially concerning.

Infected feed, contact with infected animals or eggs, or contact with a contaminated environment can all lead to a Salmonella outbreak within a flock.

Unlike humans, infected poultry often show few or no signs of disease: out of the over 2,500 serotypes of Salmonella, only two are known to result in a high mortality rate. In most cases, only young birds may show symptoms such as depression, diarrhoea, stunted growth, weakness, and dehydration - all of which are often caused by other illnesses which makes Salmonellosis difficult to spot.



Salmonella: The history, and what farmers can do



1879

While the Salmonella genus takes its name from Daniel Elmer Salmon, an American veterinary pathologist, Salmonella bacteria were first observed earlier in 1879 by Karl Eberth in the lymph nodes and the spleen of typhoid patients.

1906

The Salmonella Typhi serotype, known to cause potentially deadly typhoid fever, led to an outbreak in New York in the early 1900s. This outbreak remains notable as the first known case of a healthy carrier of Salmonella Typhi. The vast majority of the 3,000 documented cases of typhoid fever which occurred between 1906 and 1907 were all traced back to a single person: a cook named Mary Mallon. Once identified as the source of the outbreak, 'Typhoid Mary' was forced to live the rest of her days under quarantine on North Brother Island.

2022

Nowadays, with vaccines and antibiotics to effectively treat the disease, there is no need for such drastic measures. We might, however, have been relying a bit too much on antibiotics: research shows that the emergence of drug-resistant Salmonella serotypes is undermining the efficacy of antibiotic treatment¹, and suggests that restrictions of indiscriminate use of antibiotics in livestock may be needed to avoid a worst-case scenario in which antibiotic-resistant serotypes become a serious threat to life.



¹ www.tandfonline.com/doi/full/10.1080/21553769.2015.1051243

While antibiotics can be a huge help in eliminating Salmonella infection in flocks, prevention remains the best course of action. Vaccines are an important measure to guard against infection, as they protect from different serotypes.

For example, the vaccine to protect poultry from Salmonella Enteritidis is also effective against Salmonella Pullorum and Salmonella Gallinarum.

Other precautions include:

- Using Salmonella-negative feed, which is treated specifically to ensure it is not contaminated with the bacteria.
- Chlorinating drinking water.
- Ensuring pest control measures are in place and are effective.
- Reducing the potential for interaction with wild birds that may have the disease.
- Maintaining poultry sheds in a good state of repair and ensuring that they are kept clean to reduce risk of disease.
- Ensuring all equipment used in housing areas is thoroughly disinfected before and after use.
- Only introducing new chicks from Salmonella-free flocks.



Salmonella in the UK

Research published in 2018 by Public Health England, indicates that Salmonellosis has affected between 7,000 and 12,000 people in the UK every year between 2007 and 2016.²

The majority of cases recorded concerned Salmonella Enteritidis (SE) and Typhimurium (STM), the serovars most frequently associated with human illness.³

While these figures may seem high, they are a marked decrease from those prior to 1993, when England and Wales launched a vaccination programme for chickens against SE and STM, as well as introducing new measures to test both the birds and the feed they were eating. Vaccination of poultry is required to meet the Lion Quality Code of Practice and is required for the Lion Mark use on eggs.

Data⁴ from the medical journal BMJ shows an average of 33 human deaths per year occur in the UK because of Salmonella. According to the Center for Disease Control and Prevention (CDC), Salmonella bacteria cause about 1.35 million infections, 26,500 hospitalisations, and 420 deaths in the United States per year.⁵ The vast majority of people are infected by contaminated food and Salmonella is estimated to cause more foodborne illnesses than any other genus of bacteria.

 **An average of 33 human deaths per year occur in the UK because of Salmonella**

BMJ Journal

Most people have Salmonella bacteria in their stomach and intestine. Stomach acid usually ensures the bacteria is killed and passes through without issues. Yet, when full of food, the pH of the stomach can become considerably higher - and therefore, less acidic. If the food ingested is contaminated, the increase in pH allows the bacteria to survive in the stomach and go on to successfully colonise the intestines, thus causing illness.⁶

Those with Salmonellosis will suffer from symptoms such as diarrhoea, fever, and stomach cramps. Most infected people will recover within days without antibiotics. Young children, people with compromised immune systems, elderly people and those with pre-existing medical problems will require a course of antibiotics.

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/711972/salmonella_data_2007_to_2016_may_2018.pdf

³ www.sciencedirect.com/topics/agricultural-and-biological-sciences/salmonella-typhimurium

⁴ <https://bmjopengastro.bmj.com/content/7/1/e000377>

⁵ <https://www.cdc.gov/salmonella/index.html>

⁶ <https://www.nature.com/articles/news981015-6>

Are there any emerging threats?

A recent article by The Bureau of Investigative Journalism (TBIJ) suggests that a different, more dangerous strain is becoming more common in the UK.

According to test results obtained by TBIJ and The Guardian newspaper, there has been a spike in poultry products contaminated with Salmonella Infantis - one of the most virulent among the many types of Salmonella bacteria. This strain is often found among broiler flocks in the EU and can prove fatal.⁷

While data is currently incomplete, it is believed that around 400 people were infected with Salmonella Infantis between 2019 and 2020 in the UK.

There are some measures the public can take to protect themselves and ensuring that poultry meat is thoroughly cooked is a first, important step. Paying close attention to hygiene while handling raw meat or eggs, is usually enough to protect the public from Salmonellosis - but anybody can slip up in the kitchen, and proper cooking cannot be the only layer of defence between the public and a potentially dangerous bacterium.

Taking steps to minimise the risk of Salmonellosis in poultry remains vital.



⁷ www.thebureauinvestigates.com/stories/2022-07-05/dangerous-salmonella-found-in-uk-farms-and-meat

Salmonella serotypes

All serotypes can be broadly divided into two groups: typhoidal and non-typhoidal.

Most serotypes are in the non-typhoidal group, and they are the ones that can be passed on from animal to humans, often through the consumption of contaminated food and with gastrointestinal symptoms.

The much smaller typhoidal group, as the name suggests, causes typhoid fever. Transmission is limited between humans.

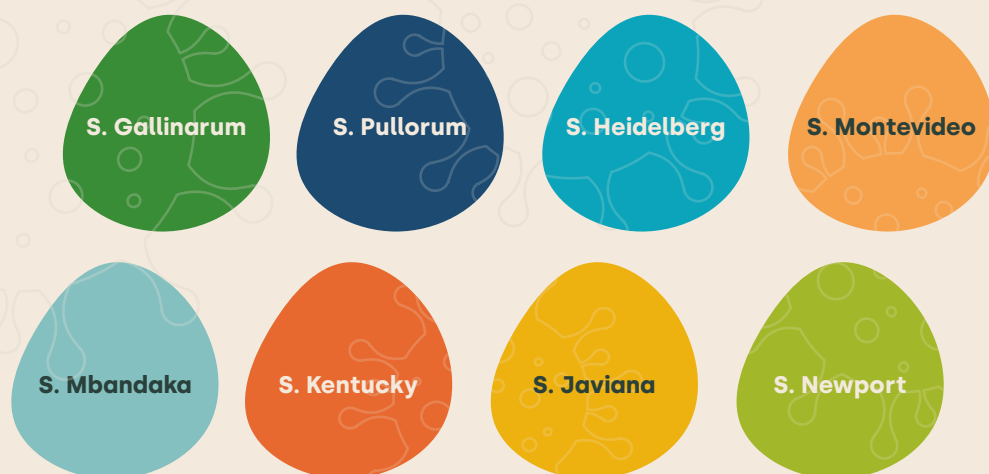
Among the serotypes that most affect poultry, *Salmonella Gallinarum* and *Salmonella Pullorum* are those with the highest rates of mortality. Causing fowl typhoid (FT) and pullorum disease (PD) respectively, they are the most likely serotypes to cause visible symptoms in affected poultry.

Due to the high rate of mortality among poultry, these two serotypes were particularly targeted by efforts to eradicate the diseases they cause. While both serotypes are still present across the world, they are far less widespread than they used to be. They also are both highly adapted to poultry as their host species, and therefore are considered of little public health significance.⁸

They can however cause significant losses among infected poultry. Recognising the signs of illness is important to protect poultry health and prevent widespread outbreaks.

There are roughly 2,500 serotypes of Salmonella.

Aside from SE, STM, and Infantis, those found most often in domestic poultry are:



⁸ <https://pubmed.ncbi.nlm.nih.gov/10935271/>

Signs of Salmonella in poultry

With such a variance of serotypes, it is difficult for poultry farmers to distinguish between two different categories of disease:

- 1 Those with few if any noticeable symptoms in poultry, but that may go on to infect humans, and**
- 2 Those that are generally harmless to humans but may be lethal to their flock.**

In the first case, birds will mostly be unaffected. These serotypes can be extremely difficult to spot, with no noticeable signs of illness in the birds. Egg production is mostly unaffected. Some symptoms may show in vulnerable birds, particularly very young ones, aged up to two weeks.

Poor growth, diarrhoea, weakness, and loss of appetite are common indicators of disease and chicks may crowd beneath heat sources showing general signs of lethargy.

These symptoms, along with a drop in egg hatching rates and higher than usual mortality amongst young chicks, are among the clearest signs that Salmonella might be circulating.

With Salmonella Gallinarum and Salmonella Pullorum, on the other hand, it is easier to see the signs of disease. Fowl typhoid and pullorum disease will hit young birds the hardest, showing symptoms that are similar to those described above but with a very high mortality rate of around 100%. Both diseases may noticeably stunt the growth of young birds.

While PD mostly hits young birds, FT may also affect adult, otherwise healthy birds.

Increased mortality, increased feed consumption, decreases in egg production and poor physical condition across the flock are all possible symptoms of FT, caused by Salmonella Gallinarum.

While mortality is not as high among adult birds as it is among chicks, birds that survive infection will remain carriers of the bacteria for a prolonged period. The infection is shed through their faeces and eggs, which makes it very difficult to entirely eradicate once present.



Salmonella survivability

While the survivability of Salmonella bacteria varies between different serotypes, most of these bacteria are remarkably resilient and can survive in challenging conditions:

- **Salmonella bacteria can grow in temperatures ranging from 8°C to 45°C.**
- **They can survive pHs as low as 4 and higher than 8.**
- **They can live in environments low on oxygen - such as in manure or in slurry pits.**
- **They are known to survive for prolonged periods of time in soil and water, making unwashed fruit and vegetables a potential vehicle of transmission.**
- **While it thrives in wet environments, Salmonella can also survive in low-moisture environments and on a wide range of materials.**



This resilience means the bacteria is often present in animal feed. Once a single bird is infected, it can quickly spread through the flock. It is particularly quick to infect poultry kept in an environment shielded from sunlight. Infection is spread mainly through faeces and some serotypes have been found to still be active in infected faeces months later.

As seemingly healthy birds can continue to spread the bacteria for a prolonged period, a constant cycle of re-infection becomes a real danger if the issue is not resolved.

What to do if you suspect Salmonella in your flock

Taking samples to test for Salmonella is mandatory if there are 250 or more breeding birds, or if eggs are produced on a commercial basis with 350 or more laying hens.

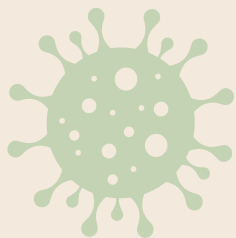
Those with fewer than 250 breeding birds, or who supply the eggs to the consumer directly with fewer than 350 laying hens, are exempt from this obligation.

In case there are different flocks - where a 'flock' is defined as a number of birds who share the same air space - on the premises, a sample test must be taken from each flock.

If all poultry share the same space, they will be considered one flock, regardless of size. This means they will all be affected by subsequent measures should the sample turn out a positive result.

All samples must be tested within four days of being taken. Samples should not be taken if the birds have been given antibiotics recently as this may impact the results.

A positive sample requires further measures to be undertaken but those measures will differ as they are specific to the serotypes detected.



If a breeding flock tests positive for *Salmonella enteritidis* or *Salmonella typhimurium*, Defra⁹ states that:



1

Flocks that tested positive and the eggs that they produce, must be kept on the farm.

2

Entire flocks must be depopulated as soon as told to do so.

3

All the eggs put in the hatchery since infection was found in the flock must be destroyed.

If other regulated strains are confirmed (*Salmonella Hadar*, *Salmonella Infantis*, or *Salmonella Virchow*) other measures must be taken to prevent the spread of disease. No new birds will be allowed to join the flock until subsequent tests come back negative, and the infected housing must be thoroughly cleansed and disinfected before new rotations.

If there is a suspected outbreak which doesn't match with a strain that carries mandatory testing, then a veterinary professional must be contacted as soon as possible.

⁹ www.gov.uk/guidance/salmonella-get-your-breeding-chickens-tested





How Livetec can help

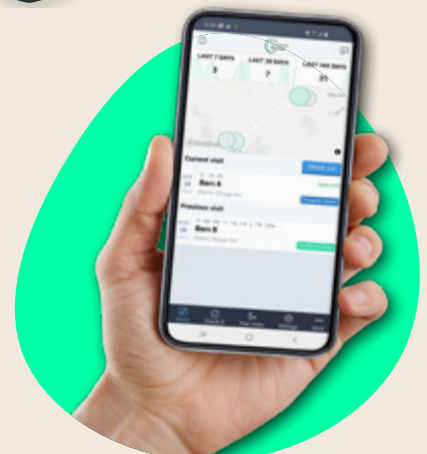
Effective biosecurity protocols are crucial to minimising the risk of disease - particularly while dealing with bacteria such as the Salmonella genus, which is difficult to eradicate and extremely infectious.

Livetec Systems is building the future of biosecurity with bespoke, evidence-based support and advice to protect livestock and livelihoods.

This advice and our other bespoke services that include: mapping, audits, contingency planning and biosecurity management software, Farm Health Guardian (FHG), are all designed to help poultry farmers mitigate against the threat of disease and to react quickly in the event of an outbreak.

Our unique biosecurity advisory service includes an on-farm visit with a Livetec biosecurity expert to provide on the spot advice that will minimise risks, and maximise protection against deadly pathogens.

Created to replace inefficient paper-based systems, **Farm Health Guardian** enables quicker implementation of disease prevention measures - keeping track of all movements in and out of the farm through digitised logbooks, reporting and instant messaging. Farm Health Guardian can be deployed across farms of any size and managed from any handheld device, allowing swift action in case of an outbreak to minimise disease incursion.



For more information,
visit www.livetecsystems.co.uk

Livetec plans help protect your livelihood and livestock:



Biosecurity advisory service

Our biosecurity advisory service provides you with an on-farm visit with a biosecurity expert. Our full on-farm discovery sessions make us a supportive partner, helping you to minimise risks and know how you can better protect your farm from disease incursion.

Contingency plan

Our contingency plans encompass every aspect of farming businesses, predicting scenarios, risks and emergencies that could arise in the future and designing strategies that help to manage the impact of these concerns. Supported by a range of plans, this also helps make you compliant and insurable.



Biosecurity plan

Without a biosecurity plan in place, you are leaving your business and animals highly susceptible to disease incursion. Our biosecurity plans encompass and outline all of the measures that must be followed by every single person on and off farm to prevent the introduction of deadly pathogens.

Infected premises response plan

An infected premises response plan significantly enhances your preparedness. Designed to cover everything that APHA needs from you if and when they visit your farm business. This plan holds all of the critical information they need, in one place, allowing you to be less stressed and make your processes smoother.



National outbreak plan

Our national outbreak plan has been designed to comply with the regulations and requirements set by the UK government, providing bird owners with a wealth of information of everything you need to know should you be impacted by zones or a disease outbreak.

Cleaning and disinfection plan

A critical part of farming includes the ability to undertake thorough and comprehensive cleaning and disinfection of your premises. Our cleaning and disinfection plan is designed to give you the framework for all of the measures you need to take, with clear instructions that show compliance to APHA.



To find out more about how our plans can help your farming business, please visit www.livetecsystems.co.uk/plans or email us for more information info@livetecsystems.co.uk