AN EGG PRODUCER'S GUIDE TO

SALMONELLA

British Free Range Egg Producers Association

A PUBLICATION BY THE BRITISH FREE RANGE EGG PRODUCERS ASSOCIATION

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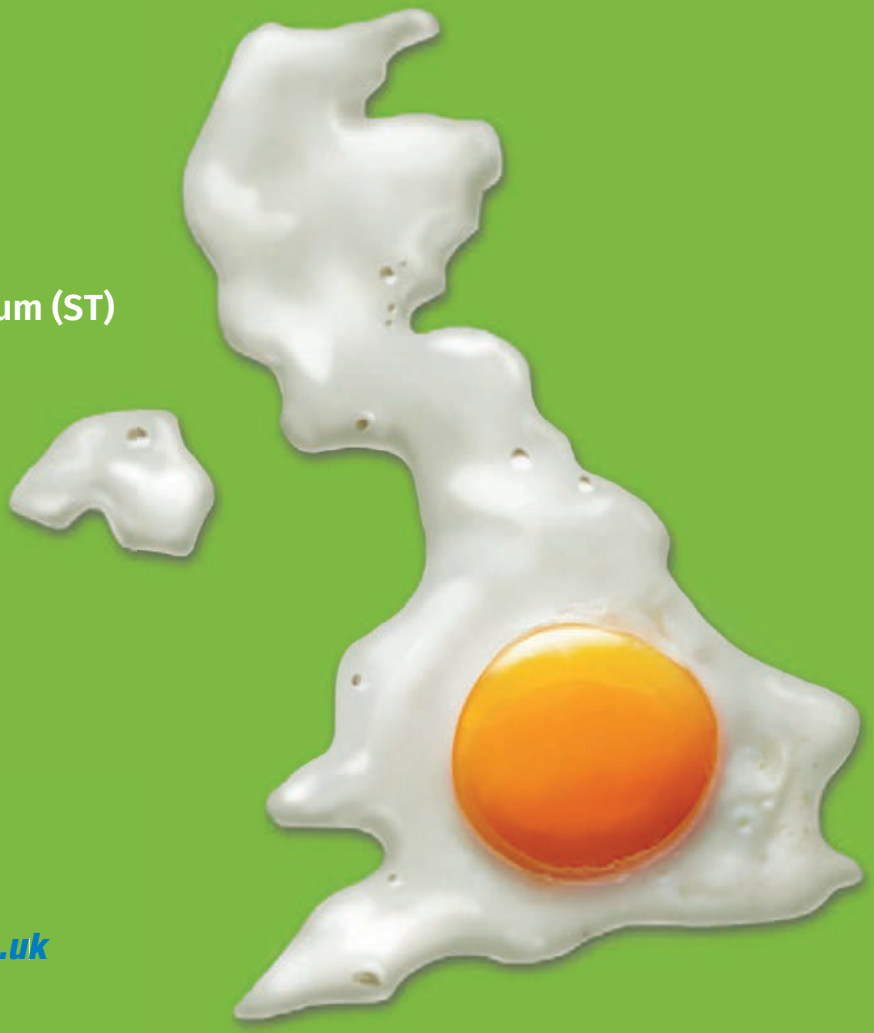

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References: 1. AviPro Salmonella Duo 2018 sales data relative to total pullets in the UK. **2.** AviPro Salmonella Duo lyophilisate is for use in drinking water, and is indicated for use in future layer hens: For active immunisation of healthy and susceptible chickens to reduce faecal excretion and colonisation of internal organs with *Salmonella* Enteritidis and *Salmonella* Typhimurium field strains and to reduce colonisation of eggs with *Salmonella* Enteritidis field strains.

Elanco UK AH Ltd, Lilly House, Priestley Road, Basingstoke, Hampshire RG24 9NL. Telephone: 01256 353131 Email: elancouk@elanco.com

Date of preparation: 25th June 2019 PM-UK-19-0454

360° Salmonella Protection

#salmonella360

IINTRODUCTION

Twenty-five years ago, Edwina Currie made a statement that shook the foundations of the egg industry when she proclaimed that 'most of the egg production in this country, sadly, is now affected with Salmonella'. It led to her resignation, and a deep depression in the egg industry from which sales of egg have never recovered.

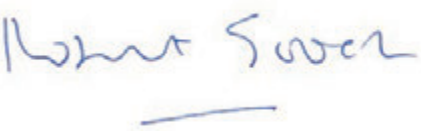
With all the issues affecting egg producers, and an increase in the number of producers who have entered the sector in the last few years', it is worth reminding producers about the history of Salmonella as a devastating infection and the reasons why those producers who remember the crisis only whisper the words.

In this publication, most originally called 'An Egg Producers Guide to Salmonella' we have a look through the archives as far back as 1885 when pioneering American veterinary scientist, Daniel E. Salmon, discovered the first strain of Salmonella. There are now nearly 3000 different types of Salmonella, but we need to be aware of the two types that are most commonly known to free range producers' – Salmonella Enteritidis and Salmonella Typhimurium.

Salmonella is one of a group of bacteria that are adapted to living in the intestine of animals but also survives well in the environment. So, this brochure gives us the background to Salmonella and the steps needed to help control Salmonella in the environment.

Re-assess your bio-security plans and research Salmonella insurance. Salmonella on your farm can be hugely debilitating, costly and offers a real and present danger to your business. BFREPA created a contingency plan workbook last year which was sent to all members. Some insurers insist on a contingency plan and offer better insurance rates to those that take their biosecurity seriously. We hope to update this workbook when Lion releases their version 8 next year.

This booklet is accompanied by an A1 poster 'Get serious about Salmonella'. Digital and printed versions are available from BFREPA.



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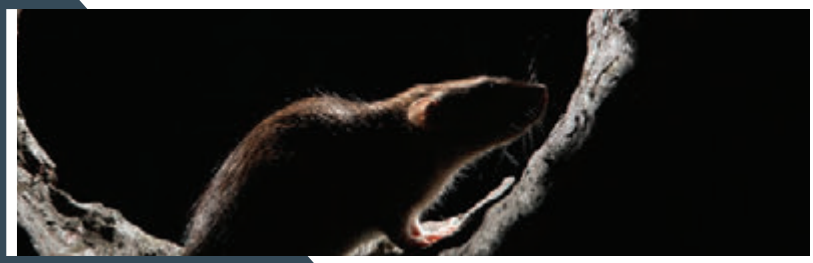

AN EGG PRODUCER'S GUIDE TO SALMONELLA

CONTENTS

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Advertising and Editorial | Keith Wild - Tel: 01484 400666 **Email:** keith@theranger.co.uk
Design | Red Hen Promotions Ltd | **Rich Jowitt - Tel:** 01484 400666 **Email:** design@redhenpromotions.com
A SPECIAL PUBLICATION BY THE BRITISH FREE RANGE EGG PRODUCERS ASSOCIATION

APOLLO 11 MOON LANDING

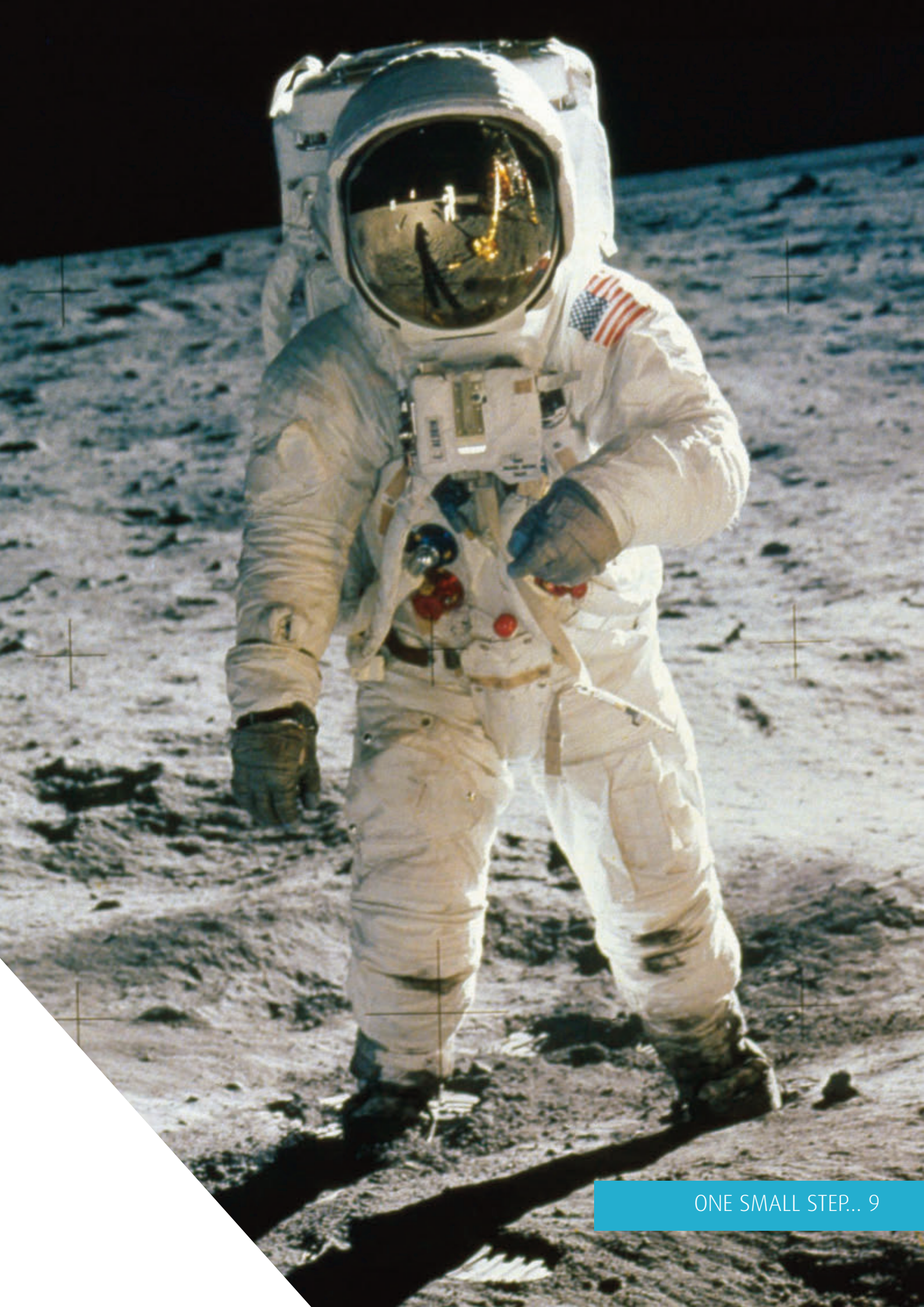
Stephen Lister - Crowshall Veterinary Services

ONE SMALL STEP...

SALMONELLA

As I write this editorial the media is reporting on the events of 50 years ago when Apollo 11 first landed on the moon in 1969. I remember watching these events on a small black and white TV as a spotty young teenager thinking this was no more than science fiction. Little did I know that it was the space race which saw the first real developments of HACCP in approaching the science of food safety – thinking about it now, zero risk of food poisoning was an understandable goal in a spaceship, as one can only imagine the difficulties of an acute explosive diarrhoea or vomiting episode whilst in a spacesuit millions of miles from earth!

I first entered the poultry industry some 10 years later in 1979. In common with the rest of the industry I was not prepared for what lay ahead for us in terms of food safety. Less than a decade after joining the industry I was hit by one of the most significant food safety scares I have ever been involved with. The proverbial really hit the fan in December 1988 with what has always been



EDWINA CURRY

labelled as the "Salmonella in eggs" scare. BSE, Horsegate, Dioxin and Fipronil had not even been thought of!

It was late in 1988, a year in which the industry had already been battling the emergence of highly virulent Gumboro Disease and issues with very virulent strains of Mareks Disease, that the game changed on Salmonella. The year ended with Edwina Currie MP, who was then the Minister of Health, stating in an unguarded ITN TV interview on 3rd December 1988 that "most of the egg production in this country, sadly, is now infected with Salmonella". Edwina already had quite a track record during her short time in the Department of Health with her unguarded comment on those afflicted by Aids, the elderly and a suggestion that many Northerners tended to die from a combination of ignorance and too many chips!
Edwina quickly said it was a slip of the tongue and she meant to say "much" rather than "most" of the egg production – but it is doubtful it would have made that much difference! In the fall out, Edwina lost her ministerial post at the Department of Health a couple of

weeks later, but the egg industry suffered much more with a catastrophic drop in egg consumption and millions of birds were slaughtered in the aftermath.

Hansard reports a debate in Parliament on the 5th December 1988 where Edwina was accused of making a "half baked, half boiled, irrational statement". John Farrant, then editor of Poultry World, reported in early January 1989 that "eggs have become the Aunt Sally for so-called experts and publicity seekers to show their lack of knowledge outside their little sphere".

Egg orders had dropped by 60% within a week at a time when UK consumers were buying 30 million eggs every day. Mayhem followed including the slaughter of over 4 million laying hens either due to identification of contamination or the lack of a market for fresh eggs, involving the destruction of nearly 300 laying flocks and 100 breeder flocks between 1989 and 1993 – it was a rough, tough 5 years!

Subsequent investigations confirmed that the number of eggs actually carrying Salmonella in intact eggs or on intact egg shells was very, very low. However, the fact that so many eggs were consumed daily, often lightly cooked, contributed to human infection being traced back to eggs, often having been poorly handled along with poultry meat in the kitchen.

Contaminated flocks remained perfectly healthy and there were no robust blood tests so monitoring and detection depended on cultural techniques to grow Salmonella from any contaminated flocks.

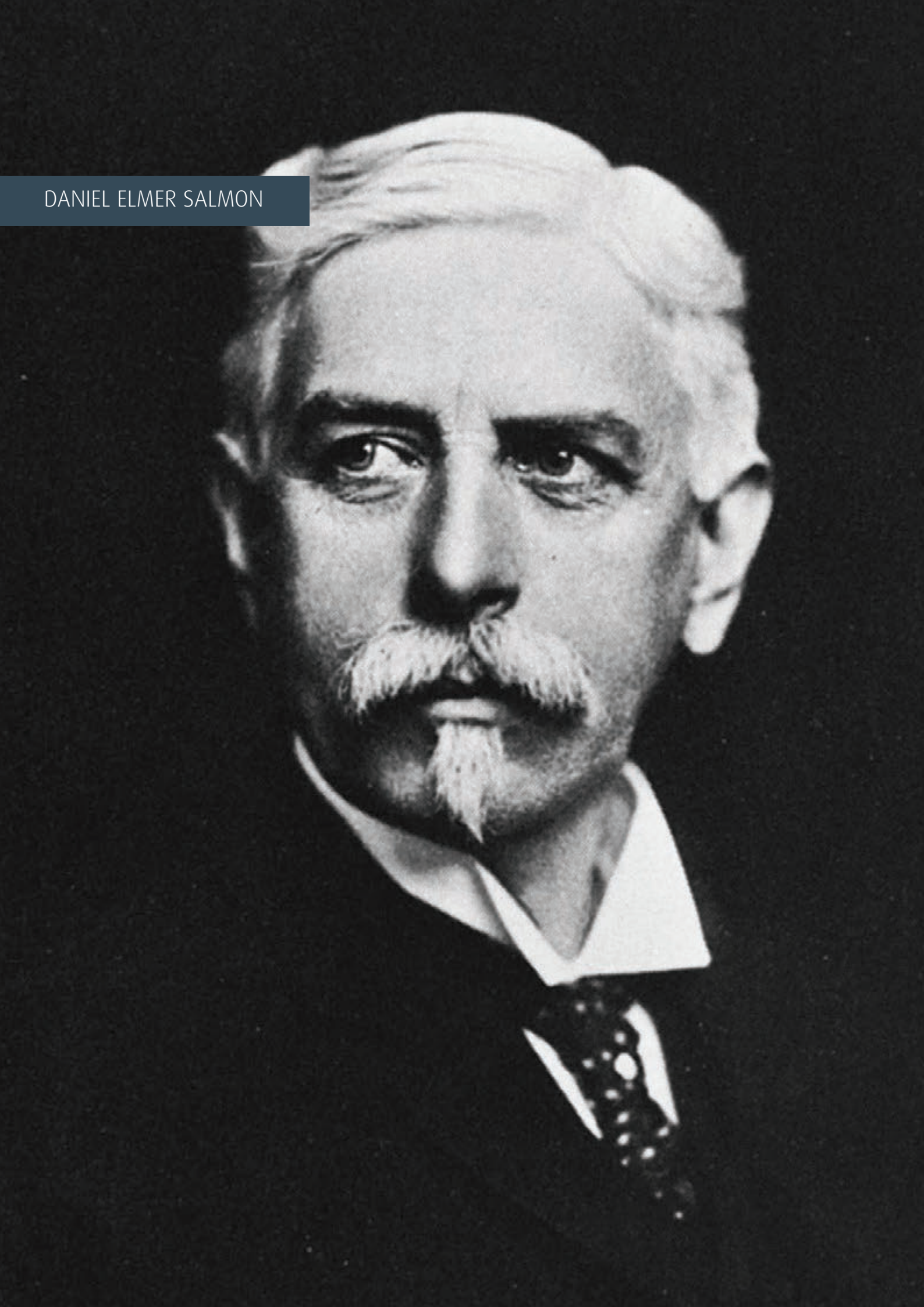
Over 2200 strains of Salmonella have been identified over the years, but currently only two, Salmonella Enteritidis (SE) and Salmonella Typhimurium (ST), are associated with any significant human food poisoning and hence are the two which arouse the most interest and requirement for control. At the time of Edwinas bombshell the main culprit on which attention was most focussed was Salmonella Enteritidis in humans.

Both SE and ST infections can be invasive in animals and lead to some disease in young chicks but mostly the birds are not aware they are carrying Salmonella and infection is silent. Hence the need for ongoing testing of all flocks we are all now so familiar with so that we can detect easily if there are any problem flocks to guide strategies for control and to maintain confidence in our industry. But it wasn't always like this and in 1988 and the years that followed we learnt much about where the contamination was and what measures were needed to detect, isolate and remove the sources of infection.

Legislation followed with a revised 1989 Zoonoses Order and various versions of Poultry Laying Flocks and Poultry Breeding Flocks and Hatchery Orders requiring testing, identifying and removing contaminated flocks.

However, legal controls don't tend to deter bugs and it was up to the industry and its advisers to develop a whole range of measures to "seek and destroy"! It was a hectic time and almost weekly the landscape was moulded and adjusted to interpret what we were learning. The end result was a wide range of Codes of Practice and monitoring schemes. These included working out where contamination was and the most sensitive and practical testing regimes. This was supported by procedures to confirm the clean handling of eggs and removal of cracked or dirty eggs from the chain, effective rodent control, effective cleansing and disinfection of sites, addressing feed contamination at home and in imported protein, hygiene in the home and education of consumers.

Once control was established consumer confidence in eggs slowly crept back but it was only with the creation of the Lion Code, including compulsory flock Salmonella vaccination, testing and reporting and the whole range of biosecurity measures that are second nature to us now that the egg industry re-established its rightful position as the provider of safe and nutritious food. The rest, as they say, is history – one small step, followed by a great leap!


DANIEL ELMER SALMON

Stephen Lister - Crowshall Veterinary Services

SALMONELLA

Salmonella was named after a US pathologist, Daniel Elmer Salmon, who was working for the US Department of Agriculture in the 1800s, so nothing to do with fishy salmon! In fact records suggest that there was a plague of typhoid fever in Ancient Greece due to Salmonella as long ago as 400 years BC! Mr Wikipedia has even blamed a catastrophic Salmonella outbreak as a contributor to the collapse of the Aztec Empire in the 16th Century, aided by Spanish invaders!

Salmonella are a group of bacteria, bugs, or germs, some of which are capable of causing food poisoning in people. There are estimated to be over 2300 different types, sometimes referred to as strains, types, serotypes or serovars. Some can cause infection in animals and an even smaller number can cause disease or illness in poultry. Each strain has its own name, sometimes associated with the animal it was first isolated from, sometimes the disease they are associated with and most often where they were first isolated – hence some exotic sounding place names.

Salmonella Pullorum and Salmonella Gallinarum are two very specific "avian" strains which were historically able to cause high mortality in poultry flocks. As a result they were at the heart of the development of our Poultry Health Scheme which was designed to remove these two strains from our country flock. These infections are now extremely rare, except occasionally being detected in some backyard flocks (another reason for avoiding contact with backyard flocks!).

Although potentially any strain can cause human food poisoning common things are common, and hence there only a handful of strains that the boffins get excited about. Some come and go having been associated with specific and localised outbreaks. The most common human associated strains, and hence those that cause our industry most grief these days in terms of control and further action, are Salmonella Enteritidis (SE) and Salmonella Typhimurium (ST). If these particular strains are isolated from our flocks that is when we are likely to be affected by legislation and control to help reduce human infection. This is why the cornerstone of the poultry industry control measures depends on robust vaccination specifically against these two types, coupled with biosecurity measures to prevent their access to flocks. As a result of this, fortunately these infections are rare in our industry, even though every flock is tested regularly.

The testing we do is designed to pick up any Salmonella that may be present and then more specific typing can tell us whether we are dealing with something more sinister. UK Government compile and report all the results of testing annually for each different poultry type (layers, breeders, broilers and turkeys) and since the National Control Programmes have been in place, our layer industry has had a good record. The most recent figures suggest that sampling shows positives for any sort of Salmonella is running at less than 0.8% and for the important types (SE or ST) less than 0.2%, way below an EU target of 2%.

If SE or ST are detected then strict control measures are put in place (see other articles for more details on this). From time to time some other strains might be isolated from our flocks but as they are very unlikely to be passed in or on eggs to affect people and our flocks don't suffer any ill effects then there are no specific controls necessary.

So, when you submit routine NCP samples you are likely to get one of two results reported to you. By far the majority will be reported as "not detected" or "negative" and this report can then be filed away until the next test is required.

If there is a suspicion of a positive your testing laboratory will let you know that they have a "suspect" and should report to you the Salmonella Group detected.

The Groups in poultry most usually involve one of Groups B, C, D, E, or G. Once you have been informed of this

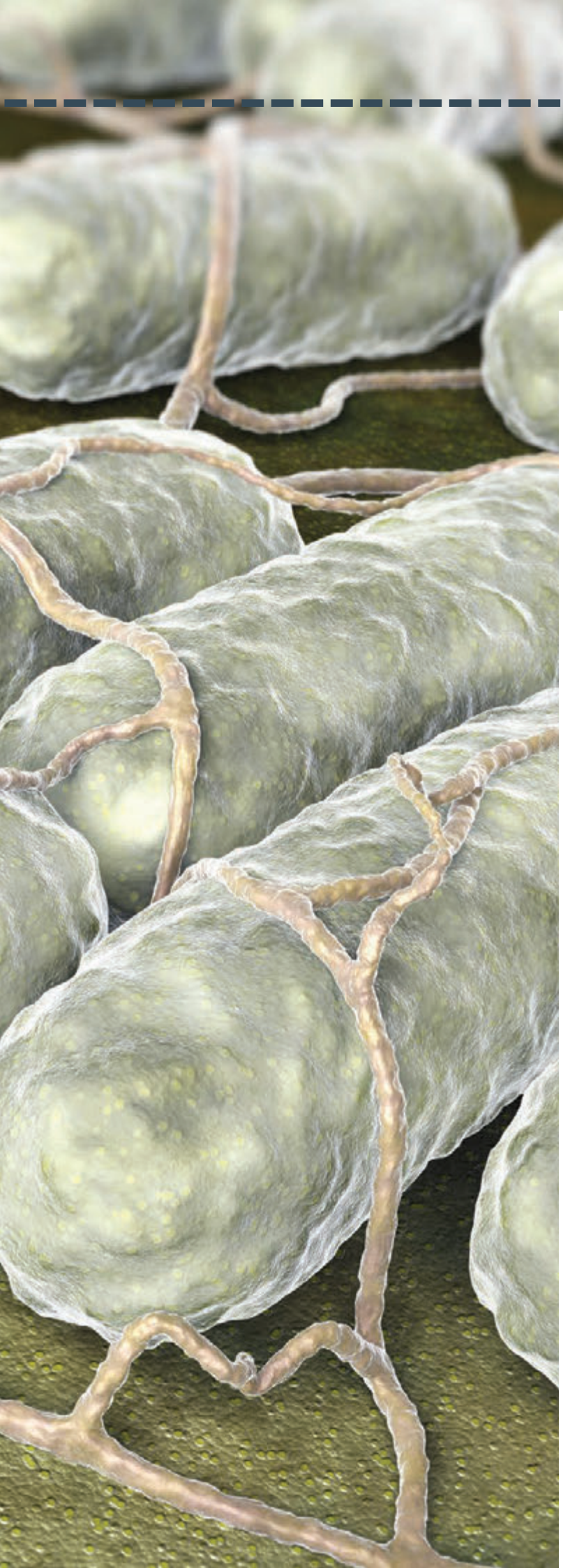
SALMONELLA BACTERIA

(usually within a week of the sample being received for testing) the laboratory has a legal responsibility to report this to Defra and to submit the isolate for confirmatory testing by APHA who are the reference laboratory for confirming the more specific serotype. This can be an anxious time for producers. As a preliminary guide the two Groups to raise most concern are Group D (which includes Salmonella Enteritidis) and Group B (which includes Salmonella Typhimurium). Groups C, E and G isolates tend to involve the less exciting strains.

So, if your testing laboratory gives you a preliminary report of a Group D or a Group B then the sample will be fast track tested by APHA to rule out (or sadly confirm) Enteritidis or Typhimurium. Fortunately, there are quite a number of harmless Group Bs and a few Group Ds that are not Enteritidis so hence the anxious wait for several days until APHA can confirm the identity.

As the above explains, the groups, names and identity of Salmonella types can be useful in helping us understand where they have come from and hence help with control measures. Salmonella Agona and Salmonella Agama (both in fact Group Bs) have been isolated from badgers, foxes and other wild mammals and if they pop up in your routine NCP testing may suggest some wild animal contamination on your range. Others (usually from Groups C or G) with a range of exotic names may be associated with feed raw ingredients. The less common and less exciting strains tend not to concentrate in birds and therefore may be present on one sampling but then disappear from a flock and are just noted with "interest" and often a little anxiety until the full typing result is known!

When considering Salmonella Enteritidis or Salmonella Typhimurium these can persist longer in flocks and their environment and hence can be more problematic (see other articles in this series). Salmonella Typhimurium can be associated with contact with pig herds or vermin appearing or being resident on site. Due to their potential to cause human illness SE and ST do arouse interest and control.



New tests are being developed all the time and can now even begin to link specific flock isolates to specific human outbreaks through a technique called Whole Genome Sequencing (or WGS). This may help deflect the blame away from poultry or may help identify exactly where are problems are.

Our industry can be justifiably proud of our record on Salmonella – we vaccinate every flock, we take biosecurity seriously and we test every flock in accredited laboratories. It means that we can be totally transparent – the flip side is that it will always highlight any chinks in our armour and we will publish all our issues openly. However, on the basis that "forewarned is forearmed" we can always stay one step ahead of the game in identifying those issues and can demonstrate our proactive approach to consumers to give them confidence and safety in our products.

CLOSEUP OF SALMONELLA

Dr Rob Davies, APHA

A VIEW FROM THE LAB

SALMONELLA

Everyone knows a bit about Salmonella, hopefully not from personal experience, but it's a name that people remember, unlike Campylobacter or Norovirus, which cause a lot more human intestinal illnesses.

Salmonella is one of a group of bacteria that are adapted to living in the intestine of animals, but most strains can also survive well in the environment, waiting for a new host to come along. In particular, Salmonella survives really well in dust, and can persist in empty poultry houses for years. In the lab, we've shown that it can survive on brick or concrete dust for at least 19 years. We've also found it surviving in surface soil or puddles on range areas of free-range poultry houses for at least 8 months and in a disused layer breeder house for at least 3 years, so it's a very resilient bug that can be difficult to control.

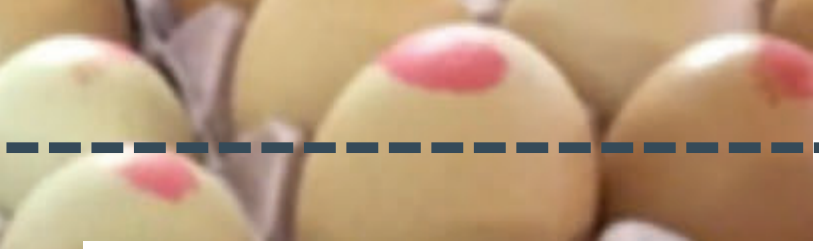
Different types of Salmonella

There are nearly 3,000 different types of Salmonella, known as serotypes, or serovars. Most of these are very rarely reported in UK, being adapted to living in reptile

EGGS MARKED FOR EXPORT

populations in hot countries, but some of them can occasionally be found in imported animal feed ingredients, and very rarely in laying flocks that have consumed contaminated feed. Some types of Salmonella are specific to certain hosts, e.g. the Salmonella Typhi and Paratyphi strains that cause typhoid in people and Salmonella Gallinarum and Pullorum, which can cause devastating disease outbreaks in poultry flocks. Both of these have been eradicated from commercial poultry in the UK, but Salmonella Pullorum, which causes 'Pullorum Disease' is still present at a low level in game birds and backyard flocks.

The last outbreak of Salmonella Gallinarum, which causes 'Fowl Typhoid' in GB was in 2006 when two large laying flocks, mostly involving cage houses, were affected, as well as three backyard flocks. Salmonella Gallinarum is mainly spread between birds by red mites, which transfer it from bird to bird directly into the bloodstream when taking a blood meal. It can persist for over 6 months within dormant red mites, so very intensive heat treatment of houses is needed to eradicate it. One of the large laying farms with Fowl Typhoid had to be closed because it was not possible to eradicate the red mite population completely, despite a massive decontamination effort. Fowl Typhoid strains are still circulating in poultry in many parts of Eastern and Southern Europe, where vaccination is used to try to reduce bird losses, so international movements of people and equipment used on poultry farms is a risk, and one of the UK Fowl Typhoid cases followed a visit from an electrician who had just returned from eastern Europe, beginning in cages next to the electrical panel being worked on. More recent cases of Fowl Typhoid have occurred in Northern Ireland, mainly in laying flocks. It is considered likely that a low level of the organism could

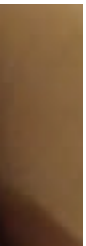


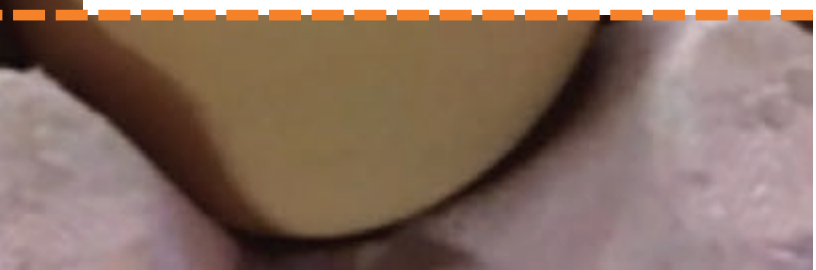
be circulating in game birds over there. Use of an autogenous vaccine as well as intensive heat and chemical decontamination was successful in all their cases.

Salmonella Enteritidis

After the successful eradication of Salmonella Gallinarum and Pullorum from poultry flocks, which was important as these types of Salmonella can invade the ovary and oviduct of birds, and so were being transmitted by hatching eggs, a new type of Salmonella with the same ability to contaminate intact eggs emerged globally. This was Salmonella Enteritidis (SE) that emerged in the late 70's/early 80's. This had little or no effect on birds, so is thought to have developed in some primary breeding flocks for both layer and meat chicken lines and been disseminated widely before it was realised that there was a problem. This was picked up as a result of human illness caused by SE, which began to appear, and then increased dramatically during the 1980's. Once the association with consumption of table eggs was identified, investigations began in many countries and SE was found in day old breeding chicks that were being shipped internationally. The only major country that didn't suffer with SE in laying flocks at that time was Australia, which never imported breeding stock from Europe or America, but SE has recently appeared in some laying flocks in New South Wales and Victoria, and the Australian Government is working to stamp it out before it gets a wider grip.

Experimental studies showed that, like Salmonella Gallinarum, SE has a strong ability to cause long-term infection of the reproductive organs of the bird, sometimes for the whole life of the bird if it was infected as a chick. This meant that the organism can be deposited inside the developing egg before the shell is formed, so becoming the 'enemy inside'. Although even with infected birds, a very small proportion of individual eggs were infected, the large number of eggs used, the pooling of eggs for foods such as mayonnaise and the ability of SE to grow to very high numbers within eggs if they were not cooled during storage, or not used quickly after being laid, increased the risk, particularly for catering establishments. The strong survival properties of SE, particularly in egg albumen, led to contamination of other foods in the kitchen.





The statement made by Edwina Currie in 1988 devastated the egg industry and led to her resignation, but she was a victim of careless messaging. When she said that "most of the egg production in this country, sadly, is now affected with Salmonella", this didn't mean individual eggs, but that a significant proportion of the flocks producing most of the eggs, especially large cage flocks, had SE infection circulating on the site, which was actually correct at that time.

Legislation to control Salmonella in breeding flocks and laying flocks was introduced in 1989, and some improvement in human cases followed that, but the big breakthrough was the development of a Salmonella Enteritidis vaccine in the early 1990's, used initially in breeding flocks, plus the recognition that mice were playing a major part in the persistence of Salmonella in poultry farms. The development of improved sampling and test methods revealed the true level of infection in flocks and revealed residual contamination of poultry houses before new birds were placed. Also, on the breeding side, it was recognised that vehicles, staff, trolleys and trays moving between farms and hatcheries could spread infection both ways, which could also be possible for laying farms and packing centres, via pallets and trays for table eggs. Vaccination of broiler breeders and some layer breeders for SE, combined with improved farm hygiene and biosecurity standards, led to the eradication of persistent SE from these sectors, although occasional incursions of infection occurred during the 1990's and early 2000's, but were quickly dealt with. Between 1993, when laying flocks were

this masked a much higher level of SE, over 50%, in large cage layer farms. After the baseline survey, the introduction of the layer NCP in 2008, followed by the restrictions on class A eggs from positive flocks from 2009, focused producers minds. APHA and vaccine company research showed that the live vaccines, which were introduced in 2002, were often not being administered properly and that rodents continued to be the main reservoir of SE on laying farms. During 2007/2008, intensive baiting on a series of farms showed that rodent populations could be eliminated, given sufficient determination, and that in most cases SE also quickly disappeared from the birds, even before the end of lay. Cleaning and disinfection protocols used in the egg industry were also shown to be insufficient to clear SE, and programmes based on formaldehyde could be both effective and increase egg output.
Another huge factor in the conquering of SE was the replacement deep pit battery cage houses that harboured rodents, with enriched cages or alternative systems that had fewer harbourage spaces, in readiness for the cage ban in 2012.

Since 2014, all SE cases in GB have been in free-range farms, reflecting increased exposure to infection via human waste sources, pets, game birds (many of which are bred in Eastern Europe where SE is common) and horses. Keeping infected flocks in production for class B eggs has proved to be a mistake in many countries, as this perpetuates a major source of SE infection on farms within the industry, which can then also involve egg packing centres.

Salmonella Typhimurium
Salmonella Typhimurium (ST) is a much more diverse serotype than SE, with hundreds of different subtypes that affect different types of animals. Unlike SE, it is not

usually very good at persisting in chickens, as it generates a more robust immune response than SE, but there can occasionally be transient contamination of eggs with virulent types of ST, e.g. DT104, found in cattle, sheep and horses. If ST does contaminate eggs internally, it is likely to grow in a similar way to SE, but contamination of shells is more likely than contents. Some types of ST are linked to different types of wild birds, e.g. DT2 and 99 with pigeons or DT40 and 56 with small garden birds, and these can transiently infect laying flocks, so if this happens at the same time as NCP sample is taken, it's bad news, as for regulatory purposes all ST is treated the same as SE. A significant source of infection for free-range flocks is likely to be game birds, which can acquire Salmonella in the hatchery of origin, or via imported hatching eggs. Game birds can be infected with a variety of ST types, e.g. DT41 in water fowl species.

Monophasic ST has emerged dramatically in the pig industry since 2007, and is now widespread. It can also be found in horses, raw meat pet food and companion animals. Laying farms that are close to pig units, particularly large outdoor farms, can be at increased risk, either because of the risk of spreading infection by movement of wild birds, rodents or flies, or in hot dry weather, contaminated dusty soil that can be blown from outdoor pig units. Grain and straw that is grown or stored closed to pig units can also become contaminated and a proportion of poultry ST infections are likely to originate from feed that has used contaminated grain, which is especially likely during the first few weeks after new-seasons grain has been used. After that, the level of contamination of grain tends to fall. It may therefore be worth adding an organic acid to layer mash during the high risk period, but this obviously increases the cost. Home mixers should also take care that wild birds, rodents or cats are not able to access their feed storage or milling facilities.

Although the risk of human infection with ST via eggs is very low, the fact that it is so widespread in other food animals, the environment and wildlife makes it more of a risk to most egg producers than SE, and the consequences are the same, so it's best to carry out a risk assessment regarding possible sources of infection and their relative risk for each laying unit, and design biosecurity and vaccination programmes accordingly.

Other Salmonellas of special public health significance

UK is in the fortunate position of being free of major non SE/ST epidemic strains. These include particular groups of strains within the serotypes Infantis, Kentucky, Java, Newport and Heidelberg, often with multiple drug resistance, that have spread in Europe or the American continent.

Salmonella Infantis is common in broiler flocks, and some laying flocks, in many European countries and is also responsible for a substantial number of human infections, particularly in Italy, when some strains have become resistant to the critically important antibiotics; extended spectrum cephalosporins and colistin. There has been one case of multidrug resistant S. Infantis on a laying site in GB, and on three broiler sites. All infections were eliminated by voluntary control action overseen and validated by APHA.

IWS

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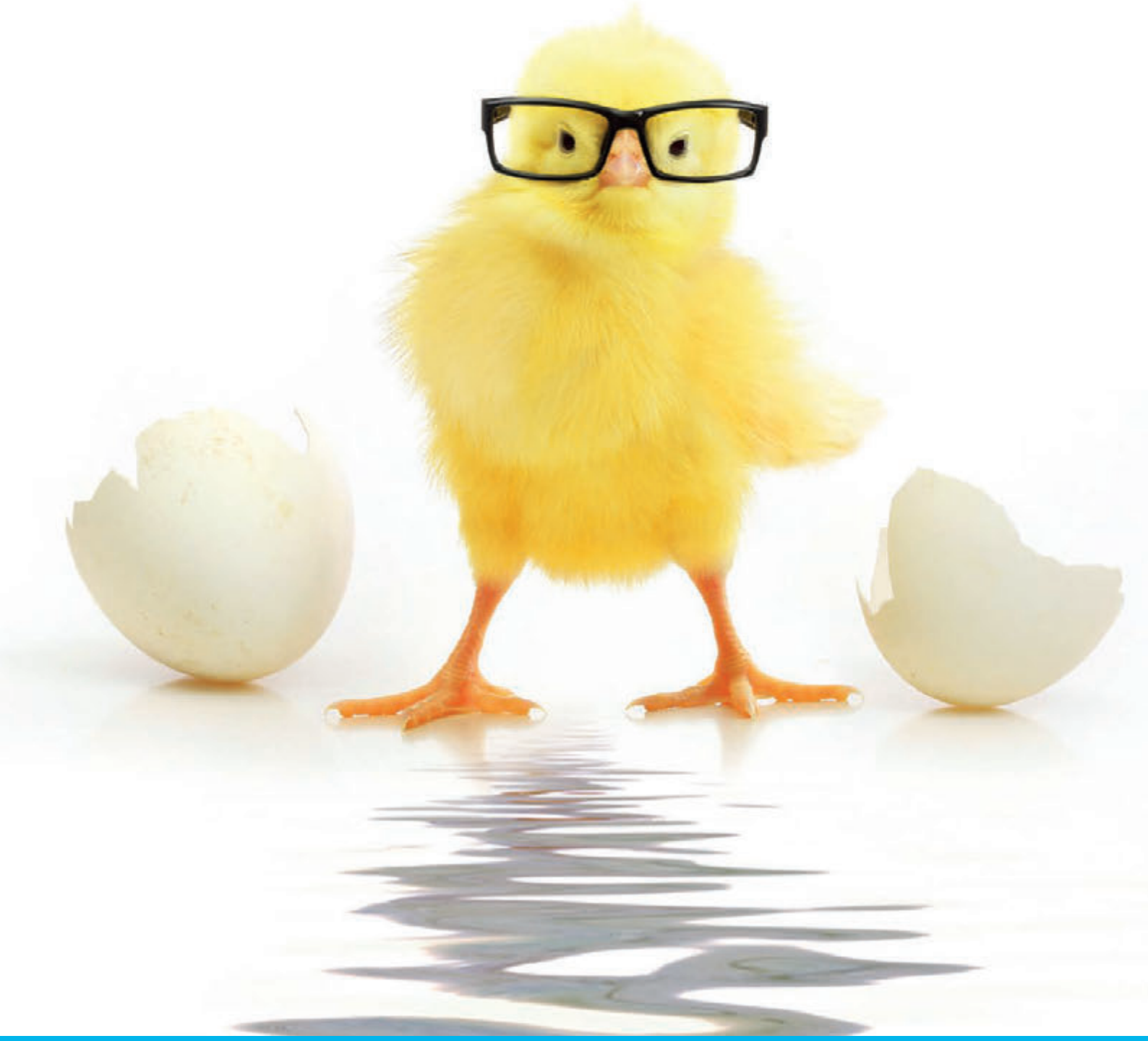

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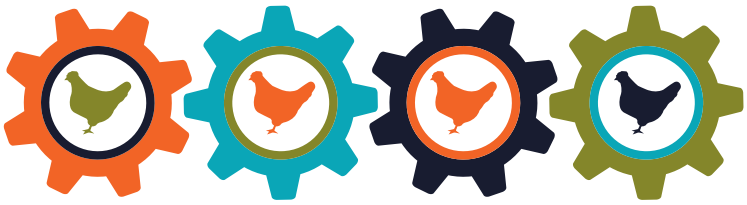


infect the contents of intact eggs as SE, but is more virulent in humans and has extensive antibiotic resistance. There have been large outbreaks of human infections and massive egg recalls caused by SH in the USA. The emergence of this strain in Canada was shown to be associated with the routine use of the antibiotic ceftiofur in breeding stock hatcheries by injection of eggs or day old chicks; a practice which was stopped in Europe in 2012, but is still common elsewhere. SH has spread widely in South American countries, and has been detected in imported chicken meat from Brazil in several European countries, including UK, Portugal and the Netherlands, where some spread to broiler production also occurred. Infection in people who have consumed Brazilian chicken and then visited laying farms would be the main risk, as well as use of waste from this chicken in raw meat pet food or contamination of dead bins used on farms at animal by-products plants that also process imported chicken waste. It hasn't been found in any animals in UK yet, but is top of the APHA 'hit list' for rapid eradication if it did occur.

Principles of control

There are more detailed considerations of specific control measures in other articles in this special issue, but as the world of Salmonella is very wide and diverse, it pays to think about the particular risks that apply to your farm. SE is the major concern for public health which is mainly associated with human sources or imported foods, but ST is widespread in the livestock environment and natural world, so is a greater risk for getting a NCP-test positive. Control measures should be applied properly; not just be a tick box exercise. This particularly applies to rodent control and effective vaccine administration, as well as cleaning and disinfection. For anything and anyone that comes on to your farm, ask yourself, "where have they been and what bugs could they be bringing with them". Being clear of virulent Salmonella is very precious, both at farm and national level, so we need to be doing everything possible to keep it that way.

CONTROL OF SALMONELLA IN FEED

FEED

Certain ingredients are at a greater risk of being contaminated by Salmonella. Pest control, and adequate drying are important for cereal producers – chemical treatment of grain may be required. However, the removal of formalin as treatment, for health and safety reasons, has limited options for feed manufacturers. Processing of soya and oilseed rape also needs to be under strict control – with feed mills operating a programme of regular testing of raw materials and finished feed for Salmonella. Pelleting reduces some of the risk, but non heat-treated mash feed has a greater risk. Organic acids can be added to raw materials and the feed, in order to prevent bacterial contamination of feed. Other additives are added to support gut health

and deal with bacterial challenges on farm.

Feed Hygiene

Salmonella present in animal feed is a significant source of infection in poultry. Due to the transmission of Salmonella enterica from feed to birds, then to human food, Salmonella in animal feedstuffs is considered a public health hazard. Salmonella infections are among the most common food-borne infections affecting humans in the EU. Animal feed ingredients, particularly animal and plant-derived protein meals, are frequently contaminated with Salmonella either from the source, from the processing plant or via recontamination in feed mills.

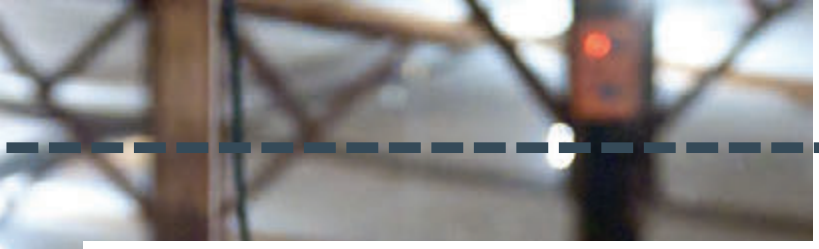
The methods for production of Salmonella-free feed involve preventing contamination of ingredients and/or feeds and preventing pathogen growth. Since microbial hazards may be introduced into various steps of feed production and delivery to the farm, technologies or products that provide long-lasting residual activity are essential. Technologies need to both be effective at reducing levels of Salmonella and provide protection from recontamination. Options include heat treatment and organic acid, as well as probiotics and other feed additives.

It's not just about controlling Salmonella

Christophe Michaut, business development manager at Perstorp focusing on feed hygiene and antioxidants, has been working with feed producers on feed hygiene strategies for many years. "Although Salmonella is often the bacteria focused on, millers need to be thinking about bacterial contamination as a whole. This may sound contradictory to EU legislation. However, we only sometimes see Salmonella but if we are controlling overall bacterial contamination every day then we will be controlling Salmonella at the same time. Conversely, if we focus on one specific bacteria, we may be missing other issues that are having a negative effect on bird health and performance." Bacterial contamination leads to digestive disorders, which potentially reduces performance. As well as causing wet litter, affecting bird welfare and increasing the number of dirty eggs – causing considerable financial losses.

The first area to consider is raw materials that are coming into the mill. Christophe explained that whole grains such as wheat and barley are low risk as they are still encased in their natural protective layer. However, it is still important to do general quality control checks; cereals should have been dried sufficiently and should not have signs of damage, like cracked grains. In terms of storage there needs to be good ventilation to prevent

SALMONELLA AND FEED



grains becoming damp.

Risky raw materials

"High risk ingredients are those that have been crushed, ground or otherwise processed – so that their natural protection has been removed - things like soy, sunflower and rapeseed meals. The seeds have been crushed and heated to 80-100#C to remove the oil. The cooling process that follows creates condensation and the air used may be dirty, allowing mould and bacteria like E. coli to grow. This cooked free protein, with easily digestible amino acids, is now available to bacteria, in an ideal still-warm environment." Christophe highlighted that with these kinds of products, including DDGS, it is recontamination of the products after processing, rather than any problem with the original raw material.

Feed millers should therefore be testing these risky raw materials more often, as part of the quality control process. It goes without saying that millers should be working with reputable suppliers, who also have their own quality standards in place to minimise risk. However, it is the whole of the feed mill, which is at risk if a contaminated raw material is bought in. The onus is then on the miller to test and take step necessary to reduce the risk.

"For these risky materials it is common practise to treat them as they are moved from the reception pit into the silo. Organic acids are added at one to two litres per tonne at this point when flow is relatively slow – around one tonne per minute. The organic acids work efficiently, eliminating bacteria within a few hours. It will also continue to work within the silo, reducing the likelihood of recontamination."

Processing power

The added challenge for layer feed, over that for broilers, it that is generally fed as a mash – so the raw materials are just ground and mixed. In contrast with pelleted feed, where the heat involved in extrusion and pelleting, reduces bacterial load at the end of feed manufacturing. "It could be said that it is even more important for there to be optimum control process in place for layer feed. However, the risky raw materials pose the same threats not just to the feed but the manufacturing plant as a whole." Christophe re-iterated that both heat and acid treatment will kill Salmonella first. Other enterobacteria will survive longer – so if you control overall bacterial load, by default you are controlling Salmonella. However, heat treatment has no residual activity after treatment, meaning that this method will not prevent recontamination of feed post-treatment. Temperatures obtained during heat treatment can negatively affect nutrients and enzymes. Whilst it isn't commercially possible to heat treat mash feed, pelleted feed can be crumbled but this would significantly increase costs.

Feed treatments

Formaldehyde has been a staple of feed pathogen control around the world for decades. However, EU Member States voted to deny the authorisation of formaldehyde for use as a feed additive for control of Salmonella in feed. Christophe is philosophical about the formaldehyde issue. "It is a strong, cheap and very effective product, but the problem is that feed producers could get away with less control because it was so effective. However, the concerns over operator safety, as well as animal health and environmental concerns – outweighed the benefits to feed hygiene. In the post-formaldehyde era, feed millers and poultry producers need to completely re-think their feed hygiene strategy." This potent treatment meant that mistakes could be made and got away with. Many people believe it's not surprising that more bacterial challenges and issues with Salmonella are currently being seen.

The protection of breeders from Salmonella contamination plays a crucial role in preventing the vertical spread of the infection to their progeny and in keeping the supply chain safe. Although Salmonella may be introduced to a flock by multiple environmental sources, feed accounts for 80% of the Salmonella infections in breeders and their progeny. Therefore, producers of breeding birds may now have to use more antibiotics to treat Salmonella-infected flocks, which goes against current international efforts to fight antimicrobial resistance.

Organic acids

Organic acids, such as formic, propionic, acetic, fumaric, caprylic, lactic, etc., have been used as bactericides for feed and as acidifiers to improve intestinal health. The efficacy of organic acids in reducing bacteria in feed is dependent on usage rate, initial level of bacteria, feed composition, and time between treatment and feeding. Organic acids are sometimes used in combination with

heat treatment to further reduce risk.

The supplementation of organic acids at the right high doses in animal feed can increase the bodyweight, improve feed conversion ratio and reduce colonization of pathogens in the intestine. More specifically they decrease the pH value and the buffering capacity of the feed. As Inhibiting growth of gram-negative bacteria in the gastrointestinal tract. Organic acid products are also available for dosing into the water. This improves the quality of the water by preventing microbial growth but also improves gut health once drunk.

Although organic acids have been used in animal feed for 30 or 40 years, it is the effects in the animal themselves, which have mostly been evaluated. "Particularly in light of the ban on formaldehyde, organic acids that are being used to treat feed, need to be evaluated in terms of their efficiency to reduce bacterial load in feed and prevent recontamination. In fact, digestive disorders are indicative of other gram-negative enterobacteria, such as E. coli not Salmonella." There are a lot of options available, each with their pros and cons. The efficacy of the product should match the job it is intended for.

Formic acid (85%) is regularly used to treat feed and is not expensive. However, by looking for a specific feed hygiene enhancer, greater benefits can be seen. Clever technology can result in even lower levels of feed contamination as well as reducing the potential for recontamination. Distribution of products in feed can be improved, along with continuing acidification.

Supporting the gut microflora

In addition to organic acids, there are various feed and water additives that are been used to reduce Salmonella colonisation in the animal. Prebiotics and probiotics are often used to prevent dysbiosis in animals. In poultry production, managing gut health is key to optimising performance. If there is an imbalance in the gut microflora, inflammation will occur – negatively effecting

gut integrity. Not only does it make birds more susceptible to infection, it may reduce nutrient absorption and lead to digestive upset.

The effect of better microbial diversity in young broiler chicks will help gut development, improving future performance. For this reason, the practise of seeding the gut of chicks has been used for many years. They are either sprayed onto them, dosed into the water, added to the feed or provided as a specific supplement. The options for probiotics products, for poultry and other livestock species, are numerous: Lactobacillus, Bacilli, Bifidobacteria, Enterococci and yeasts; single- or multi-species and combined with prebiotics or other immune supporting additives. By improving the balance of the gut microflora, the aim is to create an optimum environment to reduce the growth of pathogens, improve immunity and prevent inflammation; as well as enhancing digestion and nutrient absorption.

Clever feed hygiene

Perstorp has been working with feed producers on targeted sampling, as part of the control process. "Raw materials should be tested both before and after treatment with organic acids. We ask feed producers to send samples to us every two weeks, as part of an on-going monitoring service. Analysis of the results evaluate whether the treatment is effective, enabling millers to modify their control plans accordingly. This may mean changing the dosage rate or timing of application. They should be looking at a minimum of a 1 log reduction in enterobacteria, in order to indicate a significant effect. However, if you are making feed for breeding birds you would want to aim for a 3 log reduction. Again, if you aim for an excellent quality feed in these terms, you will be reducing Salmonella levels at the same time." Some feed producers will also/or only, send in finished feed samples to monitor the ultimate level of contamination. The samples are also tested for the organic acids themselves, with a five kilogram per tonne addition they see recovery levels of ⌖ 10%. This way the effectiveness of the treatment is monitored and issues with application or re-contamination within the mill can be addressed. "Where an issue within the process is suspected, millers may take samples at several points along the line. Along with an audit of the facility, areas of recontamination can be identified and addressed. For example, a dead end where feed is accumulating, or an elevator which is not being cleaned properly."

Obviously, the amount that the bacterial load can be reduced with, will be dependent on the level of contamination in the raw material on delivery. Millers will have agreements in place that product from

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again at mixing. "The first treatment is for internal safety of stopping contamination coming into the mill. Then the second step addresses any re-contamination, helping to produce a safe feed for the customer and the birds eating it." Taking this kind of integrated approach is key in the fight against bacterial contamination and Salmonella control.

Integrated approach

The microbial safety of animal feed is paramount to public health. As such there will always be an obligation for the industry to do all it can to reduce bacterial contamination of feed. And with pressure to reduce antibiotic usage and improve sustainability, feed hygiene solutions need to be effective and integrated with Salmonella control throughout the food chain. As well as giving the public confidence in the eggs they are buying. This, combined with financial pressures means that strategies, which also improves bird health and performance, offer benefits to egg producers.

NORWAY RAT

CONTROLLING RATS AND MICE ON FREE RANGE UNITS

RODENTS

Preventing the potentially devastating consequences of rodent infestation on free range poultry units requires careful planning and early action combined with the use of effective rodenticides.

An integrated rodent management strategy should, of course, be based on the premise that 'prevention is better than control', as this will provide the best, most cost-effective long-term solution. However, where rodents cannot be prevented it is essential to control them quickly and efficiently.

Under the new regulations which came into law in April 2016, which affects all free-range poultry buildings, you have to prove that you have a problem before taking action, or that the risk of allowing a problem to develop poses such a risk that you have to go immediately to the control stage.
In theory, if you have a new free-range building then you should not bait immediately to prevent a problem from

WHO ARE THEY?

The two rodents which present the largest issues in the UK, are the house mouse and the Norway rat, which are very different in terms of the size and characteristics.

THE HOUSE MOUSE (MUS DOMESTICUS)
The house mouse is highly inquisitive in its nature and will investigate any new object or surroundings. Living in social groups of four or five, dominated by a single male, the house mouse typically weighs 17g to 20g, to a maximum of 25g, and will produce approximately eight young every 21 days. Moving within an area if up to 100 metres, it is a particularly good climber, is able to jump vertically up to 30cm and can squeeze through an opening just 5mm in diameter. A house mouse feeds up to 200 different feeding points in a single night, eating a very small amount at each, and will consume three or four grams of feed per day. Able to survive in the moisture in its food, it produces 30,000 droppings and excrete 0.75 litres of urine each year.

THE NORWAY RAT (RATTUS MORVEGICUS)
The Norway rat is shy and avoids new objects, preferring stable, predictable environments. Weighing 250g to 500g, and a maximum of 700g, it lives in family units of eight to 15 and is very territorial when good and water are limited. Typically, it feeds at two or three points each night, consuming 25g to 30g and requires access to water. Able to travel up to 3.5km, this species is very active in areas which are familiar and will typically cover up to 700m each night around farms and buildings. Although able to climb rough walls and pipes, rats live mostly on the ground and can produce about eight young every 24 days if conditions are very favorable. Each year, it will produce 15,000 droppings and excrete five litres of urine.

developing, as would have been the case in the past, but rather let it occur and then initiate control measures. However, every situation is different and it all comes down to a question of managing risk, so you need to know what actions are allowed and what are not. For example, if you have a proven rodent problem you then have just 42 days to clear up an infestation, or prove that it still exists.

VIGILANCE REQUIRED
Rodent control is fundamental to the efficient, profitable operation of any poultry unit. Unfortunately, poultry houses, whether on a conventional broiler/layer unit, or free range site act as a magnet for rodents by providing them with three fundamental requirements - a place to live, a source of food and access to water.

The months of autumn are particularly important for monitoring and controlling rodents. With harvest completed in surrounding fields, outside sources of food starting to dwindle and temperatures starting to drop, particularly at night, they are moving from fields and ditches to environments which offers food and shelter. This is a time to be extra-vigilant, because once established they will already have inflicted considerable physical and financial damage, while controlling them becomes more difficult, time consuming and expensive.

Just because you do not see rats or mice doesn't mean that they are not there and even if you've only seen one or two there are likely to be hundreds on site. Rodents breed at a prolific rate and a single pair can quickly populate an area, so you have to kill a very high percentage to achieve effective control. That requires knowledge, skill and attention to detail, as the action which can be taken and the products allowed are now tightly regulated.
Producers will probably have insufficient knowledge or experience to spot the early signs of infestation and by the time they do it could be too late. Controlling rodents is such an important aspect of free-range production that if you don't have the time or knowledge to do it yourself to a high standard then enlist the help

of a professional pest controller with specialist knowledge of rural situations. An experienced pest controller who check sites frequently should be able to spot the signs of even a single or small number of rodents, allowing them to implement early, effective control measures using proven methods, correct techniques and fast-acting and effective products.

It is very difficult to get on top of a rodent infestation on a free range unit when your birds are still housed. Mice are the main problem in free range units as the sheds allow access during the day and at night the open feed tracks provide all the food they need to survive and thrive. It is therefore vital to use baits which are formulated to deal with infestations quickly and reliably.

Under the new regulations the first step is to put down monitoring bait to confirm the presence of rodents. Monitoring blocks or pastes, for example, are non-toxic and contain a substance that makes rodent urine glow under ultra-violet light, allowing much easier detection. If that yields positive results take action to control them immediately using proven methods, correct techniques and fast-acting bait.

Many cheap block-type baits are now ineffective so it is vital to use one of the new-generation products that are highly palatable and which rodents will want to consume in preference to the food which they have readily available. To ensure that they consume a lethal dose select one of the latest grain or pasta-based products which are appealing, fast-acting and highly effective.

Under the new regulations a paste-style Bromadiolone-type bait, such as Lodi Jade, is ideal as it contains mulched cereals and peanut butter oils to encourage consumption. A Difenacoum-based product containing peanut oils, is proven in the most difficult environments while a Brodifacoum-based bait formulated from premium grade cereals and peanut butter oil, will kill rodents in a single feed.

FINALLY - ACT FAST AT TURNAROUND

At turnaround, you really have to take fast, effective action to clear up rodents. The race is on from the time the previous flock leaves and throughout the two weeks before the new birds come in. As soon as the buildings are empty put bait stations wherever there are signs of activity. Ideally, you don't want rodents to leave the building, but that's unrealistic, because when they are cleared of muck and the cleaners move in rodents will run for cover, heading anywhere that provides refuge.

To be effective you have to kill 90%-95% of the rodent population indoors and the remainder outside using strategically sited bait stations. This necessitates the use of products that will work quickly, reliably and effectively, so I would suggest a past-type bait such as Lodi's Ruby, a Difenacoum-based product containing peanut oils which is proven in the most difficult environments. This should be followed by Lodi Sapphire, a Brodifacoum-based bait formulated from premium grade cereals and peanut butter oil, which will kill rodents in a single feed.

Keeping on top of rodent populations can be done, but requires constant monitoring, sustained effort and highly-effective products.

SPOTTING THE EARLY SIGNS

1

Rats and Mice are different!

Rats and mice are quite different in terms of lifestyle and activity. Rats generally live outside in burrows and only venture indoors in search of food, whereas mice often live entirely indoors. They will be your main adversary.

2

Monitor for activity

Continually monitor for signs of activity, such as droppings, urine, rub and tail marks, tracks and damage to the fabric of buildings caused by gnawing. If more than a few are present you should be able to smell them.

3

Clean up spills

Clear up any food spills around feed bins, although there's nothing you can do to stop poultry from spilling feed as they eat, which makes the job more difficult. The moisture and oils in feed will keep mice hydrated, but they will like to supplement this with water from drinkers, while broken eggs provide a source of food and liquid.

4

Keep vegetation low

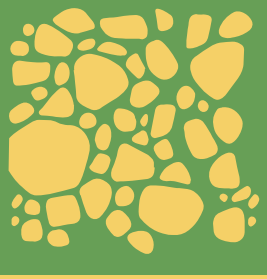
Keep the area around buildings clear of vegetation and clutter. This will act deter rodents due to the risk of predation and allow you to spot signs of activity more easily.

5

Keep grass cut

Free range hens will keep the length of the grass to a low level, but if there are places around the houses where this is not happening then it should be cut, as long grass attracts rodents and helps bacteria and viruses to survive.

The early signs of rodents often go unnoticed to the untrained eye and by the time they become obvious numbers are high. Don't wait for a problem to develop before investigating. Monitor the site frequently for early signs of activity, minimise its attractiveness to rodents and reduce its ability to support large populations.



Gravel and bark

Ideally, the area surrounding the free-range poultry houses should have an area that is at least 2m wide which is not grass, such as gravel, bark chippings or similar material.

6

Open door

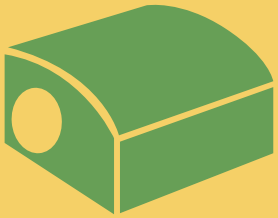
It is virtually impossible to make a poultry house totally rodent-proof, but regardless of how well it is constructed it provides an open door during the day.

7

Lights deter rats not mice

Shut pop holes as soon as it gets dark and the birds are inside – the lights in the shed will deter rats, but not mice.

8



Position bait containers

Outside, bait containers should be positioned adjacent to walls some time before baiting begins so they become familiar. Inside, secure bait boxes should be located where there are signs of activity, or rodents are likely to track. Check, and re-fill, them until fresh activity ceases and your rodent problem has been contained.

9

Burrow Baiting

Burrow baiting is very effective against rats and reduces the risk to non-target species. However, you must follow the 'little and often' principle and be able to retrieve unconsumed bait.

10

NORWAY RAT

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

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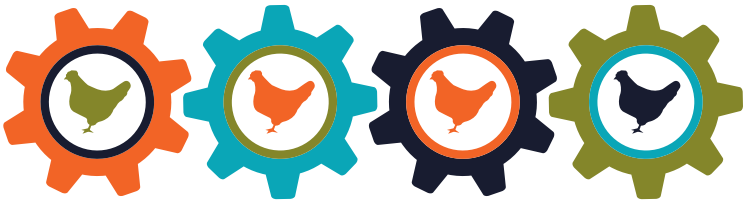


ten Salmonella organisms in to many thousand per day. Contamination can be introduced in feed. It may be brought onto farm on the wheels of a contaminated lorry. It may be left over from a previous contaminated flock or could even come from a nearby pig farm. If the house isn't properly cleaned and disinfected 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 novegicus), 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 make themselves known on your farm in a variety of ways. The most obvious sign of activity is the presence of droppings. Brown rat droppings are dark brown and approximately 9-14mm long. House mouse droppings on the other hand are much smaller: roughly 3-7mm long and look like dark little seeds.

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

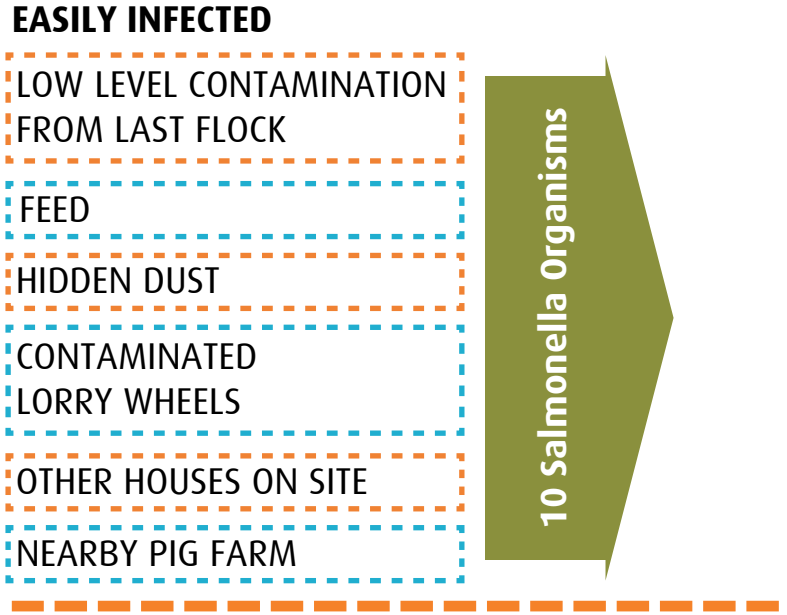
DID YOU KNOW?

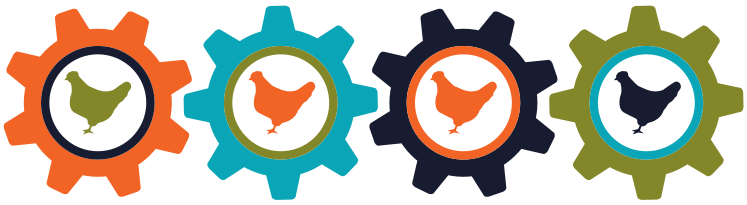
- Rodents greatly increase the risk of Salmonella problems on your farm
- The key pest species are the brown rat and house mouse
- Signs of rodent activity include: holes in the range or manure pits, droppings, footprints, rub marks, urine pillars and damage
- An integrated pest management plan is more 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 – bpca.org.uk) and responsible for pest control will enhance accountability and success

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 shoeprints 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 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.

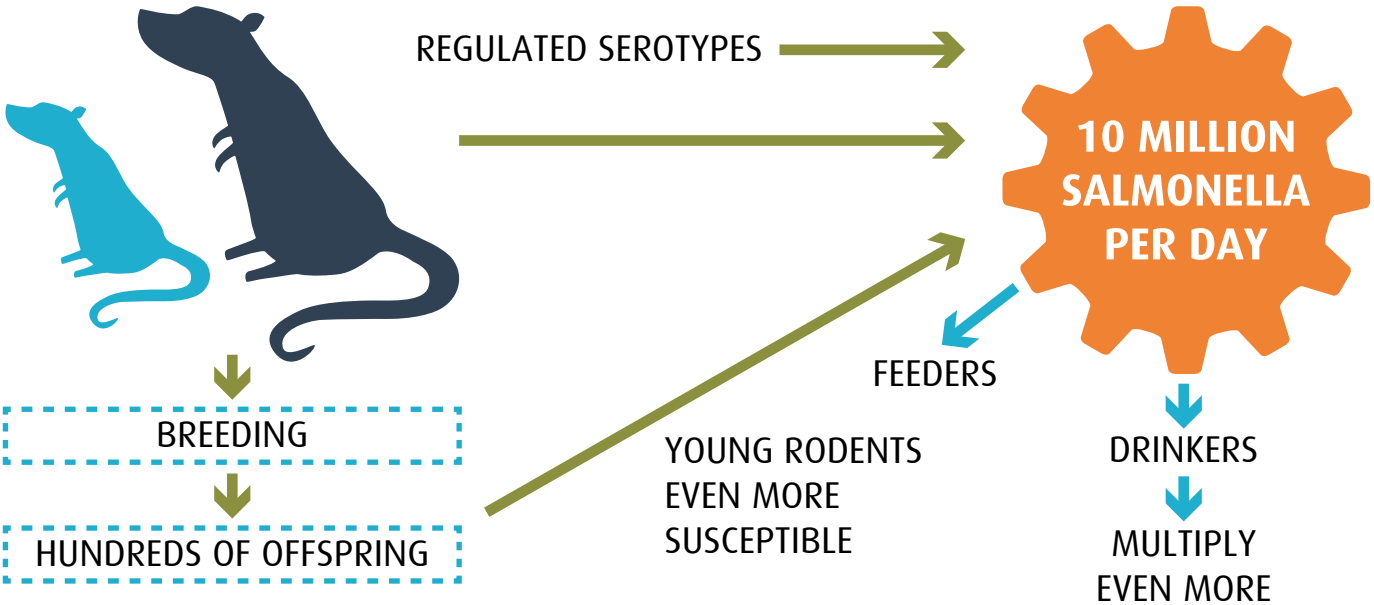
Further inspection of your premises may also yield signs of damage. A characteristic of rodents is their continuously growing teeth. To combat this, they do a lot of gnawing. Look for areas where cracks in wood or plastic have been enlarged by overeager incisors. Any other unexplained damage, for instance 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 plan should focus on both prevention of initial incursion of rodents and a more forceful 'cure' of the problem should rodents become established. Inevitably this will require lethal approaches such as poison.

Integrated pest management: Lethal control
The most effective way to remove high numbers of unwanted rodents is via lethal control. Humane traps will not be feasible given the likely scale of the problem. Rodenticide poisons can broadly be classified into either anticoagulants or non-anticoagulants. Coagulation is the process by which blood clots. Therefore an anticoagulant poison works by preventing the blood from clotting, effectively thinning the blood until death. Not the most humane solution but it can be very effective.

Non-anticoagulant poisons have other modes of action. Alpha chloralose poisons for instance cause narcosis,



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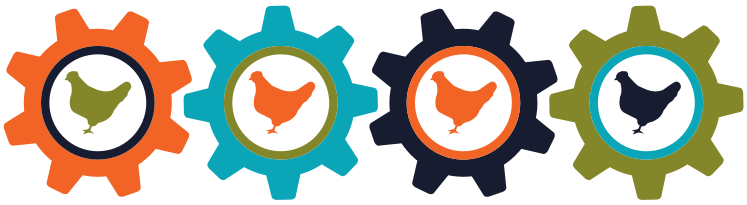


whereas cholecaciferol poisons act by inducing hypercalcemia which can cause renal failure. Non-anticoagulant poisons are usually faster acting. The use of rodenticides is now mainly restricted to anticoagulant compounds. The Health and Safety Executive (HSE) is responsible for the biocide legislation that controls the use of rodent poison. The HSE stipulates that rodenticides should only be used by trained personnel and that measures should be put in place to prevent non-target species eating the poison.

Poisons will be either 'single-feed', meaning they are effective after one ingestion, or 'multi-feed' which require more than one sitting to have an effect. In practice, single-feed poisons still require the rodent to consume enough in one meal to have the desired lethal effect and so are not necessarily more effective.

Anticoagulant poisons were first used in the 1950s and proved very effective. However it wasn't long before rodenticide resistance was first identified. Fast-forward to present day and rodents are showing increasing resistance to the second-generation anticoagulants brodifacoum and flocoumafen. This resistance is genetic in nature and a DNA test is available to determine if rodents on your farm are resistant to these poisons. The British Pest Control Association's (BPCA) Rodenticide Resistance Action Group offer excellent advice on this matter (BPCA.org.uk/about/partners/rrag).

The University of Reading are working with the BPCA on a 'Campaign for Responsible Rodenticide Use' and offer a free DNA test for anticoagulant resistance in rats. Visit their website for more details: research.reading.ac.uk/resistant-rats/rat-resistance-testing. The type of anticoagulant poison can then be tailored to your needs depending on the situation on your farm.
This is all well and good, but it can be a challenge in itself ensuring pests eat the poison in the first place. Lacing a bait product with the chosen poison will be necessary. Placing placebo bait in advance of 'live' bait helps to acclimatise rodents to the presence of a new foodstuff. It is advised to use a dummy bait consistently and then switch to real bait when signs are seen based on weekly checks. This will enhance uptake when poison is used. Bait can take many different forms, for instance: cut or whole grain, pellets, edible gels or lard, pasta or peanut oil based baits. There is no 'one size fits all' approach. You will need to find the best combination of baits, poisons and other control measures, for instance instant kill traps, which work best for your farm.

A pest control expert should be consulted when placing bait stations and traps to ensure the best possible efficacy. The use of lethal control must be accompanied by efforts to assess the success of the pest management plan. A method called 'index trapping' allows the density and distribution of rodents to be calculated across the farm. Rodent abundance is measured over time by comparing the number of individuals trapped with the number of traps deployed within a given time period. Remember, one rodent trapped or observed on your farm equates to up to 100 not seen.
Success in tackling a rodent infestation requires persistence. Keep up control efforts until you are on top of the problem and then maintain good preventative measures thereafter. It is worth appointing a named member of staff who is trained and responsible for pest control rather than just relying on contractors when the situation worsens. Contractors may not respond in a timely enough manner and can even pose a biosecurity risk to your farm.

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 clearing 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

RODENTS

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 if 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.

DEALING WITH, TESTING AND REPORTING SALMONELLA

LION CODE

Since its launch in 1998, the cornerstone of the Lion Code of Practice has been food safety, designed to ensure that British eggs remain the safest in the world.

The 'Salmonella in eggs' crisis 31 years ago taught the egg industry an important lesson. Since then BEIC has been determined to ensure that Salmonella in laying flocks is controlled. This has been achieved by putting in place a stringent set of standards across the whole production chain, starting at breeder level, through to packing centres and, via a separate code of practice, to egg products.

The key points of the Lion Code are:
Registration and traceability of hens, eggs and feed – this is achieved via the BEIC database which holds details of all Lion registered sites, by system of production, numbers of birds and hatch date. The 'Lion passport' is a

depopulation.

Vaccination against Salmonella Enteriditis, Salmonella Typhimurium and monophasic Salmonella Typhimurium
Without doubt one of the major cornerstones of the Lion Code is the requirement for every commercial hen to be fully vaccinated against Salmonella, using a vaccine that has a current UK marketing authorisation. We are fortunate in the UK that there are several products available, both live and inactivated, providing the producer and his/her rearer with choice.

Proper rodent control
Another critical area of the Lion Code is to properly control rodents on farms. History has shown that rodents can recycle infection from one flock to another (so-called horizontal transmission), therefore ensuring that farms have in place an effective baiting and control programme, that is carefully monitored, is vital.

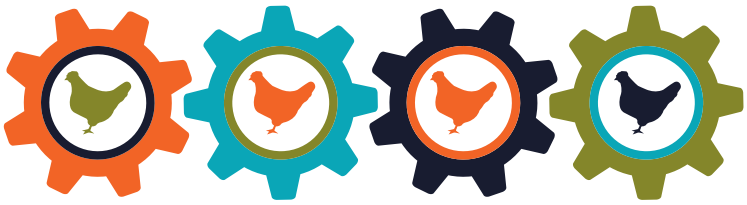
Hygiene, time and temperature controls
The Lion Code requires that high standards of hygiene and biosecurity are in place. Eggs must be collected from farm every third working day. Whilst on farm, and after removal from where they were laid, eggs must be stored at no more than 20oC. With rising summer temperatures, egg stores on laying sites must have some means of keeping eggs cool, to maintain quality and food safety.

Feed controls
All feed that is produced for Lion birds must be to the UFAS standard. This requires strict controls over raw materials, straights, and vitamins and minerals.

Enhanced Salmonella testing
In addition to the sampling requirements of the UK National Control Programme, the Lion Code requires post cleaning and disinfection swabbing, including contact surfaces and rodent faeces/bait boxes. This is aimed at providing the operator with confidence that the C&D process has been effective.

Independent auditing
Our accredited monitoring agency is NSF International, operating to ISO17065 accreditation. The Lion Code also requires 6 monthly self-audits of all sites. In January 2019 we introduced the requirement that the Subscriber - be it a packer, breeder, pullet rearer, or feed mill – must accompany the senior manager of the site during both the 6-monthly self-audits. The NSF audit takes place independent of the 6 monthly self-audit cycle. To further enhance the audit process, in January 2019 BEIC increased the proportion of unannounced audits to 10% of all laying farms.

Reporting of Salmonella
The Lion code requires that any isolation of non-vaccinal Salmonella Enteritidis, Typhimurium or monophasic Typhimurium from the laying flock, or its environment, must be immediately reported to the BEIC. If an exotic Salmonella serovar other than SE, ST or mST should be isolated from the laying flock or its environment, veterinary advice must be sought and acted upon.



Actions in event of a positive
If, in the unfortunate event that a site should be notified that non-vaccinal SE, ST or mST has been identified, a strict protocol would be initiated under the Lion Code.

There are two separate courses of action - one by government and the other by Lion. As far as government is concerned, a notice is served on the affected flock requiring eggs to heat treated i.e. become Class B. The producer can opt for one of the three so-called confirmatory tests (Commission Regulation (EC) No 1237/2007) – enhanced environmental, 300 carcasses, or 4,000 eggs. Only if this test proves negative can eggs regain Class A status again and restrictions on the flock be lifted.

BEIC action requires that the flock be immediately suspended from the Lion scheme. BEIC would contact the producer to explain what happens next and to explain the producer's options going forward. A BEIC appointed veterinarian would visit the site to take samples of the environment and eggs in all houses on site, and to carry out a thorough review including vaccination of the pullets and details of other parts of the supply chain.

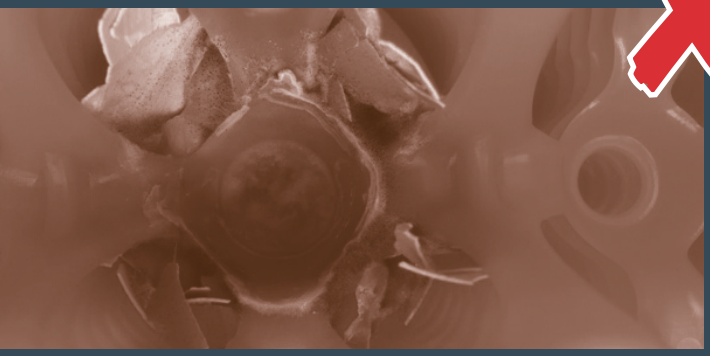
When results are known, this would determine actions required and the producer would be able to decide what action best suits their business. If it is an older flock that is infected, often the decision would be to depopulate, noting that a further negative test would be required on the neck flaps of a randomly selected sample of birds to allow them to go to a processor, otherwise it could be slaughter on farm and the carcasses sent for rendering.

Bearing in mind that the removal of any residual infection is vital, BEIC would advise that, if possible, delivery of the new pullet flock be delayed, especially if a tight turnaround was planned, as it would be important to allow sufficient time for a longer than normal C&D of the site. Once C&D of the house(s) has taken place, a BEIC appointed veterinarian would return to resample across all areas of the house (50 samples). Only if these tests are negative can restocking take place and the site reinstated into the Lion scheme. It should also be remembered that APHA will take an official sample of the replacement pullet flock between 22-26 weeks. If this were to be positive, it could be a financial disaster for the producer, hence why it is considered vital to allow enough time to carry out a really good C&D.

Clearly, this would be a stressful time for any producer who is unfortunate enough to be in this situation. Should it occur BEIC would seek to ensure that the parties involved are kept up to speed with options as well as providing a point of contact. One area that producers may wish to consider is taking out insurance cover should they be unfortunate to be affected.

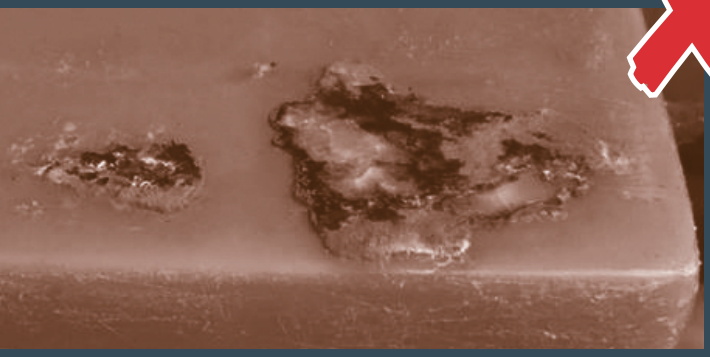
Looking to the future, several amendments will be added to the Lion Code to strengthen Salmonella control, which will be published in version 8 later this year. This includes other parts of the supply chain. We are also carrying out a research project looking at vaccine protection in older flocks. All this is designed to ensure that industry, our customers and consumers continue to have confidence in the Lion Code.

TRANSIT PACKAGING



Producers should report and reject packaging sent to your farm that is not visibly clean and free from debris.

Trucks which enter the farm should be cleaned and disinfected before being allowed on farm. This taillift has the potential to infect a farm.



Reject pallets that do not appear to be visibly clean and free of debris.

Lion Code requirements on biosecurity in packing centres

C27 All transit packaging must be visibly clean and free of debris. Where plastic trays are used, suitable provision to wash plastic keyes trays must be available on the premises, or available elsewhere.

Transit packaging includes plastic keyes trays, dividers and pallets. Where plastic trays are used, suitable provision to wash plastic keyes trays must be available on the premises, or available elsewhere. The tray washer should be checked for effectiveness and that packaging is clean. A non-conformance can be issued if dirty trays are found easily post cleaning e.g. soiling can be seen by the auditor without moving or lifting packaging to check for cleanliness.

C28 If using fibre keyes trays, only new trays may be brought into the system (closed loop) by the packing centre.

The purchase of used or second-hand fibre keyes trays and boxes, to be used as packaging to top up the system, is not permitted. Only new keyes trays can be used.

C29 Consideration should be given to egg vehicles and pallet trucks. Are they visually clean?

Consideration should be given to where vehicles have come from. Are they visually clean? If not, provision must be made to be able to clean and disinfect egg vehicles and pallet trucks.

Possible means of vehicle disinfection include disinfectant mats, vehicle washers and wheel troughs. Attention should also be paid to the potential transmission of material from 'cab to ground'.

Egg collection drivers shall demonstrate competence in the implementation of

One potential risk is cross contamination involving machinery, equipment and packaging which finds its way to your farm from either another farm, packing centre or external location. It is imperative these items are inspected to ensure they are visibly clean and free of debris, but also disinfected.

The lion code is very specific about transit packaging and have clear guidlines for packing centres and producers.

effective biosecurity measures.

C30 Ask for written evidence of the biosecurity training plan. Relevant staff should attend a refresher training course every 3 years. Where appropriate, conduct visual assessment of the biosecurity measures.

Lion Code requirements on biosecurity on laying farms

Control measures must be in place to minimise the spread of disease within the site/farm and between other sites/farms.

N4 It is the responsibility of senior management of the site to ensure that effective control measures are in place and enforced at all times.

There must be a minimum of two levels of biosecurity; a defined 'General' biosecure area and defined 'Specific' biosecure area on each site/farm.

N5 Two levels of biosecurity shall be defined;

- A 'General' area of biosecurity which may refer to the site/farm at large (e.g. inside the perimeter), depending on the individual site. This may exclude any property not associated with the poultry enterprise, e.g. car park, dwelling house, other farm buildings and other farm areas. There must be a gate or barrier at the entry to the 'General' biosecure area. All personnel and visitors entering a 'General' biosecure area must comply with the biosecurity requirements of the site. Vehicles entering a 'General' biosecure area should be disinfected.
- A 'Specific' area of biosecurity refers to each poultry house where birds are housed on the site/farm. Entry to a 'Specific' biosecure area requires further measures (noting that a poultry house may have more than one entrance/exit) including a change of footwear (to 'indoor' footwear) over a barrier arrangement, and the wearing of protective clothing. A 'Specific' biosecure area therefore requires a higher level of biosecurity. Clear signage showing the 'General' and 'Specific' biosecure areas shall be in place. A site plan shall clearly show all biosecure areas and their perimeters, with an identifiable key.

The site must have an area of clean concrete, metalled surface or rolled stone which is large enough for a delivery / collection vehicle, or feed lorry, to stand.

For concrete, a wash with a hose to remove debris would demonstrate 'clean'.

N6 Consideration should be given to any vehicles and/or equipment which enters the 'General' biosecure area. Is it visibly clean?

Consideration should be given to where vehicles and/or equipment has come from. Is it visibly clean? If not, more thorough disinfection of the vehicles and/or equipment to be undertaken.

N7 Possible means of vehicle disinfection include disinfectant mats, vehicle washers and wheel troughs. Attention should also be paid to the potential transmission of material from 'cab to ground'.

Foot-dip/bath facilities must be provided at the entrance to the 'General' biosecure area and must be used by all who enter and exit.

Footwear must be able to be fully dipped in the foot dip/bath.

The foot-dip/bath facility shall be replenished with fresh disinfectant at a

N8 minimum frequency of once weekly. Only disinfectants on the BEIC list of Defra approved disinfectants shall be used. Records of disinfectants in use, including dilution, and when changed, are to be kept.

Only Defra approved disinfectants (on the BEIC list) must be used in accordance with manufacturer's instructions. Disinfectant solutions must also be replaced on a regular **N9** basis (a minimum weekly, or earlier if contaminated by debris/dirt, or if affected by the weather) and this recorded. The foot-dip/bath must have a cover in place to prevent dilution by rain or sunlight. An additional foot-scrub is to be provided so that organic matter can be removed prior to dipping, as it is always good practice to remove debris before dipping footwear.

Check disinfectants against the BEIC list of Defra approved disinfectants (Annex N).

A physical barrier footwear system, with dedicated footwear, must be provided at the entrance to each 'Specific' biosecure bird area. Hand sanitisers are to be provided at the entrance to the 'Specific' biosecure area.

A barrier system is to be established at the entry to the 'Specific' biosecure area. All staff and visitors must change into colour coded house dedicated footwear (or use new robust disposable overshoes) upon each entry / exit. As poultry houses can have more than one entrance, each entry point must provide for a physical **N10** barrier footwear system, with dedicated footwear, at the entrance to each 'specific' biosecure bird area. Such a barrier to be: no less than 30cm high; the area inside the barrier is considered to be the 'Specific' biosecure area; staff remove outdoor footwear on the external side of the barrier; staff then put on dedicated biosecure footwear in the internal area of the barrier; provision to be seated, or supported, when changing footwear.

The auditor will look to see that debris from the 'General' biosecure area is not getting into the 'Specific' area and vice versa. Both areas should be maintained in a tidy state, e.g. cleaned daily. The use of farm dedicated protective clothing is required to be worn when in the 'Specific' biosecure area. This shall be changed and laundered regularly. 'Regularly' is defined as a minimum of twice weekly. Ideally, protective clothing should not be taken home to be laundered. However, where it is, cross-contamination must be avoided. The use of disposable protective clothing is allowed.

On a free range and organic unit, the range area shall be considered to be an intermediate biosecure area which shall require the use of foot-dips/baths and protective clothing.

There must be a gate or barrier at the entry to the range area. Personnel and vehicles entering the range area must use foot-dips/baths and disinfect vehicles respectively. This will require the use of protective clothing.

Birds must be effectively contained within the defined 'Specific' biosecure area and in the 'General' biosecure area for where ranges are present. Remedial action must be taken to prevent hens leaving these areas. **N11**

Birds must be prevented from having access to service areas and aprons. Suitable fencing must be in place.

There should not be a pond or areas of standing water on the premises. Poultry must not have access to a pond or 'open' water. There shall be no areas of standing water on the premises.

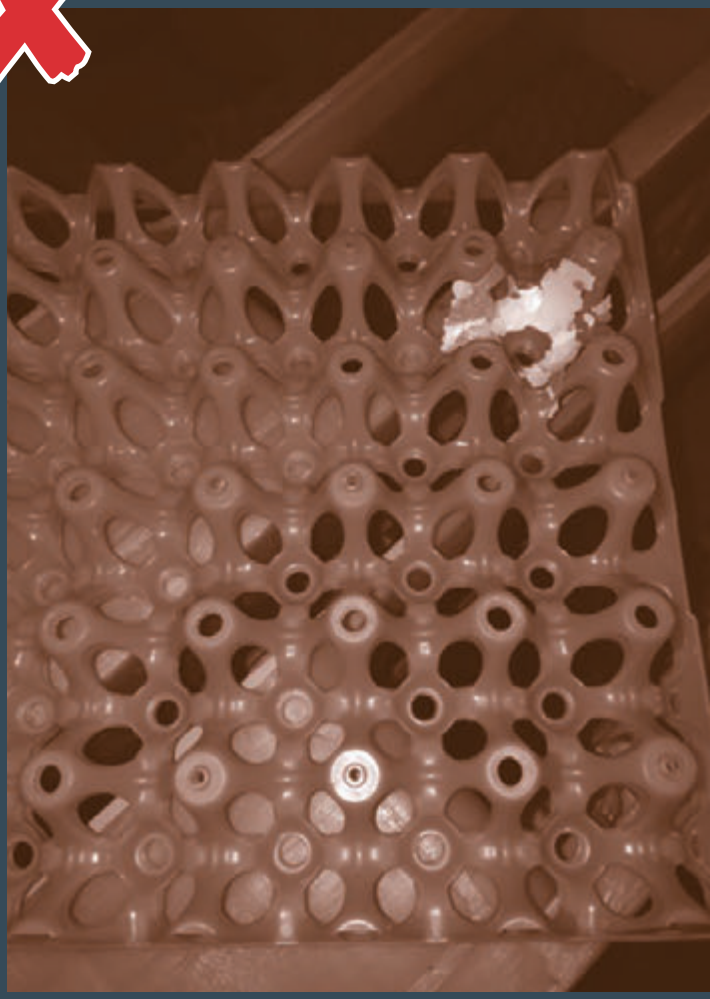
If ponds are present, steps must be taken to prevent **N12** access to the pond by the birds. Where possible, ponds should be filled in. Where this is not possible, fencing-off and netting is required. Steps should be taken to discourage waterfowl from the premises (i.e. not encourage them onto the premises). Whilst it is

accepted that during periods of heavy rain, puddles may appear, there must be no persistent standing water on the site/farm. Ask what action senior management has taken (to assess the risk) to minimise contact between wild birds / waterfowl and poultry.

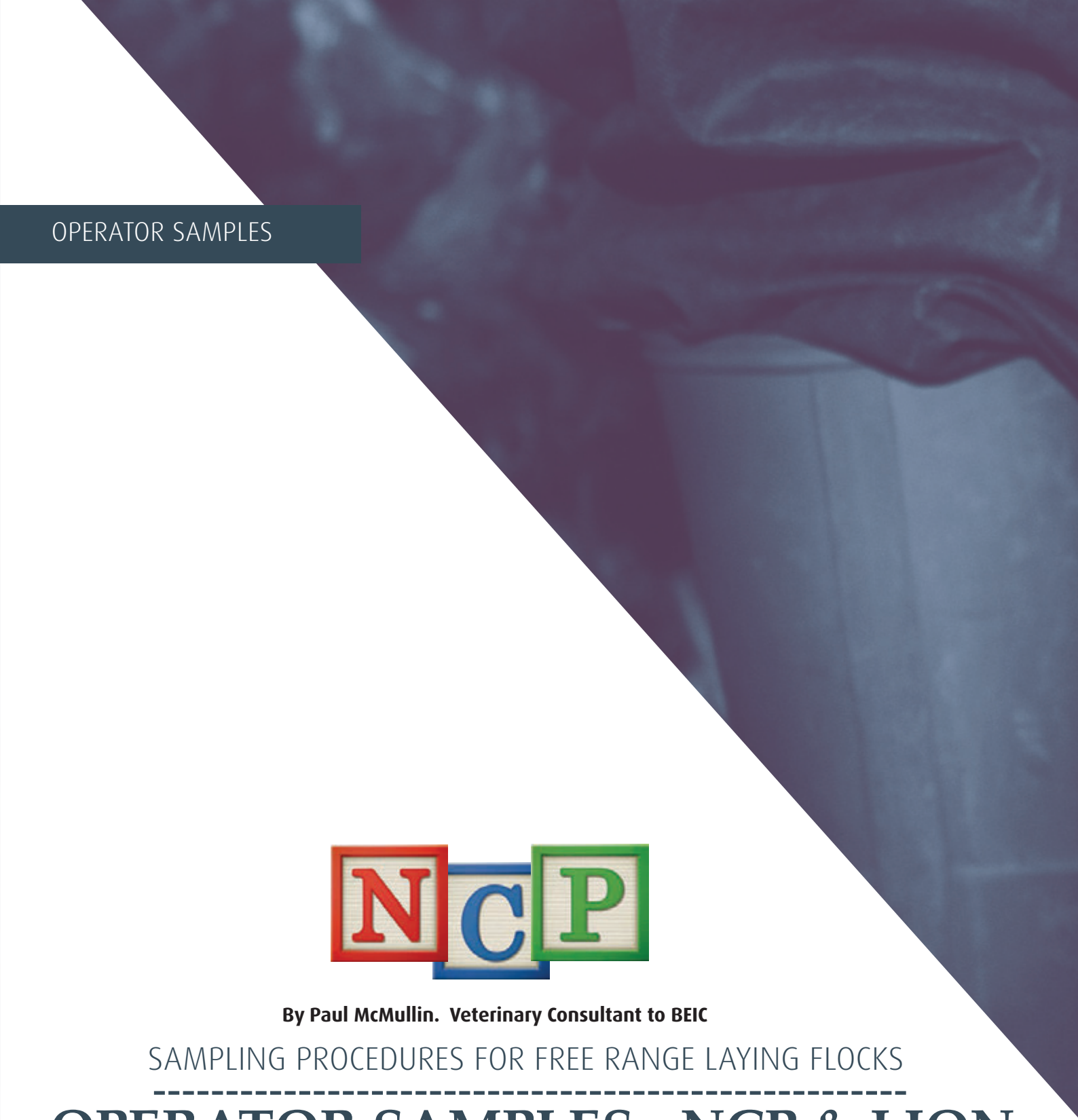
N13

A written biosecurity plan, including at least the minimum measures provided for in the appropriate government body's biosecurity guidance for protection against Avian Influenza is to be available.

N14



Consideration should be given to where equipment has come from. Is it visibly clean? If not, more thorough disinfection of the equipment should be undertaken.



By Paul McMullin. Veterinary Consultant to BEIC

SAMPLING PROCEDURES FOR FREE RANGE LAYING FLOCKS

OPERATOR SAMPLES - NCP & LION

It is now over 10 years since the implementation of the EU Regulation 2160/2003, under which eggs from flocks infected with salmonellae of human health significance (or from flocks not tested in accordance with the national control programme,(NCP)) are not allowed to be sold for direct human consumption. The salmonellas of human health significance are non-vaccinal strains of Salmonella Enteritidis and Salmonella Typhimurium. As I write this it remains uncertain if, how, and when Brexit will occur, but the government has stated that a series of protections under EU law will not be reduced after Brexit. This seems very likely to be one of them.

Operator sampling under the NCP has limited sensitivity but is capable of detecting Salmonella infection when carried out correctly. It is supplemented by annual official sampling of one flock per farm by NSF auditors (for Lion Scheme farms) or APHA egg inspectors for others, which is more sensitive because an extra sample is taken. BEIC has requested that verification sampling of all houses be carried out in the next 12 months or so. Should either operator or official samples prove positive,

OPERATOR SAMPLES

Defra no longer carry out routine confirmatory sampling (in fact they have never done this for official samples). Producers may, however, opt for confirmatory testing of either "enhanced environmental samples" (5 pairs of boot swabs tested individually, and 2 sets of dust samples), 300 carcases, or 4,000 eggs. However, the eggs produced until a negative result is obtained are downgraded to Class B. If the producer does not opt for this testing, or it is found to be positive, all other flocks on site are subject to official enhanced environmental sampling.

Egg producers are the key link in a food production chain (which includes the layer breeders, hatcheries, pullet rearers, feed producers, egg packers, and testing laboratories. If

STEPS TO FOLLOW

STEP 1

PLAN AHEAD

Set up a calendar to ensure that samples are taken to the required schedule. The first sample must be collected when a flock is 22 to 26 weeks of age and the maximum interval required in law is 15 weeks. However, if you do not have a valid test result back within this interval you may run into problems. Because of the risk of samples 'lost in the post' packers are requiring shorter intervals (14 or 13 weeks) to allow replacement samples to be collected. The Lion Code will also soon shorten the interval.

STEP 2

KNOW HOW YOU WILL SHIP YOUR SAMPLE

- The testing must begin within 4 days of sampling otherwise the results would be invalid. It will usually be best to schedule testing early in the week to avoid weekend delivery and set-up issues.

STEP 3

ENSURE THAT YOU HAVE ALL OF THE REQUIRED MATERIALS

Remember that each 'air-space' has to be separately sampled (though up to 6 small mobiles, containing no more than 6,000 birds may be considered one airspace). Your egg inspector will normally approve your 'air spaces'. For each air space you will require a pair of plastic overshoes, a pair of gloves, a sample container and 2 pairs of boot swabs. You will also need a laboratory submission form and packaging material. Testing laboratories can provide kits with the required materials. You should make sure to store unused kits carefully away from sources of possible contamination.

STEP 4

FOLLOW ALL YOUR STANDARD SITE ENTRY BIOSECURITY PRECAUTIONS

It is advisable to use clean overalls, and boots, or equivalent disposable materials.

we fail to detect an infected flock through inadequate sampling, it is possible that the immunity conferred by vaccination will be overcome and that consumers could be harmed. There have been a small number of cases of infected laying flocks since the NCP began, and the ability of 'Whole Genome Sequencing (WGS)" to link widely separated individual human cases has shown its value in identifying different sources of Salmonella infection.

If, in the past, a producer regarded his operator sampling as a chore which could be delegated, and was not very important, then he or she should think again! It is not in the interest of the producer, particularly those with multiple flocks on site, not to identify the first infected flock early. Failure to do so may allow the infection to spread to other flocks on the holding, or result in early infection in the next flock in a house, or even onward spread to other farms.

Detailed advice on the collection of operator samples is available from poultry veterinary practices, testing laboratories and fieldsmen/women for egg packers. It is also covered by training modules under the 'Lion Passport' training scheme.

STEP 5

PREPARE THE MATERIALS

Boot swabs must be thoroughly moistened with potable water. This will normally be sourced on site (from a mains tap, before any supplementary sanitiser use) but if there is any doubt as to its quality, use a new (previously unopened) bottle of bottled drinking water without gas. Discard excess water. If sampling multiple flocks it is helpful to identify the sample containers in advance (farm, flock, date).

STEP 6

TAKE YOUR SAMPLES

Since March 2019 it is necessary to sample multi-tier systems (in which the majority of the manure is removed by belts) differently from traditional flat-deck systems.
(see page 61)

STEP 7

CAREFULLY CLOSE THE SAMPLE CONTAINERS, ENSURING THAT THE IDENTIFICATION IS CORRECT

Clean any external contamination. Complete the submission form and sign it to take responsibility for the sampling. Retain a copy or photograph for your records. Pack the samples and submission form ready for dispatch.

STEP 8

GET THE SAMPLES TO THE POST IN TIME

The samples may be described as "environmental swabs for analysis" if this is requested. Samples should be dispatched within 24 hours of collection. Keep in a cool place away from sunlight until dispatched.

OPERATOR SAMPLES

Please note: Approved laboratories are expected to check that samples received are compliant with the NCP requirements (in type, size, and interval between sampling and setup). Non-compliant samples will require to be repeated.

Further Information: Please refer to the appropriate sections and annexes of the Lion Code. Annexe I deals with what is required when a positive Salmonella result is obtained and will be substantially updated in Version 8.

Information is also available at: https:www.gov.uk/guidance/salmonella-get-your-egg-laying-hens-tested

All clean sampling material should be stored somewhere securely on farm to avoid inadvertent contamination before sampling?

Everything should be clearly labelled and there MUST be a submission form identifying the farm, house, bird age, sampling date and sampler?

SAMPLING PROCEDURE

Enter the airspace with the sampling materials, gloves, plastic overboots, boot swabs, and sample container, taking your normal biosecurity precautions.

At all times care should be taken to sure that samples are correctly identified, and not exposed to extraneous contamination (i.e. touched by un-gloved hands or packs opened before entering the house to be sampled).

If, for instance, a boot swab comes off the boot, but this is promptly identified, it may still be used, but should only be handled by the sampler. If there is, however, any doubt about the suitability of the sample, a fresh kit of sampling materials should be used and sampling re-started.

STEP 1

Put on the plastic overshoes, and gloves

STEP 2

Put on one or both pairs of boot swabs

STEP 3

Divide the floor area of the house (including any slatted areas) into two equal sectors for sampling. If the house is internally subdivided, ensure all areas are represented in the sampling. Sampling should include the slatted areas if the slats are of robust enough structure to ensure that it is safe to sample the area. Collect one pair of boot swabs in each sector of the house starting upon the raised perforated floors (above the droppings pit), if safe to do so, specifically walking anywhere that manure naturally gathers (joins in flooring for example) and then onto the litter area, specifically including areas of damp litter if present.

STEP 4

Take a minimum of one hundred steps per pair of swabs, using a shuffling gait (but take care not to lose your swabs!) and ensuring that all parts of the sector are sampled, not including any outdoor areas or areas just inside pop-holes. The two pairs of boot-swab samples must collectively be representative for the entire flock in a single airspace.

STEP 5

On completion of sampling in each sector, carefully remove the boot swabs so as not to dislodge adherent material. Boot swabs should be inverted to retain faecal material and placed in the container. Repeat the process for the second sector, placing the samples in the same container.

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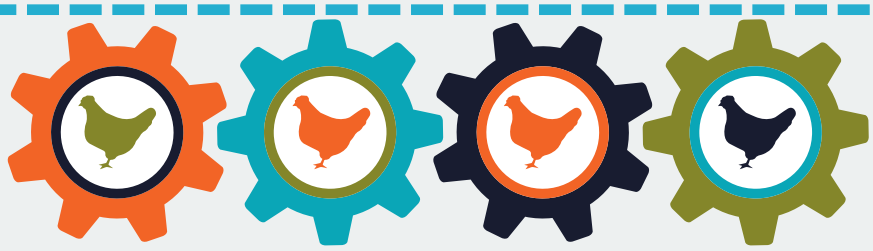


Multi-tier houses with belt cleaning in the system:
Most of the faecal material is removed from the house by dropping belts in these systems.

STEP 1

You should have run the muck belts within 24 hours of sampling, but do not clean off the belt scrapers.

STEP 2

Take one pair of boot swabs by walking around the whole of the littered areas as described above for flat deck systems.

STEP 3

Use at least 2 moistened fabric swabs (900cm2 each) or one pair of boot swabs (each boot swab is over 900 cm2 in area) as hand swabs, thoroughly swab manually all accessible dropping belts at the discharge end (including composite faeces at the scrapers.

STEP 4

All clean sampling material should be stored somewhere securely on farm to avoid inadvertent contamination before sampling?

These belt swabs are placed in the same container with the single pair of boot swabs from the floor. Please note that the hand swabs must be thoroughly and grossly contaminated by faeces on both sides and be used to transfer adherent faeces to the sample bag.

Dr Becky Gosling, APHA

CLEANING AND DISINFECTION FOR FREE RANGE FARMS

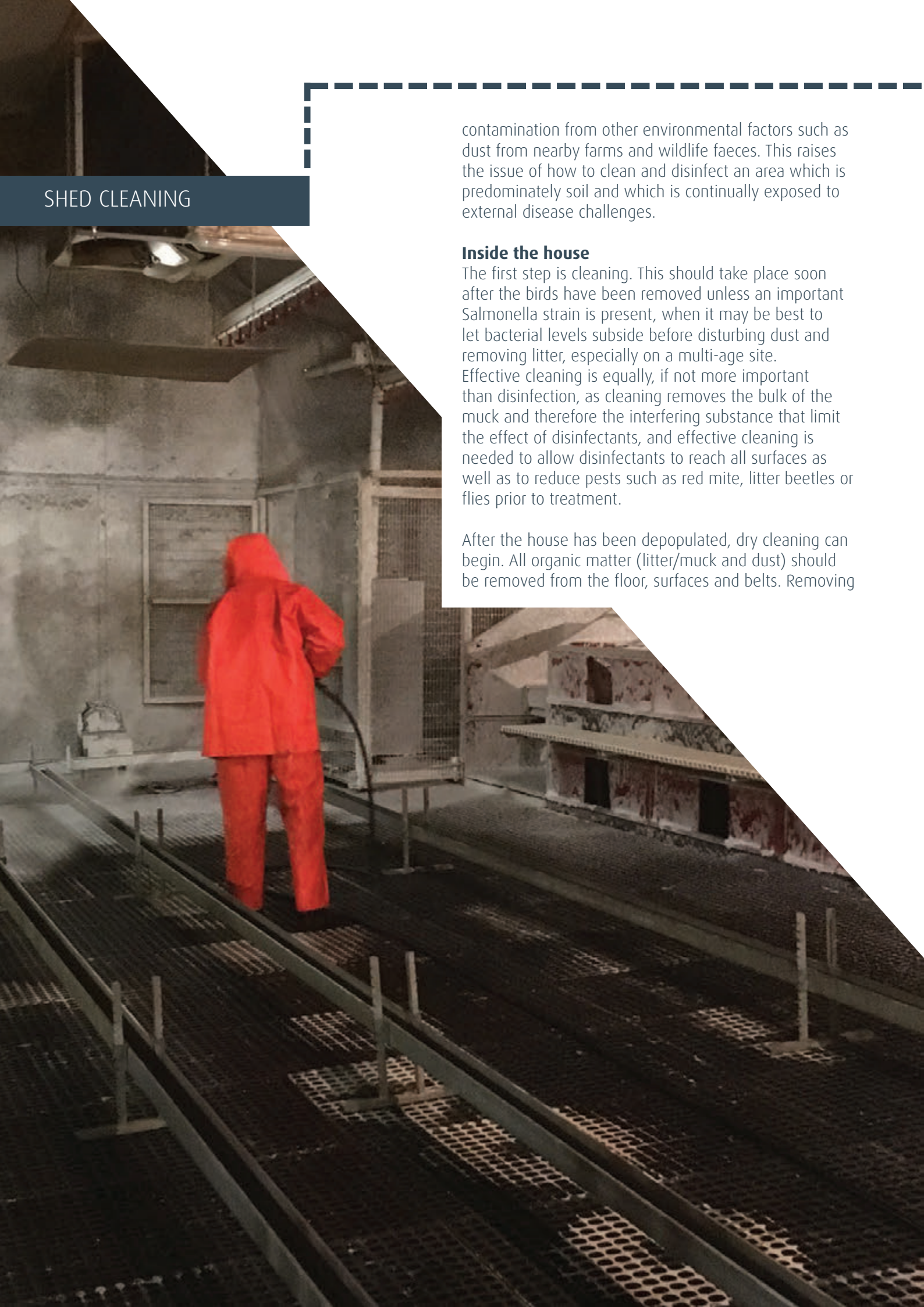
C & D

Effective cleaning and disinfection plays a key role in maintaining good biosecurity and bird health, however, implementing this does have its challenges, especially for free-range units.

The stages for cleaning and disinfecting the inside of a house are the same across the poultry industry. These include the removal of organic matter (litter), removal of dust, removal and cleaning of equipment and house specific boots/overalls, cleaning water lines and checking for signs of rodents and responding appropriately. The key point is to allow enough time to do this process thoroughly. Plan for at least two weeks downtime.

Further challenges are presented in terms of cleaning and disinfection for free-range birds due to their access to the external environment. The areas around the pop holes also allow contaminants from outside to enter the house, the range can attract wildlife and pests, especially if feed or water is accessible, and the range is at risk of

SHED CLEANING



contamination from other environmental factors such as dust from nearby farms and wildlife faeces. This raises the issue of how to clean and disinfect an area which is predominately soil and which is continually exposed to external disease challenges.

Inside the house

The first step is cleaning. This should take place soon after the birds have been removed unless an important Salmonella strain is present, when it may be best to let bacterial levels subside before disturbing dust and removing litter, especially on a multi-age site. Effective cleaning is equally, if not more important than disinfection, as cleaning removes the bulk of the muck and therefore the interfering substance that limit the effect of disinfectants, and effective cleaning is needed to allow disinfectants to reach all surfaces as well as to reduce pests such as red mite, litter beetles or flies prior to treatment.

After the house has been depopulated, dry cleaning can begin. All organic matter (litter/muck and dust) should be removed from the floor, surfaces and belts. Removing

the litter removes the majority of the disease risk as pathogenic organisms such as Salmonella can multiple and survive well in faeces. Any feed remaining in feeders should be removed as quickly as possible to avoid attracting rodents or other wildlife into the house. Salmonella has been found to survive in dust for up to nineteen years and can be a cause of re-infection between flocks. Remember to check areas such as high ledges, ceilings and fans, which may be difficult to reach, and nest boxes and belts, which can be inaccessible. This is especially important in layer houses as the birds will have been in place for around a year and a substantial amount of dust is likely to have built up.

Then any equipment such as perches, raised flooring, nest boxes and multi-tier system equipment which is removable, should be taken out of the house for thorough cleaning and disinfection. The benefit of this is that equipment can harbour pests, or may be difficult to clean in-situ. Removal allows a thorough inspection of the equipment for damage as well as inspection of the house. It also makes the house easier to clean, with fewer obstructions to clean around. Any house- specific equipment, clothing and foot wear should also be removed for thorough cleaning and disinfection.

At this point the water lines should be cleaned using an appropriate product, usually an oxidising disinfectant such as peracetic acid, to flush through the system. There is a chance that some nipple drinkers can become blocked by dislodged biofilm after flushing so it is important to remember to check them before reintroducing new birds and to use a two stage cleaning programme to dissolve biofilm then dislodge it if needed.

After dry cleaning has taken place, wet cleaning can begin. It is not possible to effectively disinfect a dry-cleaned house and this practice is likely to lead to a build-up of disease organisms and pests. Surfaces should be soaked and a detergent applied. Detergents help to loosen dried- on dirt and grease, and may be beneficial for layer houses where birds have been in place for many weeks and muck has been allowed to build up. It is essential to give the water and detergent time to work, to soak in. This then makes removal of dried material much easier during the wash down stage. Wash down all surfaces, removing any remaining detergent and organic matter.

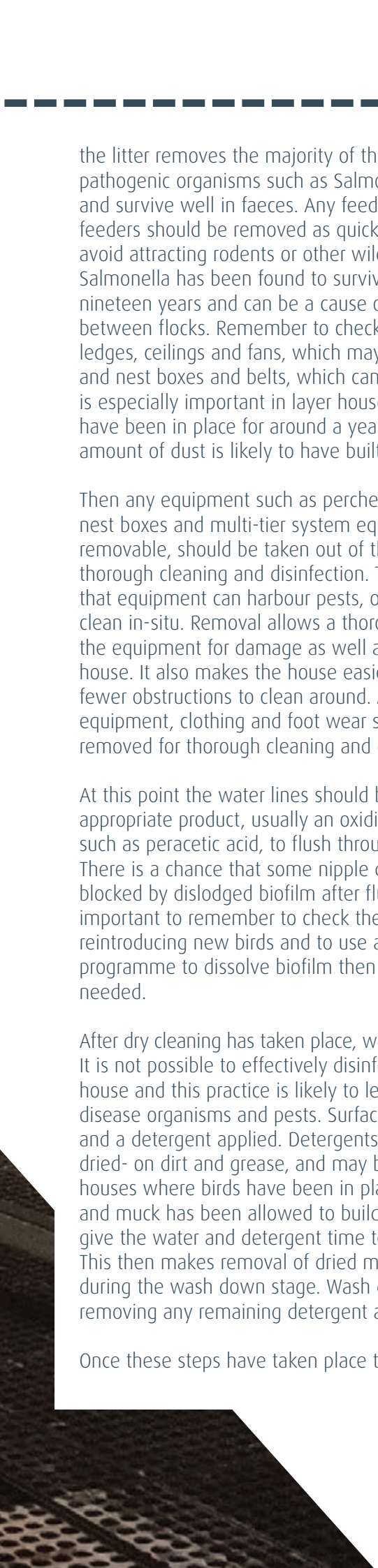
Once these steps have taken place this is the time to check carefully, using a powerful torch and white moist wipes, how thorough the cleaning has been, have any areas been missed, especially underneath low surfaces or on top of high ones, behind fixed equipment, especially in and around vents, nest boxes and egg belts, in cracks in the floor or walls and in feeding systems. If the cleaning is not of the standard you require this is the time to repeat it. Disinfectants do not work well if there is still muck in the house so removing it thoroughly while you have the chance is important. If feeders, troughs/chains and/or drinkers/ remain in the house during cleaning, make sure these receive the same level of cleaning and that any excess water is removed to allow them to dry before disinfecting. Leaving wash water in these will cause additional dilution of the disinfectant when it is applied, making it less likely to be effective in killing any bacteria present, which may even multiply if the disinfectant is diluted by residual water.

Once you are happy with the standard of cleaning, the house should be allowed time to dry. The drying steps do increase the length of the process but they are key because bacteria and viruses can survive much better in wet conditions and allowing the house to dry reduces any bacterial load present. A minimum of 24h drying time is recommended, although the longer the better.

If maintenance tasks are required, now is the time to carry them out. Be aware that these can dislodge trapped muck and dust which can re-contaminate the area which may need re-cleaning following major maintenance work.

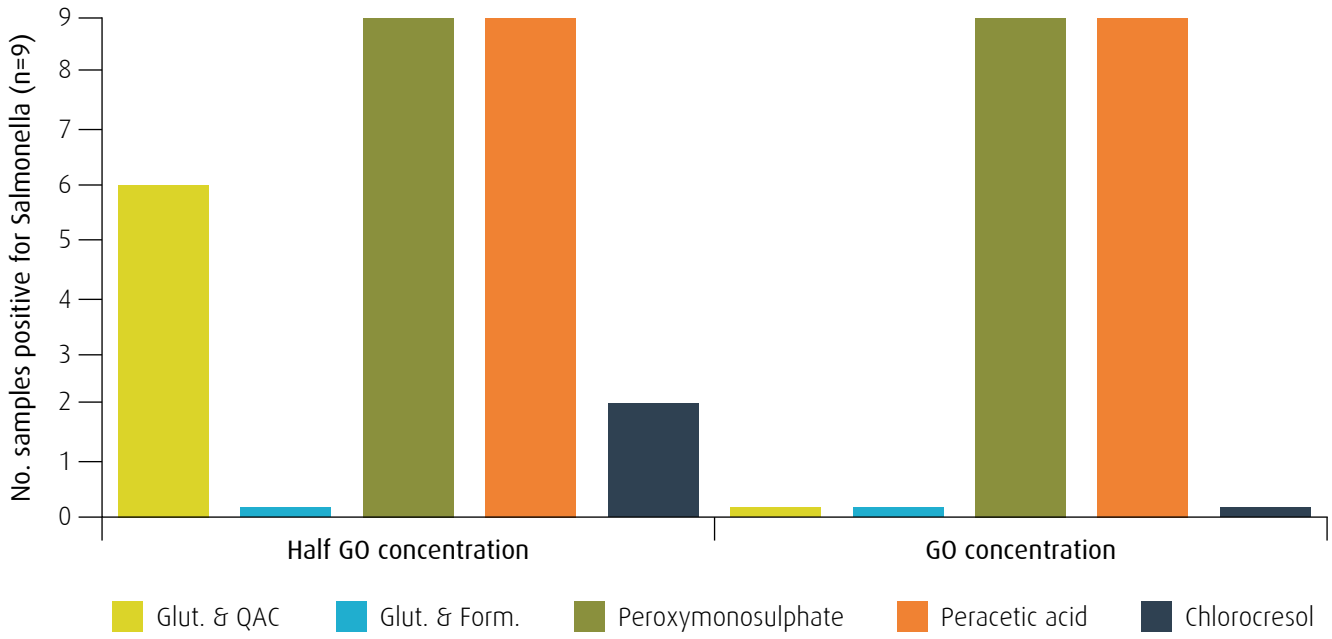
The next step is to apply a disinfectant. The first challenge here is selecting which disinfectant to use. This may already be outlined in your biosecurity plan however it is worth revisiting your selection to check it is still appropriate for the task required.

The activity of disinfectants is affected by their active chemicals, the temperature they will be used at, the amount of organic matter present, the hardness and cleanliness of the water used to dilute it and possible interactions with any detergent which has not been rinsed away. Disinfectants used should also be approved by Defra for use against notifiable and zoonotic diseases which fall under Disease Orders. All approved products appear on a public list (http://disinfectants.defra.gov.uk/DisinfectantsExternal/Default.aspx?Module=ApprovalsList_SI) along with the manufacturer details and



GRAPH 1

Salmonella survival on surfaces following disinfection with different products



concentration for which they have been approved for each disease. For poultry the Orders of interest are Poultry Orders which covers Newcastle disease and Avian Influenza and General Orders which covers Salmonella and other bacteria. The concentration of disinfectant required to pass each test will vary and it is recommended to use the General Orders (GO) concentration as this will kill viruses as well as bacteria, whereas the Diseases of Poultry Orders concentration is unlikely to eliminate Salmonella. The Lion Code stipulates that "Only Defra-approved disinfectants shall be used during clean-out. Those in use must be Defra approved for both General Orders (e.g. Salmonella control) and for diseases of poultry". The same applies for disinfectants used in boot dips on Lion Code farms.

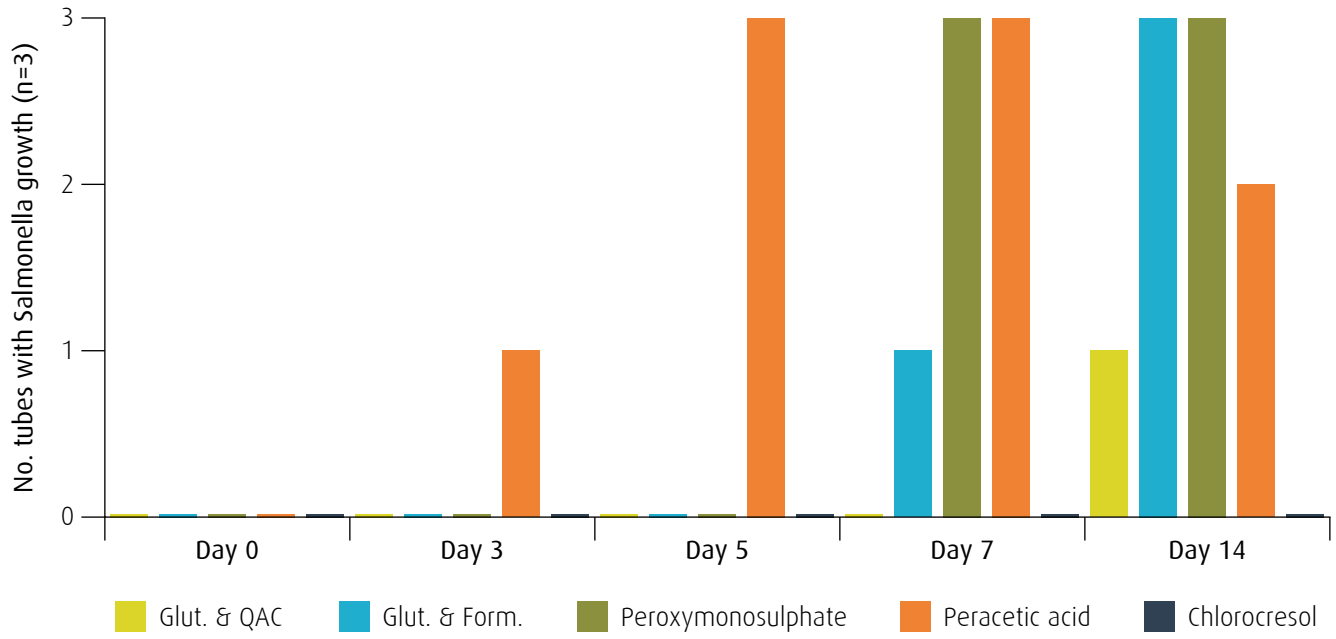
Before starting disinfection check that the product you have on site is in date and check the Defra Approved concentration on the Defra website as the list is live and approved concentrations do change over time.

Research carried out by APHA has investigated how different disinfectants perform when used in boot dips and for surface disinfection, and there are differences between the different test environments. For use in boot dips, chlorocresol-based disinfectants performed the best, they were able to cope with increasing levels of organic matter, as more muck would be added each time the boot dip was used. The chlorocresol-based products also remained active for the longest period of time. However, for surface disinfection glutaraldehyde-based products, especially those in combinations with formaldehyde, rather than just quaternary ammonium compounds, were most effective for killing Salmonella. Both studies included disinfectants at GO and half GO concentrations, with products tested at half the GO concentration usually failing. This highlights the importance of ensuring disinfectants are used at the recommended concentration.

Disinfectants should be applied in accordance with the manufacturers' safety guidelines, wearing appropriate

GRAPH 2

Salmonella survival in boot dips of different products, up to 14 days old



protective clothing and ensuring a good coverage is achieved on all surfaces. Contact time is important, to allow the disinfectant to be fully effective so disinfectants should be applied to saturation point at high pressure and then left to dry on verandas and any service areas such as egg rooms or stores should be cleaned and disinfected to the same standard as the rest of the house.

After disinfection and before birds are placed, continue to maintain good biosecurity. Do not store equipment in the clean house, ensure boot dips or boot changes are in place and used if staff need to re-enter, and maintain rodent and pest control. Be especially careful when using vehicles that enter the clean house to set it up or deliver birds.

Mobile units

Mobile units require the same level of cleaning and disinfection as a fixed structure house, however this will require the house to be moved to a clean area and good drainage during cleaning and disinfection in a way that avoids transferring contamination. The dry cleaning steps will include the removal litter and dust from the internal surfaces of the house, and the removal of slats, nesting boxes and artificial scratching areas as well as any other removable equipment. The build-up of manure beneath the house is a potential harbourage site for rodents and other pests, and therefore disease. Disturbing these during cleaning has the potential to spread disease from one house to another and active rodent control is required. Cleaning should also include the removal of wild bird droppings from the external surfaces of the house.

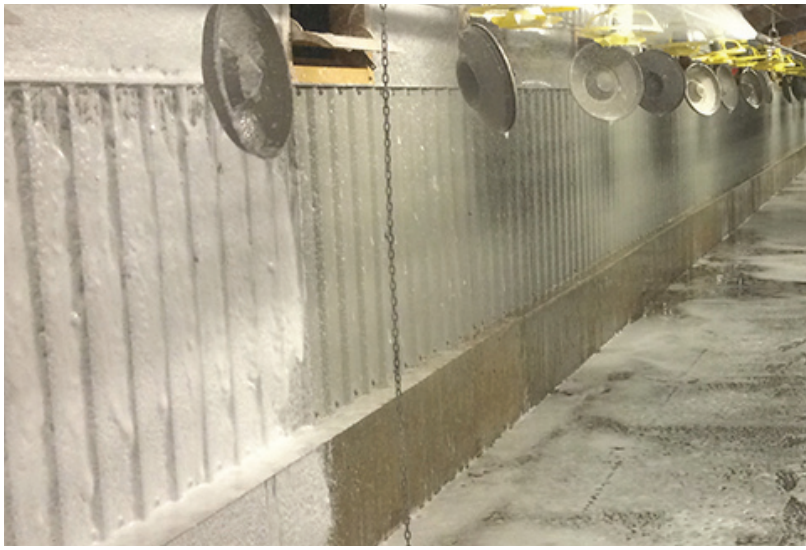
Wet cleaning and disinfection can then take place as discussed above.

Range

Cleaning the range is more difficult and good range management is the best solution, i.e. preventing puddles forming which can attract wildlife, not feeding the birds

KEY STEPS

- Take action to reduce rodents and arthropod pests as much as possible before depopulation.
- Muck out / dust thoroughly (dry clean) then power wash or steam clean (wet clean). Check that a thorough job has been done especially for feeding systems, vents, nest boxes and moveable equipment.
- If Salmonella has been present previously, or performance has been poor, include disinfectant in the wash water.
- Carry out maintenance work on the house structure or ventilation system before disinfecting the house.
- Ensure that any opportunity to check for rodent activity and bait rodents between cleaning stages is not missed.
- Let surfaces dry before using a high pressure spray with disinfectant at Defra General Orders Rates (http://disinfectants.defra.gov.uk/)
- If Salmonella has been present, or suspected, seek advice on the best types of disinfectant to use.
- Use residual acaricide after disinfectants have dried.
- Carry out Salmonella tests or bacterial count check on key surfaces after disinfectants have dried.
- Put foot dips and boot changes back in place after washing to avoid recontamination of a clean house by people entering without protection.
- Do not introduce any non-disinfected items.



in the range and having a robust external fence and hedge in place which limits access by foxes, feral cats etc. and dust contamination from any nearby farms. The area closest to the house is most likely to be contaminated, where birds have congregated after leaving and to get back into the house, especially in shaded or poorly drained areas..

If a serious Salmonella has been present, the surface layer of muck around the house should be scraped away, the immediate surroundings safely sprayed with 5% formalin. Products are available to help disinfect the range, generally in the form of lime-based powders and one of these can be applied after the formalin has dried or soaked in. These products alter the pH of the soil making it less attractive for the survival of bacteria. It should be noted that none of these dry powder products are Defra- approved as the Defra testing scheme only tests products applied as liquids.

External areas

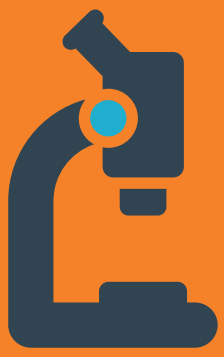
The environment around the farm has the potential to contaminate the house and infect the birds with pathogens, through airborne transmission or, more likely in most cases, by staff or visitors walking contamination in or contamination being picked up by equipment. It is important to ensure the areas immediately surrounding houses, particularly access routes, are also included during cleaning and disinfection. These include entrances to houses, ante rooms, concrete aprons and surrounds, areas around feed bins, including where feed delivery lorries have access to and dead bird bins. Cleaning and

disinfecting these areas regularly and at depopulation will help minimise the risk of infection across the whole farm.

Cleaning and disinfection is a basic prerequisite, not a new solution, however doing it well can have real benefits to bird health, production and disease control.

COMMON ERRORS

- Insufficient attention from farm or area managers at this critical point in the production cycle.
- Insufficient cleaning.
- Pooled water especially in drinkers and feed pans.
- Rodents or arthropods still present.
- Unsuitable disinfection product or product combinations.
- Wrong concentration – e.g. 'Diseases of Poultry' concentrations used instead of 'General Orders'.
- Uneven coverage because of use of low power or orchard sprayer.
- Vents etc. missed.
- Recontamination after disinfection – by people, equipment, pets, maintenance activities etc.



INVESTIGATION, DETECTING & IDENTIFYING SALMONELLA

SAMPLING

Ian Lowery BVetMed MRCVS, Crowshall Veterinary Services

Public Health England are the government department tasked with improving the nation's health. Part of this remit includes investigating food poisoning outbreaks, working with Food Standards Agency (FSA) to identify common causes of wide scale ill health and working across the supply chain to control the risk.

Salmonella remains a common cause of food poisoning in man, and of all the Salmonella species which can cause vomiting and diarrhoea, S. Enteritidis and S. Typhimurium top the list. Of course, Salmonella may be associated with non-poultry foodstuff; pork, lamb, beef or unpasteurised milk. Indeed the poultry meat and egg sector has an excellent record in identifying cases of Salmonella and working with FSA to prevent infectious material entering the foodchain through pasteurisation or heat treating of meat or eggs, or through on-farm slaughter.

These interventions come at a significant cost to the unfortunate producer where Salmonella is identified, however a zero tolerance to Enteritidis or Typhimurium infections has helped the poultry industry to grow consumer confidence in the meat and eggs which we produce. Enhanced biosecurity alongside vaccination of laying hens has meant that Salmonella infections are mercifully rare in the poultry sector.

As you will be aware chickens and turkeys are subjected to a legal requirement to conduct Salmonella testing prior to slaughter for meat birds or periodically through the laying phase in laying hens. The nature of the sampling required, and the test methodology, is laid down by European regulations, however the devil is in the detail. Careful sampling and accurate completion of submission forms are important to ensure that we have confidence in negative results and are able to assure ourselves, and our customers that flocks are free of Salmonella. In order to ensure that "negative" really means "negative" it is vital that sampling instructions are carefully followed and that samples are submitted to an approved and accredited laboratory as soon as possible in suitable packaging. Whilst it may not seem self-serving to take additional measures to enhance the sensitivity of your testing, there are a number of compelling arguments for ensuring that operator Salmonella samples are conducted accurately:

- Alongside operator samples laying flocks are also subjected to "official samples" conducted by personnel who have been trained to follow sampling procedures which maximise the chances of detecting Salmonella. Where official samples detect Salmonella which has not been detected by recent operator samples questions may be raised as to quality of operator samples which may affect relationships with packers and retailers.

- Approved, accredited labs can only conduct effective testing on valid samples. Where samples have not arrived at the lab within 4 days of sampling, where paperwork is incomplete or where samples appear to have been "tampered" the laboratory is unable to test under their UKAS approval and as such any resulting result certificates will not carry the UKAS logo. These tests will not be considered as valid by inspectors and auditors.

- As assurance schemes and retailers strive for ever higher levels of food safety they are likely to demand deeper transparency around laboratory procedures. Interrogation of interim laboratory results could be used to support or dispute the quality of operator sampling.

- Genetic profiling of Salmonella organisms can be used to link human cases of food poisoning to a farming enterprise with a high degree of certainty. If infection is missed in a laying flock due to poor on-farm sampling the infection may be further disseminated leading to more cases of Salmonella

- Where cases of Salmonella are not identified early there is a significant risk that the infection could spread to nearby flocks.

There are 2 golden rules to conducting accurate operator Salmonella testing. The first is to make sure that you do not accidentally find Salmonella which is not really infecting your hens. The Salmonella testing procedure is very sensitive and can detect just a few Salmonella organisms. It is vitally important that the bootswabs or hand swabs are sterile before they enter the poultry house to be tested and only come in contact with the bird area to be tested. Sampling material must be kept

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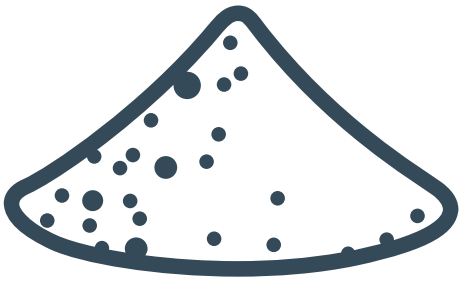
in sealed, fly and rodent proof packaging and only handled with clean hands. Swabs must be carefully transported into the specific biosecure area and care must be taken to ensure that no cross-contamination occurs between houses. Swabbing is best conducted from the interior of the house away from pop-holes and entrances. Furthermore bootswabs must only be put onto clean boots on top of plastic disposable overboots. Remember, without a sterile overboot, the inside of the bootswab is sampling bacteria from the sole of the shoe which may have become contaminated by flies or rodents or by being worn outside of the specific biosecure area.

The second golden rule is that the goal of testing ought to be to find Salmonella if it is present (for all of the reasons listed above!). To this end swabs should be thoroughly moistened prior to sampling (pay attention to the cleanliness of the equipment used to pre-moisten the swabs). A sufficiently large area of the house should be sampled. For bootswabs this should be 100 "shuffle steps" per pair of bootswabs, care should be taken to ensure the whole house is walked and sampled during this process. For muck belts in multi-tier units hand swabs should be sufficiently large (900cm2 each) and should sample a large area from at least 3 areas on the belt ensuring that the swabs are thoroughly coated with faeces on both sides.

linked to the paperwork should the two get separated.

Swabs should be stored out of direct sunlight and kept cool. The swabs should be received as soon as possible by the testing laboratory. Samples should be delivered by hand or sent by recorded or guaranteed delivery.
As food producers across all livestock sectors adapt to an increasing requirement to assure food safety it is important that the egg sector upholds the high standards we have set, remaining ahead of other livestock sectors in providing nutritious, safe and healthy food.

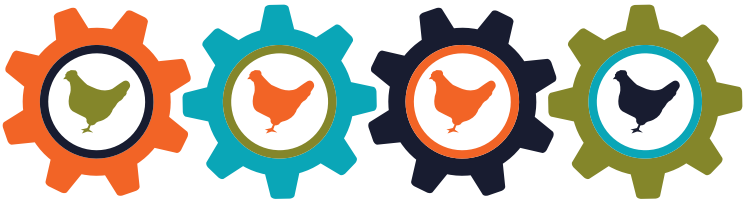


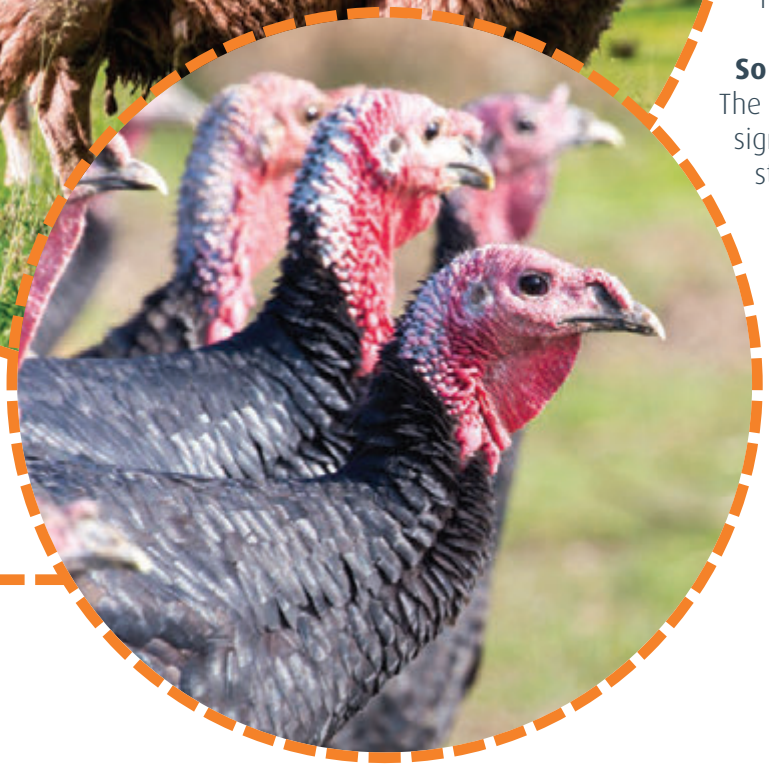
ANIMALS AND

SALMONELLA

Ian Lowery BVetMed MRCVS, Crowshall Veterinary Services

Your 15 weekly bootswabbing for Salmonella serve to ensure that your unit remains compliant with the "National Control Programme for Salmonella in laying flocks of domestic fowl". This is a legal requirement which ensures that flocks in the UK remain compliant with European regulations which demand that we monitor laying flocks for certain strains of Salmonella, which are most commonly associated with food poisoning in people, and achieve published targets for the number of positive flocks annually.





Similar control programmes exist for meat chickens, meat turkeys, breeding chickens (both layer-breeders and broiler-breeders) and breeding turkeys. There are no legal requirements for on-farm testing of other poultry species (ducks, geese etc) nor for other farmed species (pigs, sheep, cattle etc).

Before you ask, Brexit is highly unlikely to have any tangible effect on the UK's approach to Salmonella control in laying hens. As with other aspects of farming, increasingly retailer requirements supersede the minimum standards stipulated by law and as such Salmonella surveillance and control is likely to be mandatory whether due to legal statute or retailer requirement. Similarly the Lion code lays down requirements for Salmonella surveillance and control which exceed those minimum standards required by law.

So why are chickens and turkeys singled out?

The cost of running a national control programme is significant both to the individual producer and the state. Prior to control programmes being implemented there has to be sufficient evidence that cases of Salmonella can be controlled and the overall target of a reduction in the number of infected flocks can be achieved. All of this needs to be offset against the cost of cases of Salmonella to the country (ie if we find Salmonella in a flock are we able to effectively control it and if so are the costs of surveillance and monitoring less than the costs (both monetary

and social) of treating Salmonella in the human population.

The poultry industry is highly integrated and consolidated. We have a good understanding of biosecurity, we have a reasonably well developed armoury of Salmonella vaccines and we produce poultry meat and eggs from large holding which can become widely disseminated throughout the supply chain. If a large layer holding becomes infected with Salmonella it can lead to a very complicated food poisoning outbreak in the public. If a layer-breeding holding becomes infected with Salmonella a significant number of hatching eggs could be infected leading to wide scale infection of replacement layers either due to direct infection of the egg or cross-infection in the hatchery. Likewise the highly efficient and mechanised methods of slaughter employed in poultry processing plants can mean that a single infected bird can contaminate a large number of other birds processed on the same day.

On weighing up these factors the EU has determined that control of Salmonella in chickens and turkeys offers a cost benefit to the public and thus we are obliged to conduct regular testing of our flocks for Salmonella with significant consequences if a Salmonella enteritidis or typhimurium are detected. There is no such requirement in other livestock species and no legal mechanism to prevent infected meat entering the food chain when it originates from other species.

Crucially, amount Salmonella in the national herd of a farmed species does not necessarily correlate with the number of cases of food poisoning in humans. Infections of meat producing animals (who generally live much longer than meat chickens) have often resolved by slaughter age. The slaughter process for non-poultry species is generally much less likely to result in cross contamination between individuals and, for pork in particular post slaughter processing (in the production of bacon for example) infers anti-microbial properties.

So, in summary the poultry industry enjoys the dubious honour of having a National Control Programme for Salmonella whilst other food producing animals do not. And whilst we suffer the costs of testing and the consequences if Salmonella is detected, we also enjoy a reputation for producing safe, healthy and inexpensive food.

But if the government is not concerned about Salmonella in other species why should I be concerned?

Precisely because Salmonella infection in laying hens may have significant consequences, it is vital that producers are aware of all potential sources of infection. In recent years laying flocks have become infected with Salmonella strains which have been linked with pigs, cattle and sheep.

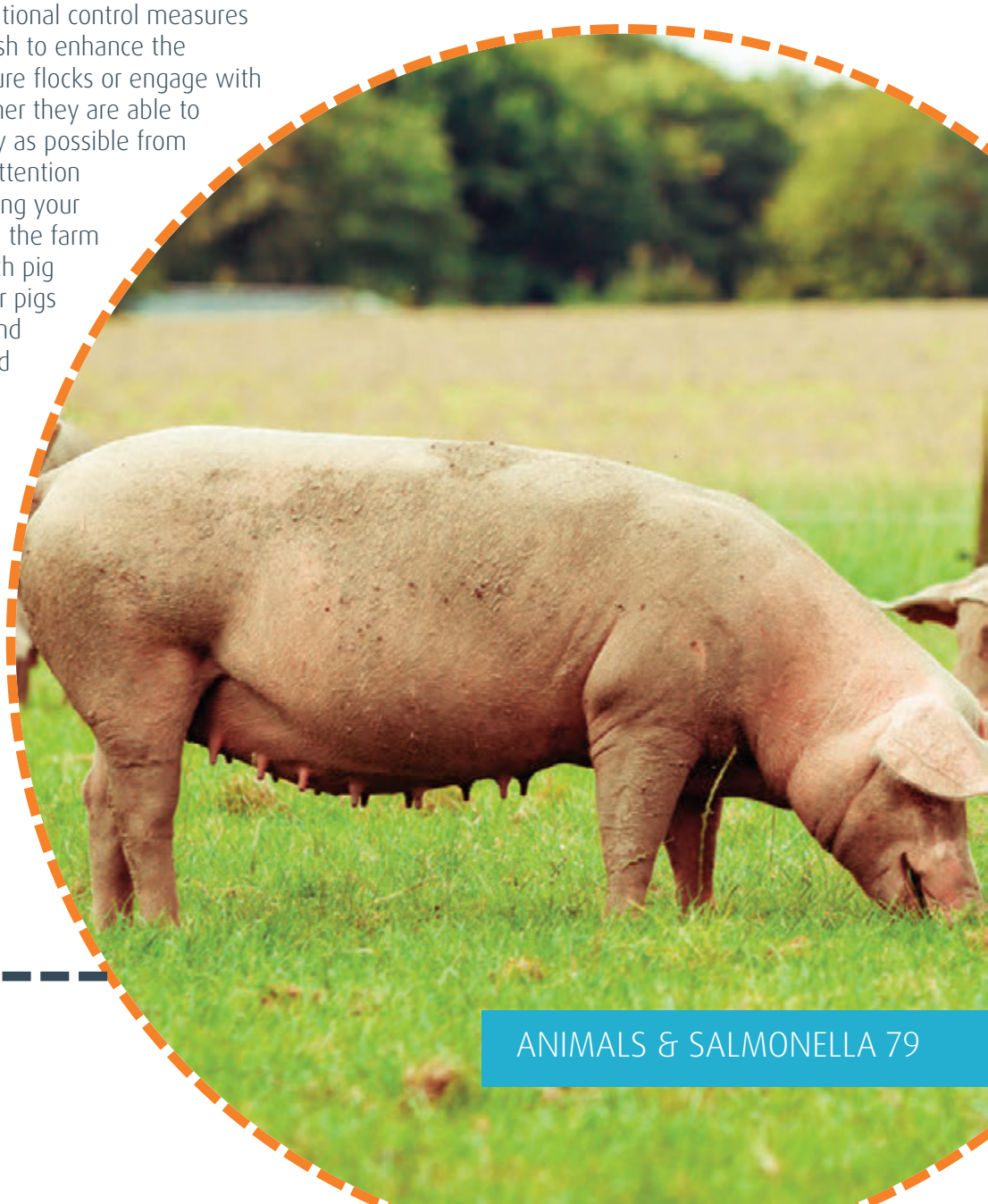
In 2017 and 2018 two food poisoning outbreaks occurred which were associated with Salmonella typhimurium in sheep. Given that sheep often co-graze with laying hens producers are urged to conduct their own risk assessment on this activity.

Similarly, cattle often co-graze with sheep and are another species where Salmonella typhimurium can be found. Phage type 104 in particular seems to have increased in prevalence in recent years and has been responsible for infections in laying flocks which co-graze with cattle.

Co-grazing is not without risk, however these risks can be controlled to a certain extent. Voluntary testing of sheep and cattle should be conducted to assure yourself that they are free of Salmonella infection. Assuming your co-grazers are clean, efforts should focus on maintaining a disease free flock/herd by minimising stock movements and ensuring all bought in animals are also "clean". You may wish to consider vaccination in cattle and as always other risk factors for example rodent control is vital.

Unlike sheep and cattle, pigs present a rather different risk to free range laying flocks. The prevalence of

Salmonella in pigs is very high. Salmonella typhimurium and monophasic typhimurium appear to be readily isolated from environments where pigs have been farmed. Salmonella typhimurium can be found in puddles, flies, wild birds, rodents dust and hedgerows around commercial pig units and this represents a significant source of infection for laying flocks where infection may result in slaughter of the laying flock. Protecting your flock from Salmonella infection depends on very high standards of biosecurity, excellent rodent control and management of feed bins and ranges to minimise the number of wild birds on the range however where pig units are located in close proximity to your laying units it is recommended that additional advice is sought to explore whether additional control measures may be indicated. You may wish to enhance the Salmonella vaccinations for future flocks or engage with the pig enterprise to see whether they are able to locate mobile herds as far away as possible from the chicken house. Particular attention should be paid to vehicles visiting your site, particularly if roads around the farm are obviously contaminated with pig muck. A Salmonella vaccine for pigs has recently been developed and it is hoped that this will be used as part of an increasing desire to control Salmonella, however, in the meantime farmed species which are not regulated by a Salmonella control program ought to be viewed with some suspicion and where these farming enterprises are in close proximity to your laying unit a specific risk assessment ought to be conducted.

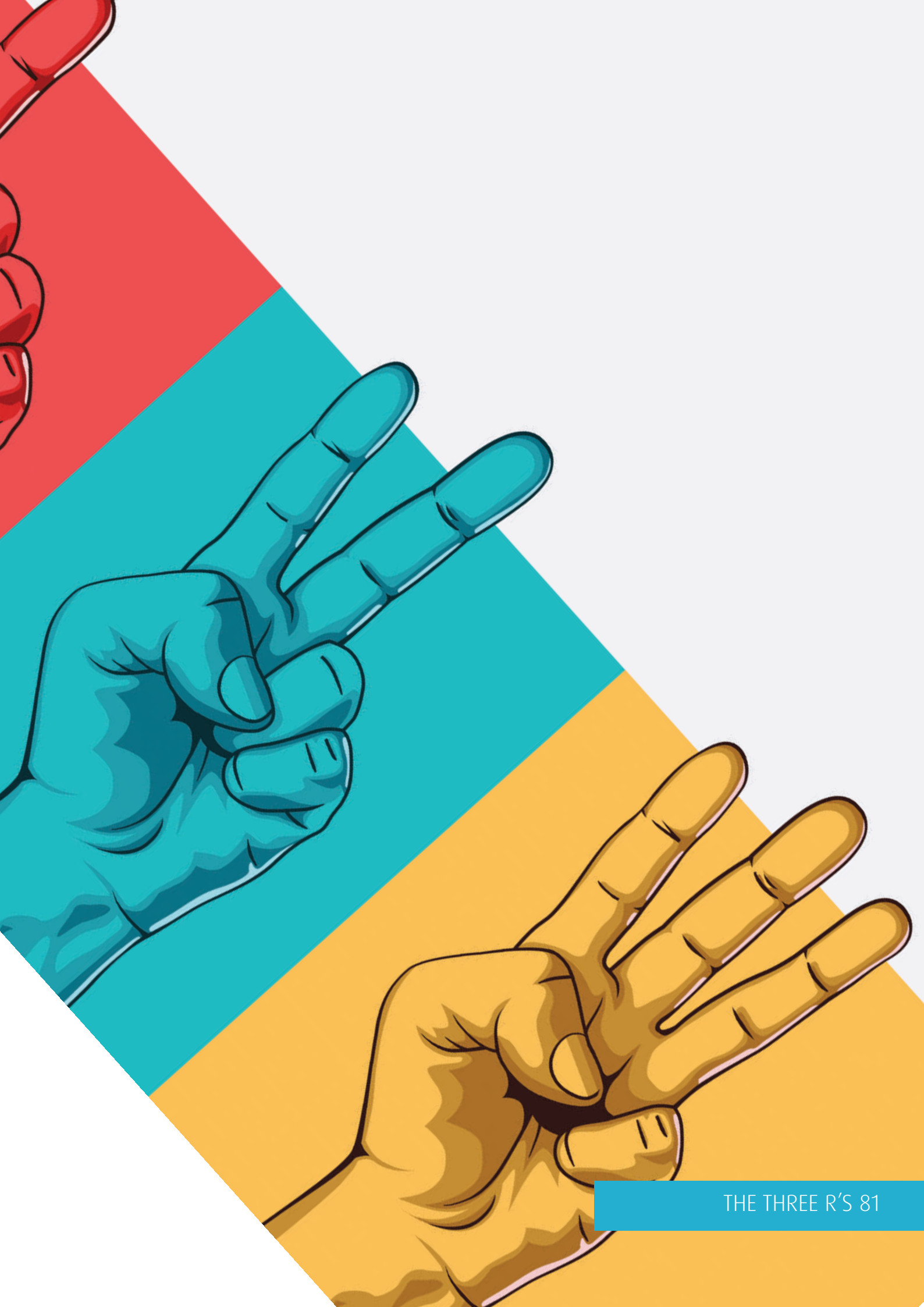


SALMONELLA

THE 3 R'S

"How do you deal with risk?" David Heckman, Elanco Global Marketing Consultant for Poultry, posed this question to delegates that gathered at Elanco's annual Layer Conference, just days before a media spotlight was once again shone on the issue of Salmonella. Here we explore what Heckman terms "the 3 R's of Salmonella" and his mantra of sharing not scaring.

The fact that this topic was high on the agenda of the conference prior to the media coverage breaking only goes to show that, as an industry, managing Salmonella risk is at the forefront and never an afterthought. Complacency has no place in Salmonella prevention and management, and it is imperative that the basics are firmly put in place. Echoing the foundations for life known as the 3 R's, Heckman cleverly uses this acronym within the Salmonella risk management approach to cover: (1) **Relentless** (2) **Risk** and (3) **uRgency**. Turning to 'Relentless' first, Heckman very rightly pointed out that the poultry industry is under ongoing scrutiny



from government, the food chain, media, activists and more. There are 'Relentless' rules – more than there were 10-20 years ago and with the rules being made around us, we have no choice but to adhere to them.

Government is usually acting on something that has already happened and in the modern age, this is being driven very much by technology and immediate access to information at an incredibly rapid pace. Consumers, the food chain and retailers are the ones making these rules – partly to protect themselves, but also to protect their business. The British Lion Code focuses on being one step ahead of the issue before Government and consumers have the chance to make the rules and Heckman very openly says that he wishes there was a version of this globally – certainly something that we can and should be proud of here in the UK.

"Don't wait for somebody else to make the rules – too often those rule makers don't fully understand what the industry does day to day" is a piece of advice from Heckman that we should all heed carefully. We are the ones that are ingrained in our industry on a daily basis and we therefore are best placed to drive the direction of our industry and it is our previous success that can help to drive this future success – however, simply relying on previous success to do our job is not enough. Whilst the British Lion Code is very successful, we need to keep building on it. One of the challenges in all walks of life is that we see something working well and we consider the job complete, but an issue like Salmonella doesn't remain stagnant. We need to understand and continue to revisit the importance of a complex issue like Salmonella.

Whilst biosecurity and the holistic Salmonella 360 approach is absolutely vital, vaccinating against Salmonella is also critical because if we don't start with the immune system of the bird, everything else will likely fail. Biosecurity alone may protect one house, but that's failing to see the bigger picture and this is just one of the reasons why Elanco continues to work collaboratively with the industry and the British Egg Industry Council (BEIC) – to be a collaborative driving force striving for a successful future.

"When we see a Salmonella positive, we take it seriously. We do a disservice to the industry if we simply said 'switch to a different vaccine and it will all be solved'" – Heckman's statement once again reinforced the industry's commitment to total transparency and collaboration. We need to address all of the touchpoints – biosecurity, vaccination, cleaning and disinfection, rodent control, and prudent husbandry practices – to truly prevent and manage Salmonella with a Salmonella 360 vision of "do it all and do it all right."

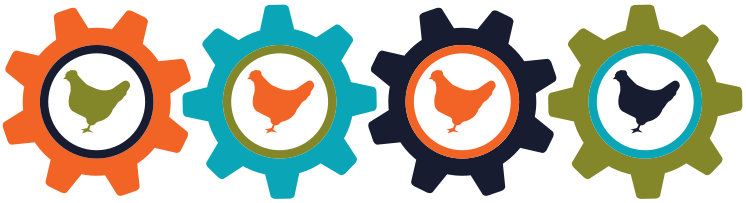
After setting the 'Relentless' foundations, Heckman turned his attention to 'Risk' and in doing so, made it very clear that 'Risk' is inherent everywhere and we need to understand where it's coming from. This 'Risk' comes in three primary forms: (1) economic; (2) business and brand; and (3) legal.

From an economic perspective, the cost of a Salmonella outbreak to a business can be huge. The need to subsequently sell product at a discounted price; an inability to sell the product; the knock-on effect on the cost of operational logistics; and flock depopulation all have the potential to cause irreparable damage to a business.

Heckman also drew attention to the fact that an issue doesn't need to technically or scientifically be an issue, but the media's ability to make it one can snowball it into a huge business and brand issue with the propensity to damage both the brand and business way beyond the outbreak.

An interesting case is that of the legal risk. Whilst accountability is placed at the human level to cook the chicken correctly, if you are producing a contaminated product, you cannot shift the blame to the consumer. The liability is in live production and failing to acknowledge this is not a defence.

The last of the 3 R's at hand is that of uRgency. The speed and transparency around the flow of information in our current digital age can very quickly spread a message, which can erode years of effort. Social media can be a close ally, or a dangerous foe, particularly in an era when the voice of detractors is given an open platform to talk



very loudly. Heckman's best piece of advice was "Don't give them ammunition." We cannot afford to have the loudest voices of media and social media telling our story, so controlling it at our level is critically important.

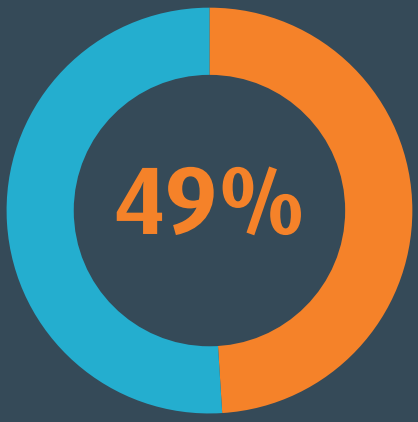
It's not just within the media sphere that speed is dominating, but also within the diagnostic world. The speed of new test development and the capabilities of such tests mean that what was undetectable months ago is now detectable and it's detectable faster and cheaper. One way of looking at it is as a race and as preventers, we need to cross that finish line before the detectors.

A closing remark came in the form of a quote from Frank Yiannas speaking at the Watt Global Media Chicken Marketing Summit: "Each and every one of you in the room today are in this race, and that race is between your ability and your company's ability to prevent poultry-related illnesses and our ability as a society to detect them…". Yiannas put public health at the heart of this challenge and Heckman unequivocally agreed with this stating that "there is nothing more important that we do than protecting the health and welfare of the people. This is our sense of purpose and why we do what we do." Through protecting human health, we can protect and grow the poultry industry for a safe and successful future and Salmonella control must begin and end with a holistic approach that ultimately places the safety of the people at the heart.

DID YOU KNOW?

Risk!
Globally it is estimated that Salmonella causes 94 million infections and 155,000 deaths annually

Relentless!
49% of Salmonella strains resistant to antibiotics



Urgency!
It takes 12 to 72 hours for Salmonella symptoms to develop

By David Hodson Jnr of Rosehill Agricultural Trading - www.rosehillpoultry.co.uk

LIVE SALMONELLA VACCINE STORAGE, HANDLING AND ADMINISTRATION

VACCINES

The benefit of using a live vaccine administered via the water route is that it provides a method of application that both minimises the stress to the birds and mimics the route of natural infection by providing protection immediately on a cellular level to the intestinal tract of the bird.

The key element of properly understanding the importance of the use of live vaccines is that by using a live vaccine that has been attenuated to provide an immune response will only be effective if the vaccine has remained in a live state. If a live vaccine is exposed to poor storage, contact with cleaning chemicals or antibiotics, chlorine and/or is not properly administered then the titre (amount of antigen present) will be reduced which in turn will negatively affect the ability of the vaccine to produce a good immune response.

We have found live vaccine to offer excellent protection against field strains of serotypes Enteritidis and

Typhimurium from the first administration to the end of the lay providing the process of storage, handling and administration have been followed.

Rosehill
AGRICULTURAL TRADING

Rosehill have carried out regular on farm training alongside supplying vaccine to our customers since the 1970's. We believe that perfecting the vaccination process will help protect your company's profitability, the health status of your flocks and safeguard the reputation of our industry.

We will arrange a visit to carry out a practical vaccination session followed by a sit down course covering the full range of diseases found in the UK, immunity in the broiler or layer bird, implications of each disease, the development of vaccination methods and how to apply these lessons to your farm.

We also supply and advise on the equipment needed for all areas of administration including the coarse spray method and all forms of water administration.

Following the training session, a manual on vaccination will be left on site and each member of staff present will receive a certificate that is recognised across the industry.

- A training manual which covers disease history, all vaccination methods, vaccine types and their uses, a complete list of available vaccines for each disease, the formulas developed to ensure correct administration and example sheets for fridge / vaccination records.
- A stock solution chart which has a calculated of water volume and water stabiliser for each vaccination throughout the rearing cycle.
- Vaccination Equipment such as stock solution containers, jugs, whisks as needed including the full Dosatron range of dosing pumps and accessories.
- A certificate that is recognised industry wide stating that the members of staff present have been fully training in the correct methods of vaccine storage, handling and administration.

For information about the on site training courses we carry out please get in touch with us at Dave@Rosehillpoultry.co.uk or on 01948 841 412
www.rosehillpoultry.co.uk

SALMONELLA VACCINE ADMINISTRATION VIA THE WATER ROUTE – A COMPLETE GUIDE

The first area to pay attention to is that we recommend that water treatments are turned off preferably 48 or a minimum of 24 hours before the water vaccination is due. This is due to the primary function of a water treatment system that uses either acids or chlorine is eliminate virus and bacteria in the water. As Vaccine is attenuated virus or bacteria, exposure to these chemicals will render it ineffective.

Water Stabiliser should ALWAYS be used as mains and borehole sourced water with either Chlorine or heavy minerals present will damage the vaccine. We recommend Aviblue which has been shown to effectively buffer the vaccine and provide a greater duration of time in which the vaccine will remain effective.

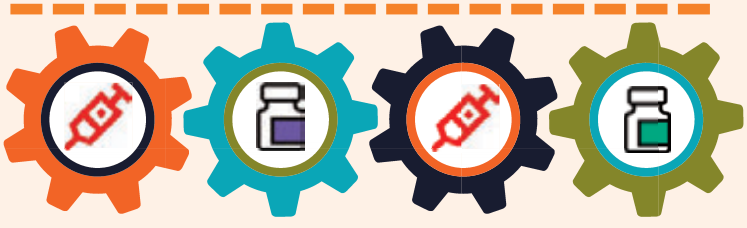
STORAGE OF LIVE VACCINE

The correct temperature to store the Salmonella vaccines is always between 2-8ºC.

For the refrigeration unit used to store the vaccines at the rearing site it is important to bear in mind the value of the goods and their importance in producing fully protected pullets. Therefore, we advise that a new unit is purchased a where possible it should be of a light commercial standard fitted with metal grills and an air circulation fan which ensure an even temperature throughout the entire fridge. These units are also more resistant to external temperature fluctuations that occur in outbuildings.

In order to ensure that this temperature range is maintained we advise our customers to invest in a min/max thermometer that has been validated against a calibrated device.

The device should be stored close to the vaccines in the centre of the fridge and should be reset daily after the Minimum and Maximum temperatures have been recorded.



HANDLING OF LIVE VACCINE

Surface
Vaccine should be prepared on a clean surface that has been wiped with warm water and is free from chemicals and debris. Vaccine should never be prepared on the floor or near to any kind of foot dip. It may be necessary to place a clean plastic bag or paper on the preparation surface.

Mixing Equipment
The equipment used for both the mixing and administration of vaccine should only ever be used for vaccine and clearly labelled as such. Store the equipment off the floor and only ever wash with warm water.

You will need the following
Aviblue Water Stabiliser • A 5-litre measuring jug • A stainless steel whisk • Disposable gloves
A Stock solution container capable of hold 2-3 hours of drinking water at up to 16 weeks of age.

Mixing Method
Remove vaccine from the fridge and check to confirm;

1. The vaccine is the correct type
2. That is within its expiry date
3. That you have the correct number of doses (Never cut doses)

Wearing gloves proceed to measure 4 litres into the measuring jug with 1g of Aviblue. Remove the protective caps from the vials and then submerge the vials underwater and open. This will prevent a cap forming of the freeze-dried vaccine and making mixing easier. Once all vials have been opened underwater then thoroughly mix the solution using a whisk.


WARRIOR


VACCINE
USE
ONLY

STOCK SOLUTIONS

There are several key factors of establishing the correct amount of stock solution to use.

1. The amount of stock solution should be adequate to last a minimum of 2 hours and should be used in 3 hours. Trial work carried out using tongue scoring (a method whereby a strong dye is used to show which birds have consumed the vaccine) has shown that a period of an hour leads to significantly poorer results while more than 3 hours does not show any benefit.

Example: 32,000 birds at 42 days of age will drink approximately 1350 Litres when they have been thirsted and then allowed water for 2-3 hours. As such for a Dosatron set at 2% a stock solution of 27 Litres will be required.

2. Aviblue or a similar water stabiliser MUST be used regardless of whether you are using mains or borehole water. Our own work carried out on behalf of Rosehill by SciTech laboratories effectively demonstrated that the presence of Chlorine, Acids or heavy minerals had a very detrimental effect on the vaccine.

Example: 32,000 birds consuming 1350 Litres with require a stock solution of 27 litres at a 2% administration rate. Aviblue required will be 1 cap per 200L consumed – 1350 / 200L = 7 caps

For Aviblue a cap (25g) should be used per 200L of water the birds will consume.

3. To accurately calculate the volume of vaccine to be given a practise vaccination can be carried out the previous day (without vaccine) over a 3 hour period and water consumed recorded.

LINE PRIMING METHOD

Overview

Failure to completely remove all the water remaining in the lines prior to administering the live vaccine has been shown in trial work carried out in the USA to mean 40% of the birds do not receive a protective dose of vaccine.

Most nipple lines that have been "emptied" by the birds will still contain in the region of 100ml per metre of clear unvaccinated water which will be pushed by air to the far end of the lines leading to these birds not being protected.

Follow Up Actions

In order to refine the vaccination process, we recommend that a note is made of the vaccination start and finish times to allow you to modify the volumes of water used for future vaccinations. Also, the line priming will allow any debris to be removed from the lines and alert the farm manager to the presence of biofilm or mineral build up within the water lines which can be detrimental to bird health.

Once the vaccination is complete, we recommend that you put 4 litres of clean water into the stock solution and allow it to flush the Dosatron pipe and system. All equipment should be washed with warm water and stored away from dust and chemicals.

Two operatives will be needed ideally along with torches, 10L buckets and radios.

1. Check Dosatron to ensure it is set correctly if the unit is adjustable. If needed flush with clean water prior to starting the vaccination.

2. Place stock solution pipe/filter into the vaccine and turn the water feed to the Dosatron and ensure that the bypass has been turned off.

3. If the water lines have been lifted above bird height, then the lights can be left on during the line priming process.

4. If the water lines are at bird height of the rearing unit does not allow the lines to be lifted, then we advise that torches and radios are used.

5. Agree upon a line with which to start and how you will proceed in order of water lines to prevent the flush valve damaging the nipple line connections.

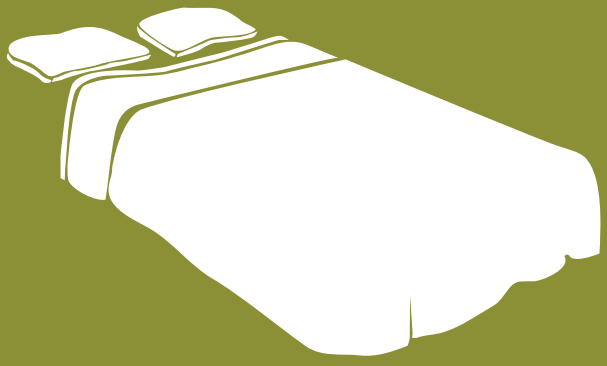
6. An operative should go to the far end of the water line and open the tap to drain into a bucket, once open they should notify the operative at near end to engage the flush valve.

7. Once the blue dye is present at the end of the line the flush valve operator should be notified to turn off the flush.

8. When the pressure has been reduced this line can be sealed and the next line can begin.

9. When complete turn on the lights and lower lines to bird height if needed.

Note: in a modern unit of 40,000 birds this whole process can be completed in as little as 20 minutes.



REDUCING RISKS OF SALMONELLA IN

ANIMAL BEDDING

As with so many health issues prevention is always better than a cure. [journalist details] looks at how choosing the right bedding can reduce the risk of Salmonella being introduced into free range flocks.

It's a simple and obvious fact but the best way to reduce the risk of Salmonella occurring is to ensure that it is not introduced on to the farm in the first place. Alongside the risks associated with the introduction of infected chicks, food, human activity and bedding are naturally the most significant inputs into any free range environment. By better controlling these input risks we can significantly reduce the likelihood of harmful bacteria being present.

Even under the most stringent operating conditions and controls, however, there is always the potential for

bacteria to occur. In this situation the type of bedding being used can play a key role in minimising any impact. This is achieved by avoiding the creation of damp warm environments that provide the ideal habitat for bacterial growth. Birds will work, scratch and turnover bedding, thus allowing certain bedding to release moisture reducing the risks of bacterial growth and allow dust bathing.

With the wide range of products on offer, choosing the right bedding can be a challenge for producers who are looking to control risk and cost, with each come their own benefits and challenges.

Straw – the main challenge with straw is implied in its name. Its tube structure makes it hard to treat as you cannot be sure the chemicals used to sterilize the material are getting inside. This is coupled with the fact that straw is very susceptible to being compromised by wild birds and rodents. As a result, it is regarded as one of the highest risk bedding materials, although widely used with readily available supplies, low cost straw usage can be much higher than other products. On the positive side spent litter from straw use is more widely used on farmland for fertilizer.

Rape straw – is by nature very fibrous and as a result it easily attracts and retains moisture. It is also difficult to treat and if harvested or packed with any moisture it can deteriorate rapidly even before use. Rape straw in the free range scratch areas breaks down much quicker than normal straw and if dry can make ideal dust bathing for the birds, however once wet it struggles to recover.

Shavings – have for a long time been the preferred choice of bedding but over the last 10 years with saw mills and timber manufacturing industries reducing and the introduction of high speed shaving machines that produce a smaller shaving with a much higher dust content, the price of good quality shavings have risen with the equine industry taking the better quality. This has led to shavings falling out of favour due to quality, price and supply. They are also widely used in small scale biomass which again has increased dramatically over the past three years. This has made the sourcing of them even more of a problem due to the seasonal demands of biomass plants outside of the poultry industry.

Shavings are sometimes viewed in a different light, being a by-product of other processes, biosecurity is hard to achieve and as a result it is difficult know what they may have been exposed to throughout the manufacturing process. It is also common for them to have come into contact with wild avian species whilst in open transport. Shavings do have good friability however they can struggle in heavily soiled and capped areas.

Paper – can require a significant amount of treatment prior to being utilised as bedding. It can also be hard to handle especially when it needs to be cleared out as it absorbs water and unlike wood-based bedding it won't release it again making it more difficult for the birds to work or scratch, paper will easily cap. When wet, paper will stick to any surface and is very difficult to remove or clean on turnaround.

There are however other wood based alternatives such as easichick available on the market. These manufactured products retain the positive characteristics of wood in their ability to accept and release moisture but don't break down and compact in the same way as shavings, paper and straw for example. By retaining their structure these products allow moisture to pass through the substrate and allow the birds to work the litter. This in turn reduces the potential for compact damp environment where bacterial growth will be accelerated. It's a bit like a gravel drive which retains its integrity

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Dust free wood fibre bedding

CELEBRATING OVER 18 YEARS

Traceable testing for all bedding produced

For happier, healthier free-range hens

- Zero counts for moulds, Salmonella sp., Pseudomonas, Aspergillus sp., Avian Influenza and Entero bacteria*
- Absorbent and free-draining
- Free moving
- Reduces capping, hock burn and podo
- Allows birds to dust bathe

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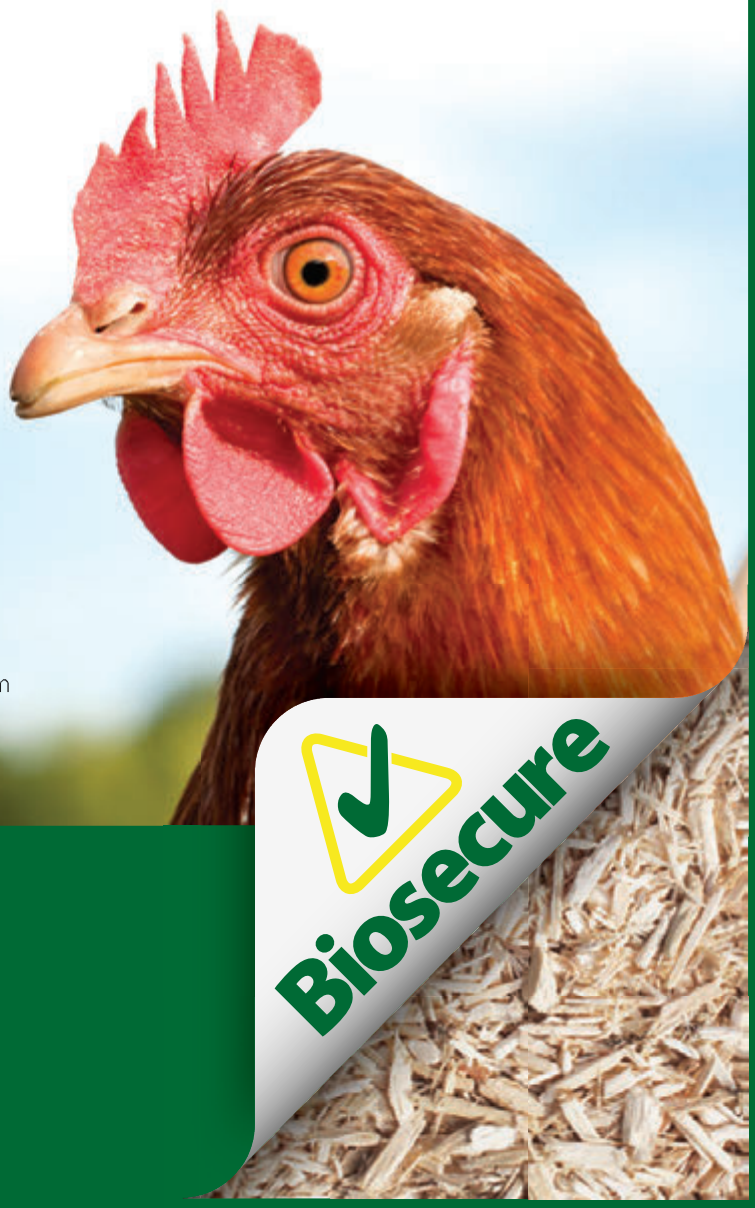
OF&G ORGANIC — APPROVED FOR USE IN ORGANIC SYSTEMS



* 20 organisms/gram (Aspergillus); 10 organisms/gram (Entero bacteria); 20 organisms/gram (Moulds); 20 organisms/gram (Pseudomonas); and not detected in 25g (Salmonella).

For bedding advice and more info:

0161 301 6600

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An enva brand

19087

even when subjected to motion and pressure on the surface the only difference being the disturbance results from hens, pecking and scratching the material.

One of the key innovations developed by easichick is its unique treatment technology ensuring that the bedding is bacteria free and manufactured in a biosecure environment. This unique formulation has been manufactured for the last 15 years and has years of microbiology and toxicology data to provide reassurance to users. This coupled with a modern lab facility and QC systems ensures constant testing to provide consistent bacteria free bedding. As a result, there has never been a single instance of Salmonella in bacteria leaving the production facility.

In addition to reducing input risk and minimising bacterial breeding grounds, easichick also has a practical advantage when it comes to laying. The structure of the product also means that hens don't like to lay their eggs directly on to it. This increases the use of nesting boxes and reduces the number of floor eggs. Whilst they are treated, floor eggs present a higher risk from Salmonella due to their contact with the floor where dirt and bacteria can reside. Even though these eggs will be washed there is the potential for bacteria to have already penetrated the egg due to its porous nature.

One final benefit of the bedding is that if an egg is laid directly onto it then less of the egg's surface area comes into contact with bedding when compared to other more compact beddings – this again reduces the bacterial challenges.

Ultimately, choosing modern specifically designed wood-based bedding products can play an important role in helping free range egg producers to reduce the opportunity for harmful bacteria to enter the birds' environment. It will also ensure hens are kept dry and reduce the potential for damp warm environments that foster the growth of bacteria and other infections. Delivered in easy to handle 20kg bales this Organic Farmers & Growers accredited bedding has over 15 years of happy customers to recommend it.

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THREE KEY BENEFITS OF INSTALLING

ELECTRIC GATES

Gates are vital to everyday poultry farm operations, an essential part of good biosecurity as well as creating peace of mind. In recent years, electric gates have become much more common on egg production units throughout the UK.

With this has come more advanced functionality that offers greater benefits for producers. Here are 3 key benefits from installing an electric gate – like Weaving Machinery's Sliding Gate – on your farm.

1) **Greater Biosecurity**
   Diseases are a huge concern for all producers. Electric gates are designed to only open when authorised personnel arrive – giving you complete control over who and what comes on to your farm. Biosecurity is one of the fundamental foundations for poultry production. Make sure your farm is secure.

2) **Greater Peace of Mind**
   As well as providing a strong barrier against unwelcome visitors, the Sliding Gate features a brushless motor system. Many electric gates run on tracks, which risk becoming clogged with debris and causing constant maintenance issues – as well as leaving potential contaminants exposed. A brushless system, such as the Weaving gate, operates off the ground and avoids this entirely, leaving one less thing to worry about.

3) **Greater Convenience**
   Forget padlocks, fiddling around in the rain, or battling with the gate in high winds. With just a quick few taps on a keypad (or using a fob without even exiting your vehicle) an electric gate slides open and closed without a fuss. It's also possible to install whatever the original terrain of your driveway entrance – slopes and uneven ground are no problem.

ED NOTTINGHAM

INSURING YOURSELF AGAINST

SALMONELLA

"We have certainly seen a marked increase in the number of enquiries for cover," is the opening comment from Ed Nottingham of Scrutton Bland Insurance Brokers when asked by the Ranger about the marketplace for Salmonella insurance at present.

Salmonella insurance has long been on the agenda for many producers, with consistent availability from insurers adding to its popularity over many years. As with all insurance products, the perception of what constitutes a risk to producers is mirrored by insurers, with the two working closely to compliment those producers who have risk mitigation placed high on their management plan.

Top of that list is always bio-security. Whilst this is seen as a mainstay for any commercial producer, the need to reinforce good practices is as strong as ever. Insurers largely rely on the external audit processes of BEIC, packers and retailers to maintain high standards but are

now also rewarding producers who create full contingency plans. This means teaming up with equipment and training providers to ensure that those who take this seriously are rewarded with the best cover and rates available. "Being able to offer financial encouragement for engagement with professional livestock protection providers such as Livetec Systems is certainly one of the better things to happen within insurance in the last couple of years" says Ed. "It is only right that we encourage good behaviour, and we are proud of the role we play in ensuring that the process of getting better never stops."

Free range egg producers will also be part of the National Control Programme (NCP) for Salmonella, and this is seen as a mainstay of eligibility for cover. Ed comments: "Producers are used to the regular testing that is required by the NCP. Not only does it reinforce good practice, it also allows for early notification if there is an issue." And this highlights one key area of concern among insurers: a succession of outbreaks. "Insurers allow for sporadic outbreaks in their financial modelling," says Ed. "But a cluster remains their biggest fear. Stopping the spread of the disease is crucial."

That NCP has led to the routine vaccination of chicks, with flocks now arriving on site with a degree of protection already within them. However, as flocks run longer, the effectiveness of those vaccines has been brought into question, with many having a perceived period of protection of around a year. As Ed says: "Flock age and the length of the expected cycle is something that is now often being asked but was not considered before. Most policies are written on an annual basis – not for the length of the flock – so it is reasonably certain that a flock will be described as 'older' at least once during every other policy. I would hope that by the time the statistics show vaccine efficacy to be a problem, the vaccines will have improved to provide longer protection."

Physical security – or at least the construction of hen sheds to prevent incursions – is also a major concern. "It is a given that the most likely route disease will take into a flock is via rodents" says Ed. "Insurers are increasingly looking to check that the structure is robust enough to withstand this threat. This invariably means the nature and age of a building will be assessed as part of the underwriting process." So does this mean that there are sheds which cannot be insured? "Officially no," says Ed. "The construction of the hen house is part of the assessment, but it's the overall attitude which is really the major factor in what leads to a quotation being obtained. Where there is a will to work together to make the farm security as good as it can possibly be, insurance remains inclusive."

In recent years parts of England and Wales have been deemed to be 'Higher Risk Areas' for Avian Influenza, so does geography also play a part in the risk of Salmonella insurance? "On a national scale, not at the moment," reports Ed. "Locally, when assessing a risk, we look for features which might have a bearing, with the main one being proximity of pigs." Pigs have long been seen as a species in which Salmonella typhimurium has a foothold, and consequently most commercial egg producers do not now have pigs on their sites. But how do you control what is going on around you? "It is very difficult. Long hot summers, outdoor pig units, lots of dust and the wind blowing the wrong way is a tough one to mitigate. Having an awareness of that issue is the start, followed by a chat with the pig site owner as to how they might be able to damp down their site is the ideal way of approaching the issue."

One other area which has become a topic for insurers is co-grazing. Long seen as a complimentary method of range management, co-grazing is now being looked upon as giving a possibly increased risk of infection. "It is not so much the animals that are grazing, more the people who are tending to them," Ed advises. "Liveries are top of that list. Who are the horse owners? Where have they been? And what do they do? These are questions that invariably do not have straightforward answers. Knowing who is coming on to the range and asking them a few questions should be commonplace these days."

Is there anything else for free range egg producers to consider? "It is the simple things," comments Ed. "The everyday factors that are right under people's noses but are maybe overlooked. Footpaths: keep an eye out and pick up any rubbish that might get left behind. Rivers, streams and ditches: keep them clear to give water the best chance of flowing away as flooding invariably brings troubles. Always ask your contractors and visitors where they have been before coming on to your farm. Remind staff not to leave food and drink behind and to clean up after themselves. It's common sense to most people, but also a timely reminder to others."

In the event of an outbreak of Salmonella there are two possible outcomes on the infected site: a culling of the flock or, if markets allow, continued production of eggs which are then sent for heat treatment before entering the food chain. It is a decision which is generally played out in a commercial environment, with insurers accommodating both options. However, that does leave insurers at odds with APHA, who have cited continued production by laying flocks infected with Salmonella as one of their top reasons for the recent spread of the disease. Ed is well aware of the role insurers play in this debate. "Potentially, insurers would rather production continued, as it limits their loss in the first instance," he says. "Does it help to eradicate the disease? Evidently not. Insurers have their part to play but I suspect that the market will dictate the course of events as there are now enough eggs in circulation, and continued production is less likely than it has been in the past."

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Ed is also optimistic about the future: "All the data confirms that the UK remains one of the best in the world at controlling regulated Salmonella. It has taken the hard work and dedication of the whole industry to get us to this point, so it is now more about continuing the established high standards of practice and remaining vigilant, as opposed to reinventing the wheel."

So knowing all this, what does Ed regard as the perfect site to insure against Salmonella? "It's the one which doesn't have an outbreak!" is his succinct response. "But aside from the obvious, it's the egg producer who is doing his level best at all times. Running any farm business is tough, but if you hit the pillow at night knowing you have done all you can, then you're the one for us."

DID YOU KNOW?

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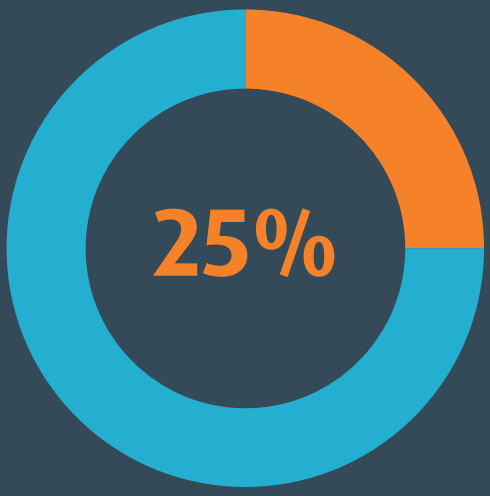

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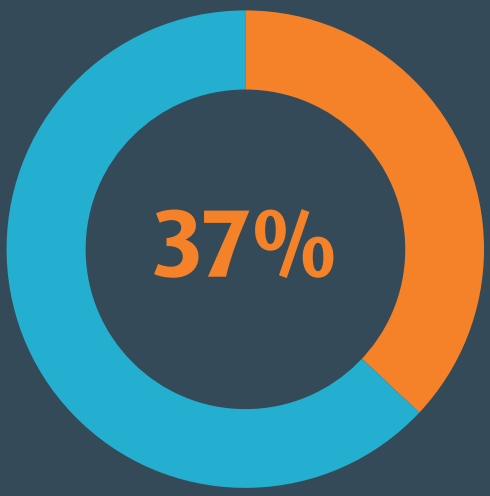

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SALMONELLA POSITIVE FLOCKS

DEPOPULATION

Julian Sparrey - Livetec Systems Ltd

From sampling, to getting an official positive result from APHA can take several days and for some reason that can often happen on a Friday when organising logistics for depopulation over a weekend can be tricky. The full operation requires catching, culling and disposal and each of these can be provisionally planned while you are waiting for results. You should also contact your insurer to see which costs you may be covered for. It is likely you will have at least a week's worth of eggs in storage on farm and you will have to arrange for appropriate disposal of these, under the supervision of an egg inspector.

Catching

Finding catchers for this type of work can be a challenge. There is currently a shortage of skilled layer catchers within the industry and those that exist are fully engaged in routine end of lay work with the key processors. In order to run smoothly you will need a team of 12 catchers. Getting catchers released from routine work is further complicated by the fact that they should be placed in quarantine for 48 hours following handling Salmonella positive birds. This also means you will have to pay for 2 additional catching shifts, unless you can organise the job for a Friday when this may be reduced to one if they can use their normal day off.

Culling

The most practical way to depopulate birds on farm is using containerised gassing units (CGUs), in theory you are permitted to use whole house gassing, but there is presently no UK based company that offers this service. The CGU systems simply requires birds to be caught and placed into transport modules, as they would at end of lay, then the modules loaded into a chamber. The birds are then exposed to an argon based gas mixture which has been shown to be one of the most humane methods of controlled atmosphere killing. Provided all the logistics are in place for disposal then the throughput of the CGUs will match the rate of catching.

Disposal

Provision for the disposal of carcases must be in place before the operation can start. Salmonella affected birds killed on farm are covered by Animal By-Products legislations and are classified as Category 2 material. They must be transported in leak proof vehicles by an qualified ADR driver. There are several rendering companies available to do this. Each bulker can carry about 25 tonnes of carcases, so for instance a 32 000 flock would need 3 bulkers to be scheduled in. In addition to the carcases you will also need to dispose of impounded eggs. Whilst a proportion of these can be sent with the carcases if you have a large quantity you may need to schedule in additional vehicle – check with your rendering company.

Summary

As you can understand, running a depopulation operation on farm requires carefully planned logistics to run as smoothly and efficiently as possible. There are many regulatory conditions to comply with, from licensed slaughters to supervised disposal of eggs. In additional the highest level of bio security must be maintained to prevent the pathogen spreading to other sheds. Livetec Systems specialises in running this type of operation, but you must also speak to your insurer to see if the costs of such an operation are covered by your policy, as they run into the 10s of thousands of pounds.

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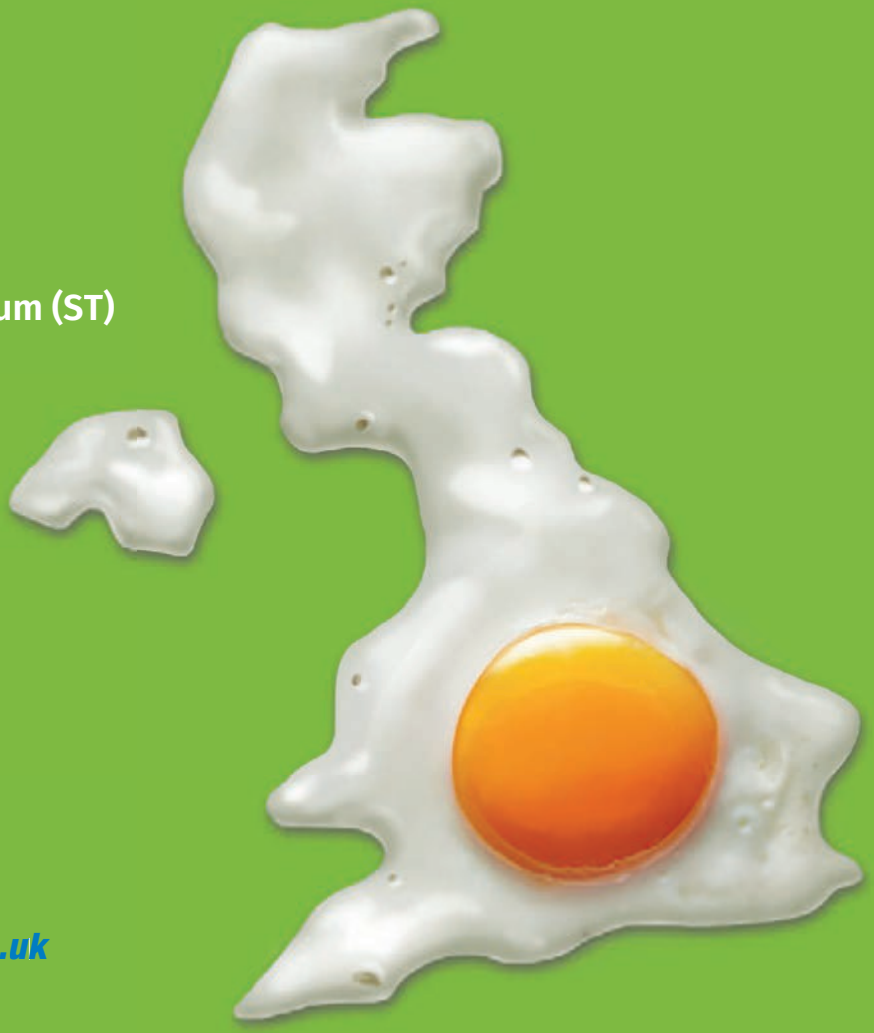

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References: 1. AviPro Salmonella Duo 2018 sales data relative to total pullets in the UK. **2.** AviPro Salmonella Duo lyophilisate is for use in drinking water, and is indicated for use in future layer hens: For active immunisation of healthy and susceptible chickens to reduce faecal excretion and colonisation of internal organs with *Salmonella* Enteritidis and *Salmonella* Typhimurium field strains and to reduce colonisation of eggs with *Salmonella* Enteritidis field strains.

Elanco UK AH Ltd, Lilly House, Priestley Road, Basingstoke, Hampshire RG24 9NL. Telephone: 01256 353131 Email: elancouk@elanco.com

Date of preparation: 25th June 2019 PM-UK-19-0454

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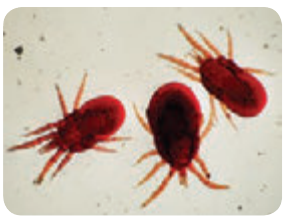

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** Avian Pathol. 2011 Feb;40(1):33-42. Evaluation of commonly-used farm disinfectants in wet and dry models of Salmonella farm contamination. McLaren I, Wales A, Breslin M, Davies R.

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