Straight tips for *Salmonella* prevention

Prevention first.
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Prevention of *Salmonella* infection can be managed most successfully by an “integrated approach”. All potential transfer sources of *Salmonella* to poultry (feed, day-old chicks, water, staff, etc.) should be carefully considered when you evaluate intervention strategies against *Salmonella*.

This leaflet is designed to assist decision-makers of integrations as well as farmers and farm managers to list and control preventive measures. It contains a selection of possible intervention strategies for *Salmonella* control at farm level, for the following areas:

1. Farm management
2. Flock management
3. Cleaning and disinfection
4. Feed hygiene
5. Water hygiene
6. Personal hygiene
7. Litter hygiene
8. Manure
9. Integrated rodent control
10. Integrated insect control
11. Carcass handling

For more detailed information, please contact your local Lohmann team.
The potential sources

Studies have identified widespread animal and environmental sources and vectors of *Salmonella* in farming:

a. Livestock (e.g. poultry, pigs, cattle, sheep) and pets (e.g. cats and dogs) – dead and alive

b. Day-old chicks (DOC)

c. Environment:
   - Air
   - Dust
   - Soil
   - Water (effluent, puddles, pond water, surface water)

d. Equipment (transport crates, tools, buckets, machinery)

e. Feed and water

f. Fresh litter (esp. straw)

g. People (via cars / vehicles, boots, clothes, hands, hair, etc.):
   - Farm staff, mechanics, vets
   - Catching crews, vaccination crews, feed and chicken delivery crews, drivers of vehicles (manure removal, rendering plant)
   - Advisers, inspectors, private visitors, etc.

h. Insects (beetles, flies, mites, cockroaches – including their different development stages e.g. eggs, larvae)

i. Rodents (mice, rats)

j. Wild birds and wildlife

There are multiple ways of *Salmonella* introduction. Therefore, single measures will not work. Only comprehensive and multiple prevention measures will achieve effective and target-oriented *Salmonella* control.
1. Farm management

A farm is one of the most important parts of the food supply chain – human food is produced here!

1.1 Chickens should preferably be obtained from breeding flocks and hatcheries that are certified as free of any *Salmonella*.

1.2 Humans: Reduce farm and poultry-house visitors to an absolute minimum. Only give access to visitors if it is really necessary.

1.3 Provide and use a visitor book.

1.4 Place disinfectant foot dips at all entrances.

1.5 Wear different clothes (overall, hairnet and boots) when entering each shed.

1.6 Ideally, flocks should be single-species enterprises and an all-in / all-out single age group principle should be adopted whenever possible.

1.7 Veterinary control: During the production cycle a veterinarian should be responsible for monitoring flock health on the farm.

1.8 Education, training: Farmers and their staff should have access to basic training on hygiene and bio-security measures relevant to poultry production and food safety.

Wrong:
The disinfectant in this foot dip has not been changed regularly, has become polluted and therefore provides inadequate protection.

Right:
Use appropriate foot dip / mat, regularly renew disinfectant. Visitors also need to wear disposable over-shoes.
1.9 Operate a black-and-white system on the farm premises and in the poultry house. (Black-and-White system: separating a premise or process in a clean and a dirty part is one of the methods that can be used to reduce the risk of transferring physical, biological, chemical contaminants from one area to the other. The system may include both structural or behavioral means to achieve the above mentioned separation).

1.10 Tidiness: Keep the farm area tidy, cut the vegetation regularly and avoid growth at a distance of at least 2 metres from the poultry houses.

1.11 Do not store junk and old machinery on the farm since it provides hiding places for vectors of Salmonella contamination.

1.12 Immediately remove any residues (e.g. feed) which could attract vectors of Salmonella contamination (e.g. rodents, wild birds).

1.13 All areas immediately surrounding the poultry houses as well as the main (transport) tracks and frequently-used routes should be paved to ease cleaning and disinfection and to avoid forming of puddles.

1.14 Avoid the storage of wastewater on the farm.

1.15 Farm protection: Protect your property. Separate the premises and the surrounding area with fences.

1.16 Keep gates and doors closed.

1.17 Instruct all visitors to park outside the designated area.

Wrong:
Debris offers hiding places for Salmonella vectors. This farm area can be accessed from every side.

Right:
This farm area is completely fenced in and tidy.
1.18 House and farm maintenance: Set a maintenance plan in place and instruct your staff to operate it. Regularly check house construction and equipment for technical condition, particularly in regard to possible pathogen entry points. Cracks and damage in the poultry house may provide entry points or hiding places for *Salmonella* vectors.

1.19 Make the building airtight: do not let external air into the flock area except through the air inlets. Other openings, such as doors, roof, windows, etc. disturb the house’s environment, significantly increase the cost of ventilation and allow contaminated vectors (insects, rodents, etc.) or dust to enter the flock area.

1.20 Information flow: An interactive communication and interaction between all people involved – from the breeding unit to the farm and the final processor – needs to be established. Keep house cards, veterinarian’s control reports, reports on delivered goods to and from the farm together with certificates, available on the farm.

Wrong:
The floor in this poultry house shows deep cracks which are difficult to clean and disinfect.

Right:
This concrete floor is sealed and can therefore be easily cleaned and disinfected.
1.21 Other inputs: Only buy in materials with low *Salmonella* risk.  
Try to obtain certificates wherever possible and archive them for a proper record.

1.22 Tools: Preferably use ‘farm-specific’ tools and machines.

1.23 If you share machinery with other farmers, clean, wash, and disinfect it on return.

1.24 Clean and disinfect tools which are moved from one house to another (e.g. scales).  
Preferably use house-specific equipment and tools only.

1.25 Other species: Other farm animals and pets are potential *Salmonella* vectors!
Pets, such as cats and dogs, should not be present on a poultry farm.

Wrong:
The broom is stored outside where it can easily get in contact with contaminated materials, dust and vectors.

Right:
Clean and disinfect tools immediately after usage and store them in a hygienic way.
2. Flock management

The daily care of your birds is essential to provide a safe product.

2.1 Feeding and drinking systems should be operated according to the manufacturer’s guidelines.

2.2 Check the flock twice a day for signs of discomfort, disease and any lack of feed and water consumption.

2.3 Manage the flock according to the breeding and integration standards. Inform your veterinarian and/or the integrator if flock data alters from these standards.

2.4 Ensure (local) immunity by using *Salmonella* vaccines (via drinking water).

2.5 Record all flock related data in a consistent and structured way. This includes flock history, surveillance activities (e.g. pest control, lab results), treatment and vaccinations for each flock.

2.6 Record on a daily basis: data on production and performance. To assist you with that, computer programs to record and analyze the data are useful.

Wrong: With this limited documentation it is difficult to monitor the development of the flock and to compare different cycles.

Right: Data management systems assist you to organize, analyze, supervise and optimize your farm data (e.g. with Lohmann’s Living Integration).
3. Cleaning and disinfection

Cleaning and disinfection form the basis of protection for each new production cycle containing valuable and healthy birds!

3.1 Cleaning and disinfection (C&D) should be part of a comprehensive and regularly implemented hygiene plan.

3.2 C&D encompasses all surfaces inside and outside the house, gates, doors, windows, ceiling, roof, service room, feed system (e.g. silo, auger, chain, weigher, and pipes), carcass container, water and ventilation system, etc. It also includes the technical equipment inside and outside, vehicles, tools, furniture, storage and social rooms, egg packing stations, clothes and all other farm related items.

3.3 First, carry out a thorough cleaning! This is the basis for an effective disinfection.

3.4 To ensure good results an external and certified service-provider may be hired.

3.5 Evaluate the efficacy of cleaning and disinfection regularly by using a professional consultant.

3.6 Cover outside dips for foot disinfection with a lid and renew solution regularly.

3.7 Clean, wash and disinfect loading places immediately after delivery and loading of livestock.

Wrong: Cleaning and disinfection measures should also include the feed weigher.

Right: Cleaning and disinfection measures should also include the feeding line inside.

Wrong: Cleaning and disinfection measures should also include the ventilation system.

Right: Cleaning and disinfection measures should also include the ceiling of the poultry house.
4. Feed hygiene

Look out! Feed can become contaminated during production, via transport or even storage.

4.1 Buy only *Salmonella*-free heat-treated feed (ask for certification!).

4.2 In case of on-farm mixing, treat the raw materials with organic acids (i.e. Cuxacid*) and monitor it for *Salmonella*.

4.3 Specify that feed additives like acids (i.e. Cuxacid*) and probiotics (i.e. Toyocerin* *) are incorporated into the feed consumed.

4.4 Ensure that all feed is consumed within one cycle.

4.5 Clean and disinfect the silo, the feed auger and the connecting parts regularly.

4.6 If you use buildings to store feed, they should be constructed and maintained in a suitably safe way.

4.7 If possible, use an external company to evaluate your feed line hygiene.

4.8 Avoid contamination during feed delivery.

Wrong:
Area beneath this silo is bare ground and not concreted. This is not easy to clean. 
Direct contamination by feed auger and connection tube is possible.

Right:
Concreted surface and clean silo.

* Toyocerin* is a registered trademark of Rubinum S.A., Spain
5. Water hygiene

For a good performance and health, birds need the best water quality.

5.1 Prepare the drinking water system in a way that you, personally, would drink from anytime.

5.2 Clean and sanitize all parts of the supply system between the cycles.

5.3 Annually test your water for compliance with the bacteriological, chemical and sensorical standards.

5.4 Check the system for leakages twice a day and immediately repair any damage.

5.5 Avoid any contamination of the water. Cover all open parts of the system (e.g. the medication tank).

5.6 Perform regular flushing to provide fresh water for the birds.

5.7 Flush your water system frequently in order to avoid and reduce biofilms in the pipeline. These may be a reservoir for pathogens such as Salmonella.

5.8 Administer Salmonella vaccine via water together with marker substances (e.g. AviBlue®) in order to ascertain whether the vaccine titre has reached each bird. AviBlue® shows up any irregularities in the drinking system, including blockages and leakages.

5.9 Set up a complete programme of acidifier (e.g. Cuxacid®) and other nutritive additives (AviPro® Liquid or Lovit products) according to production conditions.

Wrong:
This water from the drinking line can be contaminated with residues and bacteria and might affect the birds’ health.

Right:
Visually clean water for provision to the birds.
6. Personal hygiene

Watch out – Salmonella may occur everywhere in the environment!

6.1 It is very likely that you and your farm staff as well as people temporary working at your farm (e. g. catching crews, vaccination crews, visitors and mechanics) carry Salmonella and/or other pathogens on their boots, hands, hair, clothes, etc.

6.2 Ensure that farm personnel do not keep poultry (including pedigree poultry) at home.

6.3 Provide clean and tidy changing rooms and sanitary facilities for your staff and visitors.

6.4 Implement a hygienic barrier in the service room to avoid introduction of Salmonella and other pathogens.

6.5 Staff and visitors should sanitize their hands and change their clothes and shoes before entering and after leaving the poultry house. Visitors should use disposable clothing (overall, hairnet and footwear) which should not be used more than once!

Wrong: All sanitary facilities need to be cleaned and disinfected regularly to avoid a transport of pathogens into the poultry house.

Right: A hygienic separation of the outside farm area and the poultry house with lockers for external and internal garments belonging to the staff and a shoe deposit.

Wrong: Proper hand washing is not possible here.

Right: Appropriate hand sanitation facilities outside the entrance door to the flock.
7. Litter hygiene

From production to storage and during transport contamination of fresh litter with *Salmonella* can occur.

7.1 The optimum litter is free from pathogens and certified.

7.2 Stored bedding material should not have access for wild and migratory birds.

7.3 Regularly check the litter storage for moisture, beetles, rodents, cats, etc.

7.4 Establish a rodent-monitoring regime in the litter store.

7.5 When adding litter during the production cycle, clean tyres of the vehicle before driving into the poultry house.

7.6 Keep litter as dry as possible.

7.8 Immediately replace wet and sticky litter.

7.9 Occasionally you may mulch or till the litter to control humidity and eliminate the development of dry pads.

Wrong:
Storage of litter without any protection against rain and rodents. Wet litter can become mouldy increasing the risk for immunosuppression and infection.

Right:
Heat-treated, hygienically packed litter is stored in a fully-covered storage on a concrete surface.

Wrong:
Leakages in the water-line lead to wet litter and increase the risk for footpad lesions.

Right:
An adjusted water pressure and regularly maintained drinker lines keep the litter dry.
8. Manure

Caution! Contaminated manure can spread *Salmonella* throughout the premises.

8.1 It is recommended that all faeces and litter are immediately removed from the houses.

8.2 Do not store manure on the premises.

8.3 Clean and disinfect surfaces as well as the machines and transport vehicles directly after usage.

Wrong:
Do not store manure on the farm.

Right:
Clean and disinfect all surfaces in the outside area as soon as the manure has been removed from the premises.

Wrong:
Manure belt connection to the houses is not sealed.

Right:
Manure belt is covered.
9. Integrated rodent control

Rodents can carry up to even 45 diseases. They damage wood and electrical wiring, destroy insulation, contaminate and consume considerable quantities of feed.

9.1 Maintain sound ‘housekeeping’. Eliminate loosely-piled building materials, old feed bags or anything else that a rodent can hide in or under.

9.2 Implement a comprehensive rodent monitoring.

9.3 Establish a gravel strip (1-2 metres wide) around the poultry house.

9.4 Use traps and attractant baits with effective poisons.

9.5 Let specialists check the prevalence of resistance against rodenticides used on the farm.

9.6 Cats cannot eliminate a rodent problem.

Wrong:
Rodent control is not implemented effectively – even dead mice and rats can carry *Salmonella*.

Right:
Pest control is monitored regularly by a professional, external service provider.

Wrong:
Rodenticide is positioned in direct environment of the birds.

Right:
Baits should be fixed inside the box, labeled and checked regularly.
10. Integrated insect control

Many insects (cockroaches, mites, flies, beetles) can carry *Salmonella* and other diseases, damage housing, consume and contaminate poultry feed.

10.1 Comprehensive insect control comprises proactive monitoring and larvae control.


10.3 Beetle control: permanent sealing of insulation and holes. Check and document after each service period. Use long-term effective insecticide before housing the next production cycle.

10.4 Mite control: regularly check typical nesting places as well as the behaviour of the birds. Use approved (long-term active) acaricides appropriate to the birds and their environment.

10.5 Test the effectiveness and success of insecticide usage.

10.6 The service of a professional insect control company may be used.

10.7 Consider the different life cycles of the insects.

10.8 Document every application of insecticides properly.

Wrong:
Black beetles were not removed properly after cleaning – even dead beetles can carry *Salmonella*.

Wrong:
Massive infestation of red mites. Proactive measures are easier than getting rid of mites once established in the poultry house.
11. Carcass handling

Watch out – carcasses attract wild birds and rodents if not stored safely.

11.1 Sick and dead birds should be removed from poultry houses at least daily.

11.2 Store dead birds in a safe place where wild birds and other animals cannot enter.

11.3 Place the carcass container on the periphery of the farm on a concrete surface, next to the gate or, preferably, next to the farm road.

11.4 The carcass container should be cooled and easy to clean and disinfect.

11.5 Clean and disinfect bins after the transport of the carcasses to the container or use degradable bags for one-way disposal.

11.6 Do not allow a build-up of flies around carcass containers.

Wrong: Carcass container is next to the house on a non-concrete surface.

Right: A cooled and locked carcass container at the periphery of the farm.
Why fight *Salmonella*?

*Salmonella* are bacteria and can cause zoonoses. This means that they can be transferred from livestock to humans. Main sources for *Salmonella* infections in humans are eggs, egg products and poultry meat. While poultry mainly do not show any clinical signs, a *Salmonella* infection can evoke different diseases in humans. Normally, *Salmonella* can cause diarrhoea in humans but for people with a weak immune system such as infants, small children, immuno-suppressed or elderly people, a *Salmonella* infection can lead to serious diseases and in some cases also to death. Due to this high risk, *Salmonella* needs, firstly, to be reduced at farm level. Furthermore, high incidence of *Salmonella* generally may indicate poor hygiene and biosecurity, and consequently presence of other non-wanted germs, such as *Campylobacter*.

To reduce *Salmonella* contamination in poultry to an acceptable level, several national and international regulations were introduced or are currently under discussion / in development. These regulations have to be considered on international food markets and for trade affairs. Although a certain reduction has already been achieved, some countries still struggle with relatively high incidence rates of infections in poultry at farm level. Here, comprehensive measures need to be implemented within the whole production chain with the farm as a central element.

The challenge

*Salmonella* has the ability to survive for long periods both inside and outside the chicken. In dust, for example, *Salmonella* can survive for up to 2 years, in feathers 1-4 years and, in faeces spread on the walls of a poultry house, even more than 5 years.

Since *Salmonella* are not visible to the naked eye, many type of precautions need to be taken
Animal Health.
We mean animal health literally:
The good health and the well-being of the animals ensure long-term, top-level performance.
From experience we are the primary point of contact for our customers and partners in industrial livestock production.

Prevention first.
We stand for prevention in animal health: 
“Prevention first” describes the basic attitude that guides our reasoning and actions and that makes us stand out from our competitors. Both ecologically and economically speaking prevention can dispense with the need for therapy.

Integrated Solutions.
We set standards:
In order to extend our position in the market on a long term basis, we provide solutions for food production that is as ethically responsible as it is efficient and save – in Germany and all over the world.