Salmonella reduction in pig herds and pork – The Danish Experience

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Overall results

- Human cases
- Carcass prevalence
- Prevalence in herds
- Lessons learnt

Risk factors for high seroprevalence and interventions in high prevalence herds

Practical salmonella-control

- Negative herds
- High prevalence herds

Conclusions
Results

Figure 1.1. Total incidence of human salmonellosis and estimated human incidence due to domestic broilers, pork, table eggs and imported meat products in Denmark, 1988 to 2013

Note: In 2013, imported sources may be underestimated, as imported ducks were not included for lack of data, and imported beef corresponds to an estimation based only on S. Dublin from previous years (2009-2012).
Source: Danish Zoonosis Centre, National Food Institute
Percent positive carcasses

More sensitive method implemented

Salmonella
Typhimurium
Herd level

Proportion positive herds and Average prevalence in positive herds from 1995 to 2012.
Lessons learnt

Uncontrolled spread of Salmonella typhimurium between herds
  • Epidemiological misinterpretation for 10 years

High prevalence herds can reduce the level

Improved hygiene in slaughterhouses is the most important success factor
  • Highest cost-benefit ratio
  • Herd interventions prevented very high increase in pressure
Risk factors for high levels and interventions in high prevalence herds
Risk factors for introduction - buying in infected animals

Breeder/multiplier → Gilts/boars → Sow herd → Weaners/growers → Finisher
Management and hygiene

All in-all out by room
Improved hygiene and disinfection
No moving of pigs between rooms
Rodent and bird control

Good effect under experimental conditions
Unreliable as only intervention under practical conditions
Epidemiological results

<table>
<thead>
<tr>
<th>Pelleted feed/meal</th>
<th>Liquid feed/dry feed</th>
<th>Relative risk</th>
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<tr>
<td>Pellets</td>
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<tr>
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<tr>
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</table>
Mechanism

Meal – coarse ground
Increase in viscosity of gut content
Increase in lactobacillii
Increase in organic acids
Decrease in coliforms
Decrease in salmonella
Decrease in productivity
Effect of adding non-heat treated barley or wheat to pellets

Months after feed change

Percent positive
Liquid feed

Protective effect
Probably depending on pH (fermentation)
pH<4.5 essential
Organic acids for finishers

0.5-1 percent in feed
Formic acid/lactic acid has been tested
Benzoic acid promising
Organic acids in drinking water
Sows and weaners

Feed interventions have less effect compared to finishers

Cannot achieve a very low level
Expected effect of reduction strategy

High prevalence herds can reduce to approximately one third of previous level
NOT TO ZERO
Practical salmonella control in typhimurium-negative herds

Stay negative
Practical salmonella control in high prevalence finisher herds

Improved management and hygiene

• All in-all out
• No moving of pigs between units
• Optimized cleaning
• Correct disinfection protocol
  — Oxydicing agents
  — Glutaraldehyde
Practical salmonella control in high prevalence herds

Improved management and hygiene

• All in-all out
• No moving of pigs between units
• Optimized cleaning
• Rodent/bird control
• Correct disinfection protocol
  — Oxydicing agents
  — Glutaraldehyde
Dry feed

Step one
• Add organic acids 0.5 to 1 %
  — Formic or lactic acid has proven effect
  — Others may be good, benzoic?
• More barley

Step two
• Optimize protein
• Add non-heat treated barley or wheat to pellets

Step three
• Change to home-mixed meal
Liquid feed

Measure pH (<4.5)

If too high
- Increase steep time
- Increase residual
- Increase water temperature

If impossible
- Add formic acid
Salmonella control in sow herds

Difficult
Conclusions

IF YOU GO FOR REDUCTION IN PRIMARY PRODUCTION:

• Surveillance in sow herds and nucleus herds necessary
• Keep free herds clean

Positive herds stay positive – but reduction is possible

Improved slaughter hygiene is cost effective – and necessary
The future?

More than 90 % reduction of salmonella prevalence on carcasses
2 log reduction of coli