SALMONELLA IN RODENTS

WHY ARE RODENTS A PROBLEM?

Dr Christopher Nicols, APHA

Rodents pose a real risk to the hygiene and microbiological quality of free range eggs during production. The majority of regulated Salmonellas found on laying farms are linked to infestations of rodents. The role of rats and mice in disease transmission within and between flocks cannot be over-emphasised. Add this to the risk of producing eggs with potential to infect people with Salmonella and the call to arms is writ large. Not to mention the damage caused to buildings, equipment, wiring and water pipes due to imprudent gnawing, or the economic losses that comes with consumption and spoilage of feed.

Wild rodents do not normally carry Salmonella. Infection occurs easily from the farm environment. Salmonella is a resilient bug and can survive desiccation and freezing. This allows it to persist for many years in the nooks and crannies of farms. Wild rodents are unlikely to be the initial introducer of Salmonella to a free range egg production unit, but they are sure to amplify the problem if present.
Rodents act as little furry incubators, turning as few as ten Salmonella organisms into many thousand per day. Contamination can be introduced in feed, it may be brought onto farm on the wheels of a contaminated lorry, it may be left over from a previous contaminated flock or could even come from a nearby pig farm. If the house isn't properly cleaned and disinfected or the range isn't left to rest between flocks, Salmonella can remain in dust, soil and hard to clean areas. Multiplication can also occur in feeders and drinkers. All Salmonella requires for growth is a residual nutrient source, temperatures between 10°C and 40°C and moisture.

Not only do rodents multiply Salmonella in their guts and shed infectious bacteria in their droppings, they also spread it when breeding. Young rodents are particularly susceptible to infection. Infected adults beget infected juveniles that shed even higher levels.

Potential rodent issues on farms

There are significant rodent infestations on nearly all farms found to be infected with Salmonella. Usually mice are the culprits due to their ability to squeeze through very small gaps. It is very difficult to completely mouse-proof a layer farm, let alone a free range unit. Rats can also be a problem in roof spaces or mini-pits under feeding areas. They will likely be burrowing around the house, only entering at night to feed.

Often the scale of the problem is overlooked either due to the number of rodents being under-estimated or their presence accepted as 'coming with the territory'. In reality, rodent population checks are carried out infrequently and there may be a lack of pest management guidance or direction. The chickens themselves may even consume rodent droppings, thus masking and exacerbating the problem simultaneously.

Control measures may be applied inconsistently. If prevention is not targeted and properly monitored it will be at best unsuccessful and could even lead to a bait-averse rodent population. Choosing where to place bait stations can be an important factor in successful control and high risk areas can easily be missed if standard locations are repeatedly used. The design of a poultry shed can play into this. Locations accessible to rodents but not people can mask signs of infestation. A lack of access to droppings pits can result in key control points being missed. Modern houses with belts to remove waste offer increased protection against rats as long as belt-entry points are controlled.

The key rodents to be concerned about on your free-range poultry unit are rats and mice. There are two species of rat in the UK: the black rat (Rattus rattus), also known as the ship rat and the brown rat (Rattus norvegicus), otherwise known as the Norway or common rat. Other than the difference in eponymous coloration, there are a few other key differences between the black and brown rat species. You are far more likely to find the brown rat on your farm and it is much larger than the black rat – roughly double the size. Also, brown rats are burrowers. If you have holes in the ground around your range measuring approximately 3 inches, it is likely to be a brown rat. If the holes are smaller, then they could have been made by a house mouse (Mus musculus).

House mice are thought to have developed an affinity for living close to people soon after the first humans started farming. Perhaps the house mouse even caused Salmonella problems for our new-to-farming ancestors thousands of years ago.

Signs of rodent activity

Other than tell-tale holes in the ground, rodents can
DID YOU KNOW?

- Rodents greatly increase the risk of Salmonella problems on your farm.
- The key pest species are the brown rat and house mouse.
- Signs of rodent activity include: holes in the range or manure pits, droppings, footprints, rub marks, urine pillars and damage.
- An integrated pest management plan is more effective than just baiting.
- Habitat management to reduce the attractiveness of your farm to rodents and rodent-proofing should be part of the complementary solution.
- A named member of staff who is trained (BPCA offer training and certification including classroom and online learning - b pca.org.uk) and responsible for pest control will enhance accountability and success.

Free-range units can be dusty places. This allow farmers to become amateur CSI sleuths as rodent footprints will show up clearly in such environments. The size of footprint may indicate the species present, however the density of individuals isn’t always clear if footprints have been repeatedly walked over. To determine if footprints were made recently, a dusting of flour can be placed and monitored for new prints each morning.

Continuing the CSI theme, if rodent footprints are like shoplifters at a crime scene, then ‘rub marks’ can be thought of as fingerprints. Both mice and rats leave visible rub marks when moving around your farm. They are creatures of habit and will use the same routes each day.

EASILY INFECTED

LOW LEVEL CONTAMINATION FROM LAST FLOCK

FEED

HIDDEN DUST

CONTAMINATED LORRY WHEELS

OTHER HOUSES ON SITE

NEARBY PIG FARM
night. As they rub past walls, floors, beams and other surfaces they leave behind dirt and grease from their bodies. These rub marks look like dark smudges and smears. They may be visible around cracks in walls allowing entry points or along walls by narrow beams where they may have been walking.

In addition to rub marks, common and longstanding mouse pathways around your farm will likely also have visible 'urine pillars'. These unpleasant sounding pieces of tiny architecture form after mice urinate in the same places along their nightly route. Dust and dirt will settle and cling to these areas, eventually forming first a little mound and then a slowly rising stalagmite. This can indicate your infestation has been present for some time.

Further inspection of your premises may also yield signs of damage. A characteristic of rodents is their continuously growing teeth. To combat this, they do a lot of gnawing. Look for areas where cracks in wood or plastic have been enlarged by overeager incisors. Any other unexplained damage, for instance to wiring, food containers or insulation could also have been made by rodents. It is worth performing a thorough check of your premises with a powerful torch to look for these signs. This may be most easily carried out between flocks in an empty house.

Management of rodents to minimise Salmonella risk

If you've seen signs of rodents on your farm there is substantial risk that your flock is carrying Salmonella. If you do not already have a regular Salmonella testing programme in place, now is the time to speak to your vet about instating one. Even if you haven't seen signs of rodents, it is still highly recommended to implement an integrated pest management plan for your farm.

One thing that should be avoided however, is the use of a cat to help solve the problem. This will be counterproductive. Contaminated rodents will infect the cat, whose own droppings will then contribute to the persistence of Salmonella. Also, cats carry avian pathogens such as Pasteurella. Instead, an integrated pest management
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Integrated pest management: Preventative measures

Integrated pest management is not purely about reducing existing rodent numbers. It incorporates habitat management and rodent-proofing to ensure ongoing control of the problem.

Habitat management need not be complicated. Simply cleaning vegetation, debris and disused structures or equipment from your farm’s surrounding area can greatly reduce its attractiveness to rodents. Anything that provides cover is appealing and should be avoided.

Creating a hide or sun-shade for poultry on your range may intuitively seem beneficial to the welfare of your birds, however can also act as cover for unwanted rodents. Encouraging tree growth on the other hand is not inherently a rodent risk factor and can also provide shade for birds.

Your range and farm surroundings should be kept clear of spilled feed, broken eggs and other waste to avoid attracting rodents. Providing feed and water outside in range areas will put your premises at risk from rodent activity. Of course, preventing rodents accessing your range completely is extremely difficult, but reducing its attractiveness to rodents should be more feasible. Concrete skirting surrounding the house and replacing surrounding vegetation with gravel will all contribute to this.

Rodent-proofing of poultry houses on the other hand is more feasible. Small changes can make big differences, mainly because rodents can fit through very small holes. To exclude house mice, you should ensure no gaps larger than 6mm and to exclude Norway rats, no gaps larger than 13 mm. This includes gaps between doors – tightly closing doors are best – and also gaps and cracks in old walls, which should be maintained well. A key issue for rodents and free range production is the openings and pop holes necessary to allow hens to access the range. These should be securely shut at night and be close-fitting to prevent rodent access.
Preventing rodents entering your poultry houses requires lateral thinking. Imagine the rodents are hatching Mission Impossible style plans and react accordingly. Sealing drains with a wire grill and introducing overhangs will stop rodents climbing walls to enter vents.

**Pests on the wing: Wild birds**

Rodents aren’t the only pests that can cause Salmonella problems for free range egg producers. Wild birds can also act as vectors and reservoirs. Like rodents, wild birds will be attracted to any feed placed in the range area and also like rodents, wild birds can amplify any existing Salmonella present on the farm if large populations of birds are present.

Wild birds also pose an additional threat. Yours won’t be the only farm gulls and pigeons will be attracted to. This can result in cross contamination from nearby pig or cattle farms, for instance. Salmonella Typhimurium in pigs is a significant problem and if this type of Salmonella is found on your free range egg farm, it is treated in the same way as S. Enteritidis is found.

Wild birds can easily spread contamination from outdoor pig farms to free range egg units. A recent APHA study found the same type of Salmonella present in wild bird droppings, individual pigs and environmental samples all from the same pig farm, including contamination of fields that had not been used for pigs for two years by wild birds (De Lucia et al., 2018). Gulls can cover a range in excess of 10km diameter from their nest sites, meaning that pig farms over 20km from your own farm can still pose an infection threat via these winged carriers.

Swallows and similar insectivorous birds are also a risk because of their diet of potentially-contaminated flies and the use of contaminated mud to make nests. Specific types of Salmonella Typhimurium are linked to different types of wild birds. If Salmonella is found on your farm it is worth consulting an expert as they may be able to determine the likely source of contamination. This will allow your wild bird prevention strategy to be tailored to for instance; pigeons, small garden birds or gulls.

Game birds can also pose a problem, especially if the range is surrounded by woodland. Game birds can pick up Salmonella if the hatchery is contaminated so being aware of any game feeding or shooting in your area will give you a head-start on potential infection routes.

To prevent wild birds accessing the range netting would be an ideal solution, although in practice this is not likely to possible except for very small units. Standing water on the range can attract wild birds so proper drainage is essential to prevent this. Bird-scare kites in the shape of birds of prey can be an effective ‘scarecrow’ although the hens will likely require time to become acclimatised. Black thread can also deter flying birds; particularly useful for open buildings. Also remember that wild birds can easily contaminate stored bedding or equipment that is left in the open, especially during quiet times on the farm.

**Conclusions**

Do not underestimate the importance of rodents to the spread and persistence of Salmonella on free range egg farms. Most cases of Salmonella Enteritidis or Typhimurium recorded in the National Control Program – serotypes with implications for public health – involve rodent pests in some capacity. Don’t forget to also pay close attention to other pests such as insects and foxes. Both can introduce Salmonella to your farm and it is certainly worth checking manure for first stage fly larvae and litter for litter beetles. Remember also that the HSE has strict regulations regarding use of rodenticides.

Investing time in training on-site personnel will be more effective in the long-term than relying on contractors. That said, working with expert professionals at the outset can provide valuable training opportunities.