

Salmonella contamination in the feed industry

and strategies to deal with the problems in Sweden
and Svenska Foder

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Outline of my presentation

- The Swedish strategy
- Strategy in the feed industry
- Raw materials
- Heat treatment
- Risk of recontamination
- Monitoring systems
- Decontamination
- Conclusions and recommendations

History

1953 9000 sick people from S. Typhimurium

1958 Stiftelsen Veterinär Foderkontroll was founded

1961 Salmonella legislation. Control of the whole production chain; breeding animals, feed, animal production, slaughter. All findings of Salmonella in feed, animals, food and humans must be reported to the authorities. All serotypes of Salmonella are fought.

1991 Salmonella control in feedmills according to HACCP principles.

Salmonella strategy in the feed industry

1. Keep the unclean side clean
2. Heat treatment
3. Avoid recontamination
4. Frequent monitoring of the production line instead of the finished feed

Early detection – immediate measures!

Unclean side – Clean side

Cold side – Warm side

- A proper heat-treatment will kill-off Salmonella
- The ground feed is treated with hot water steam in a conditioner and then pressed to pellets (friction heat)
- The production line from the pellets-press and forward is called the clean side.

Feed free of Salmonella

Two alternatives

Alt 1. 100% efficient heat treatment

100% prevention of recontamination

- difficult to achieve in older feed mills not designed for this purpose.

Alt 2. Keeping the Salmonella pressure in the surrounding environment as low as possible

Efficient heat treatment.

Minimizing the risk of recontamination

Keep the unclean side clean

- High hygien standard
- Keep out birds, rodents etc
- Check the **raw materials** for Salmonella before it enters the feed mill. Keep risk raw materials in quarantine until declared "free"

High risk: raw materials of animal origin and by-products from the production of vegetable oils.

Low risk: Cereals and cereal by-products.

In general: Higher probability to find Salmonella in heat treated products than in non- heat treated products

Salmonella contamination in imported feed raw materials to Sweden

Official data from 2004-2005

| | |
|---------------------|-------|
| Soybean meal | 14,6% |
| Rapeseed meal/cakes | 10,0% |
| Corn gluten meal | 9,0% |

Our own experiences:

Some suppliers have more problems than others
From the same suppliers we often find the same serotype. Stationary infections?!

Heat treatment

- Swedish legislation: $> 75^{\circ}\text{C}$ for poultry feed
- Svenska Foder AB: $> 82^{\circ}\text{C}$ for all feed

Time and temperature: $75^{\circ}\text{C} * 30\text{ s.} \Rightarrow 10^3$ decrease

Long time conditioner: > 2 min retention time

Risk factors associated with heat treatment:

- Insufficient temperature
- Insufficient time
- Insufficient heat treatment after a stop in the production
- Insufficient heat treatment due to heavy contamination of the raw materials
- Heat resistant strains of Salmonella

Risk of recontamination

- Salmonella present on the unclean side or the surrounding environment
- Insufficient heat treatment
- No physical barrier between clean and unclean side
- The processing line, silos and transport vehicles are used also for non- heat treated feed and raw materials
- Flow of air and particles from unclean to clean side
- People entering the clean side without using protection clothes
- Birds, rodents and insects have access to the clean side
- Tools and equipment are used on both clean and unclean side

Risk of condensation

Salmonella needs a substrate, the right temperature (5-46° C) and free water in order to grow.

Look for big temperature gradients => condensation

- Top of the cooler, cooler room and inlet- and outlet canals, feed conveyors and top of silos.

Risk factors

- Insufficient cooling, insulation, aspiration and ventilation
- Water leakage
- Areas difficult to inspect and clean

Salmonella monitoring systems

Svenska Foder AB

Unclean side

- Risk raw materials
- Elevator foot of raw material intake*
- Central aspiration system*

Critical control point: Pellet temp $> 82^{\circ}\text{C}$

Clean side

- Top of pellet cooler*
- Cooler room*
- Top of silos for finished feed *
- Places where condensation/water may occur

* Weekly samplings of dust and scrapings sent to State Laboratory. Compulsary in feed mills producing poultry feed

If Salmonella is found

Raw materials: Decontamination using organic acids (formic-propionic) and retested before used. Heat treatment probably better, but not used in practise.

Unclean side of the feed mill:

- 30-40 extra samples taken
- Dry cleaning ("metal clean") of affected areas and disinfection with formaldehyde

Clean side of the feed mill:

- Production and feed deliveries stopped
- Dry cleaning ("metal clean") of total production line and disinfection with formaldehyde

All Salmonella findings are serotyped

Conclusions and recommendations

- Check the raw materials for Salmonella and don't let contaminated raw materials enter the feed mill
- Keep the unclean side of the feed mill as clean as possible
- Efficient heat treatment of all feed
- Don't control the feed. Control the critical control points in the production line
- Minimize the risk for recontamination (physical barrier)
- Avoid condensation and free water

Desired outcome from Biotracer from a feed producers point of view

An efficient sampling plan. High probability to detect Salmonella in heterogenous contaminated consignments to a reasonable cost.

Rapid methods for detection of Salmonella. Make screening of raw materials and finished feed possible without quarantine storage.

Quantification methods for Salmonella. Useful in risk management