Cost benefit analysis of *Salmonella* control in slaughter pigs

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FCC Consortium  
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Summary

• The requested output
• Structure of the cost-benefit analysis
• Identification of potential sources of infection and possible intervention
• Costing of interventions
• Assessment of human health impacts
• Methodology issues
• Timeline
Brief*

- EFSA have estimated a 10% prevalence of salmonella in the lymph nodes of slaughter pigs across the EU
- The cost benefit analysis will assess a reduction in prevalence taking into account
  - Costs of interventions
  - Benefits in terms of human health
- Reducing mean prevalence by 50% and 90%
  - The target mean prevalence: 5% and 1%

*Full ToR in the annex
Proposed structure of the cost-benefit analysis

• Development of a baseline European Pig sector model to include
  • Assessment of data on the structure of the pig sector in each country
  • Trade data to indicate linkages between countries for feed, animals and products and also with non-EU countries
  • Development of framework across the Union
  • Price data along the pig value chains
• Identification of critical pig systems and associated value chains
Proposed structure of the cost-benefit analysis

• Baseline estimates for the salmonella in pigs without State interventions
• Identification of the potential interventions
• Selection of a combination of interventions taking into account pig sector structure, timing of interventions
• Cost-benefit analysis of the interventions including human health costs and impacts
Initial data summary for the Member States

- Pig and human populations
- Pig meat production – total, per person, % of EU production
- Trade – import and export, self sufficiency
- Parameters – carcass weight, per capita production, offtake rate
- Salmonella – EFSA prevalence, % of burden of EU Salmonella per country
- (see annex and handout)
Potential sources of infection and possible interventions
**Possible source of infection**

- Birds, vermin other wildlife in fields
  - Organic fertilizers
- Birds, vermin other wildlife – unprotected transport and storage, entry of infected feed
  - Infection cycle in feed mill
- Birds, vermin. Entry of infected feed
  - New stock!
  - Humans. Infection cycle in the farm
- Vermin. Entry of infected animals + water.
  - Humans. Infection cycle in the slaughterhouse – cross contamination
- Vermin. Entry of infected meat + water.
  - Humans. Infection cycle in the cutting plant – cross contamination
- Vermin. Entry of infected meat, spices + water.
  - Humans. Infection cycle in processing plant
  - Cross contamination
- Vermin. Entry of infected meat, spices + water.
  - Humans. Infection cycle in retail shop
  - Cross contamination
- Vermin. Entry of infected products.
  - Humans. Cross contamination

**Possible intervention**

- Feeding stuffs
- Feed mill
- Farm
- Slaughterhouse
- Cutting
- Processing
- Retail
- Catering
- Private kitchen
- Human salmonellosis

- Difficult! (Ideas?) Use of “safe” organic fertilisers. Control of wild life.
- Pest control. Checks on feed for compound feedings stuffs. Targeted regular microbiological checks of feed mill. Clean and disinfect If infected. Check operators
- Pest control. Regular checks on feedings stuffs. Checks on life animals (e.g. serology). Cleaning and disinfection. Check operators
- Pest control. Information of the food chain. Technology and procedures. Checks on operators. AM-PM. Cleaning and disinfection
- Pest control. Checks on raw material and final products. Technology and procedures. Cleaning and disinfection. Check operators
- Pest control. Checks on raw materials, additives, final products. Technology and procedures. Cleaning and disinfection. Check operators
- Pest control. Check operators. Check products. Procedures. Cleaning and disinfection. Education
- Pest control. Procedures. Check catering staff. Education

**Below line:** Part of chain having impact on relation between lymph node prevalence and human incidence

**Above line:** Part of chain where intervention might have impact on lymph node prevalence
Salmonella in Pigs

Kitchen, Food Dispensing

Heat/Cooking – Good preparation

Poor hygiene, storage, preparation

REDUCTION

INCREASE

Environment

Poultry, Eggs

Carrier (Asymptomatic)  Non-severe  Moderate  Severe
Intervention costs
Costing of individual interventions

• For each potential intervention a costing exercise will be carried out with contact with the people involved in the pig sector.
• Expert opinion will be sought where it is felt that the costs are too high or the interventions are unlikely to be adopted.
• Questions will be asked what would make expensive and inconvenient interventions attractive.
• The latter data will be included in terms of the costs that need to be considered by the State.
Combination of interventions

- A list of the most likely interventions will be made based on the analysis of costs and potential for adoption within the scope agreed with EFSA and the Commission.
- Using expert opinion within the team combinations of interventions will be defined for the different pig systems and their associated value chains.
- Least cost combinations may be estimated, but this will be decided later in the project and will depend on time available.
Human health impact
Human Impact – Line of Enquiry

DISEASE

• Prevalence
• Incidence
• Age breakdown
  • Child, working age adult, older adults
• Investigate other measures, e.g. socio-economic status
Human Impact – Line of Enquiry

COSTS

• Direct costs to economic production:
  • Absence from work (illness, child care)
• Healthcare costs:
  • Primary care – visits to GP
  • Secondary care – admissions to hospital
• Indirect costs to industry:
  • Confidence, perceptions, market signals (price and volume of consumption)
  • Market shocks??
Methodology
Methodological Issues

• Problem: attribution
  • from animal prevalence to human incidence
• Ideally:
  • 1% salmonella in pigs = X% salmonella in humans
  • Y cases in pigs = Z cases in humans
  • Cost per human case is £xx
  • Consider currencies, e.g. QALYs, DALYs

Set of currencies, resources:
- Days absent
- Volume healthcare interventions

Cost matrix for each member state
Scale Questions

- Burden of disease extrapolated here as: prevalence x number of heads slaughtered

- 60% Cases of Salmonella in Slaughter Pigs:
  - 3 member states = France, Germany, Spain

- 84% Cases of Salmonella in Slaughter Pigs:
  - 7 Member states: + UK, Italy, Belgium, Denmark
Possible focuses of the work

• Big hitters:
  • Germany, Spain, France
  • + UK, Denmark, Italy, Belgium

• Ranked criteria:
  • 3 groups ranked by prevalence: high, medium, low (0% Finland)
  • 5 groups (quintiles) ranked by either prevalence or burden of disease (weighted prevalence)

• 4 groups following VLA

• 27 + Norway
  • Individual member states
In conclusion
Cost benefit analysis

• Baselines will be made for the pig sector and impacts on the human population for scenarios where there are no state interventions.

• Benefits from the combinations of interventions will be estimated based on the change in pig sector and human health impact and comparing it with the baseline scenarios.

• The sensitivity analysis will be performed to identify important parameters from the analysis.
Timeline

• The initial phase of the project (months 1-6) will work on:
  • Pig sector analysis
  • Identification of interventions
  • Estimations of intervention costs and acceptability
• The second phase of the project (months 7-12) will work on:
  • Identification combinations of interventions
  • Costing of the combinations
  • Baseline development
• Third phase will focus on (months 13-18)
  • Cost benefit analysis
Acknowledgements

• EU
• Alex Park, ALC
• Alex Cook, VLA
• Katharina Stärk, RVC
Annex – Full terms of reference
Full terms of reference

• The tender specifications require the undertaking of a cost-benefit analysis:
  • taking into account the criteria laid down in paragraph 6(c) of Article 4 of Regulation (EC) No 2160/2003 with regard to Salmonella, in particular:
    • i) its frequency in animal and human populations, feed and food;
    • ii) the gravity of its effects for humans;
    • iii) its economic consequences for animal and human health care and for feed and food businesses;
    • iv) epidemiological trends in animal and human populations, feed and food;
    • v) scientific advice;
    • vi) technological developments, particularly relating to the practicality of the available control options; and
    • vii) requirements and trends concerning breeding systems and production methods;
• use the outcome of the baseline survey on slaughter pigs as reference values to estimate the costs of respectively a 50% and 90% reduction of the mean prevalence at EU level, based on bacteriology of ileo-caecal lymph nodes over a period of 5-10 years;

• co-ordinate with the EFSA and its working group preparing an opinion concerning a quantitative risk assessment on Salmonella in slaughter and breeding pigs, in particular as regards the expected benefits and expected reduction by the most important control options. In this view the contractor should participate as an observer to at least 3 working group meetings in Parma (Italy) or elsewhere in the EU.
Annex – summarised pig sector data
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*relates to sum total, not average
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<th>Population (People)</th>
<th>Kilo per capita slaughtered</th>
<th>Total Consumption 2007 (000 Ton)</th>
<th>Per capita consumption (kg)</th>
<th>Self Sufficiency (net production as % of consumption)</th>
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