SALMONELLA CONTROL IN BROILER FLOCKS

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Introduction

In the Dutch broiler industry Salmonella paratyphi B biovar. Java (S. java) is the predominant serovar. From all poultry meat Salmonella isolates, S. java increased from approx 17% in 1999 to over 50% in 2002 (van Pelt et. al., 2003). Although the Dutch Salmonella intervention program succeeded in a decrease of Salmonella incidence in broiler meat from 35% in 1998 to <10% in 2003, the emerging S. java prevents a further decrease.

In a research project on a number of Dutch broiler farms a guided intervention program was carried out in order to control and eradicate S. java.

Although S. java is important as a zoonosis agent, its developing antibiotic resistance pattern is of concern. The resistance against flumequine increased from 19% in 2001 to 39% in 2002 (van Pelt et. al, 2003).

The origin of S. java is not known, but feed ingredients or broiler parents in 1997-1998 may be involved. S. java was neither isolated from a Dutch parent flock, nor from compound feed recently.

Materials and Methods

S. java appears to be very persistent in broiler houses, so the project started with a risk analysis and an inventory of critical points after cleaning and disinfection at a broiler farm.

- Farm hygiene (Good Farming Practice) of all farms was of high standard
- The cleaning and disinfection process was carried out very thoroughly and checked by swab sampling
- The buildings, floors and equipment was closely monitored and repaired, when necessary
- The operation during broiler raising was intensively monitored,
- Extra sampling during every round was carried out, in order to know when S. java was introduced in the house.
- The internal part of the feeder system in the broiler house was disinfected
- Every farm increased the eradication of insects and rodents.
- Water and feed were treated with organic acids (short chain or medium chain)
- Antibiotic resistance pattern was estimated from every S. java isolate
- Etc.

This inventory suggested that not a general strategy could be followed for every broiler farm. On basis of this risk analysis a specified intervention was designed for every single farm. The eradication of S. java by application one single intervention proved to be not successful. When a number of different interventions were applied they acted as a hurdle system and stimulated one another.

The hygienic standard on farms was very high, as was illustrated by most farms where the Salmonella infection was not present in all broiler houses but limited to a small number. On these farms often the infection occurred in the same broiler houses in successive rounds.

Results and Discussion

From weekly monitoring on the farms, it appeared that at most of the farms broilers were S. java positive during the first week of life. In some farms S. java could be isolated at three or four week of age. Vertical transmission could be excluded in these flocks by intensively monitoring hatchery debris and paper inlays of transportation crates of one-day-old chicks. Feed samples taken from silos proved to be Salmonella negative. At a small number of farms a lot of *Alphitobius diaperinus (A.d.)* beetles and larvae (lesser mealworm or black beetle) were observed from week 2 or 3 onwards, and appeared to be Salmonella positive. Since the broilers were already Salmonella positive at that time, A.d. was not held responsible for the present infection.

Salmonella could be isolated from feed of the feed pans, but this infection was obviously taken from the direct environment such as faeces.

The results of this monitoring led to the suggestion that the infection was present in the broiler house at the time that the broilers arrived. Swab sampling of the broiler house after cleaning and disinfection showed in some cases residual Salmonella especially in cracks and joints, sewer systems but also in the feeder system and roof ventilators that could not be dismantled during cleaning. Moreover, from joints between floor and walls after cleaning and disinfection, beetles and larvae entered the broiler house. They appeared occasionally to be S. java positive.

Long periods without animals in a broiler house without additional cleaning, disinfection or reparations does not eliminate the infections, as was observed in The Netherlands after the Avian Influenza crisis.

In the broiler farms where S. java infection at week one was observed, the feeder system was disinfected internally with organic acids and cracks and joints filled with flexible pasta. Ventilators were dismantled when necessary.

The following round either S. java had disappeared from the farm or from a number of houses on an infected farm. During the next rounds interventions were increased when necessary, i.e. in case S. java was not eliminated on the particular farm.

These additional interventions were chosen from the following list.

- Sewer systems in broiler houses were additionally disinfected and closed
- Air inlet valves were extra cleaned externally

- Application of Competitive Exclusion flora at day one.
- Use of one-day-old chicks of vaccinated parent flocks, so maternal immunity would offer additional protection.
- Medication on basis of resistance patterns of S. java.
- Application of detergents for cleaning and different disinfectants (preferably formaldehyde), although no resistance against these agents was found.

In total approx. 25 farms were monitored intensively and applied a specific intervention program. About 70% of those farms are S. java free now for about one year or even longer. On a small number of farms interventions were applied right after the first infected flock was slaughtered. In these farms the successive flock was Salmonella negative again. In one occasion not S. java was isolated, but S. infantis appeared to be persistent on that farm. After application of a similar intervention program this farm produces Salmonella negative broilers again. Unfortunately not all farms succeed, but in many cases the problem is that technical state of the houses is such that thorough cleaning and disinfection is impossible with traditional systems. In these farms, application of steam disinfection could be a solution, although this is very expensive and may cause damage to the plastic equipment of the broiler house.
This type of farm often suffer from insect problems, which can contribute in continuation of the infection. Additional eradication programs are required here in order to destroy the insects that enter the broiler house.

Conclusions

The eradication of Salmonella on frequently infected broiler farms is not very easy and requires a complicated approach, thorough coaching and frequent sampling. There is no generally applicable package of interventions and every farm should be considered individually so an adequate package can be designed.
Salmonella could be isolated most frequently from the feeder system, from cracks and joints, insects that stay in the house and ventilators. In many farms chicks were infected with Salmonella during the first week of life and I these farms feeder system often was Salmonella positive.
Eradication of Salmonella from frequently infected broiler farms is often a matter of applying an increasing number of interventions, which in the end may be successful.
Farms that are free of Salmonella have to apply an elevated hygiene standard for a number of successive rounds, and probably need a number of additionally applied interventions such as acidification of drinking water during the first two weeks.

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References.

Van Pelt, W., et. al., 2003, Eurosurveillance, vol 8, no 2, pp. 32-35