EFSA *Salmonella* in pigs QMRA:

Update on progress

EFSA RA consortium:
Andy Hill*, Robin Simons, Vick Ramnial, Alex Cook, Emma Snary (VLA, UK)
Arno Swart, Manon Swanenburg, Eric Evers, Maarten Nauta (RIVM, The Netherlands)
Hakan Vigre, Kristen Barfod, Ulrik Bo Pedersen, Tine Hald (Food-DTU, Denmark)
Overview

- Background

- Aims and objectives

- Methodology
  - Selection of case study Member States

- Summary
Background

- Consortium is made up of three European institutes
  - VLA (UK, lead)
  - RIVM (The Netherlands)
  - Food-DTU (Denmark)

- Project started in January 2008
  - Breeder finisher survey results due in May 09
  - First preliminary results due to Working Group end June 09
Aims and objectives of EFSA QMRA

- To estimate the relative effect of interventions (and hypothetical reductions) in reducing the risk of human illness attributable to pig meat consumption in the EU
  - Endpoint: either reduction in human cases or prevalence at retail

- To describe the difference in the effect of interventions/reductions across the EU as much as possible
  - Given data/resources

- Use the baseline surveys for parameter estimation or validation

- Provide risk assessment as input for Scientific Opinion to be produced by EFSA Working Group

- Provide input for EC Cost Benefit Analysis
Organisation of work

WP1: Network of Scientists
   ALL

WP7: Project communication

WP2: Farm, Transport & Lairage
   VLA

WP3: Slaughter & Processing
   RIVM

WP4: Preparation & Consumption
   RIVM

WP5: Hazard Characterisation and Risk Characterisation
   Food-DTU

WP6: Intervention Analysis
   VLA

Exposure Assessment
Interventions/reductions

- Agreed with EFSA Working Group and EC
  - Now in discussion with CBA team to sync interventions to be modelled

- Hypothetical reductions:
  - Effect of x% reduction in prevalence at slaughter
  - Effect of x% reduction in prevalence at end of carcass processing
  - Effect of 1,2,3 log reduction in concentration at end of carcass processing

- Interventions:
  - Farm:
    1. Reduction of feed contamination
    2. Supplier status
    3. Improved hygiene/biosecurity
      A. Within farm: increased cleaning, longer downtime
      B. Outside farm: External contamination
    4. Increased resistance (wet feed, vaccination, organic acids)
  
  - Transport:
    1. Increased cleaning
    2. Logistic slaughter (i.e., one batch, one vehicle)
  
  - Slaughter:
    1. Reducing/preventing faecal leakage
    2. Logistic slaughter (process high-risk pigs at end of day)
Methodology

- Risk assessment must:
  - Describe EU
  - Describe differences between pig meat products
  - Include all interventions/ToRs

- However, only limited data/resources/time...

Therefore:

- Select case study MSs that differ from one another sufficiently to describe varying effect of interventions

- Select three product types to describe differences in processing of products

- Develop framework which incorporates all salient points for intervention
Methodology
Framework & products

- **Input:**
  - Management system of farm
  - Sources of infection:
    1. Sows/new pigs
    2. Feed
    3. External contamination
- **Product types:**
  - Pork chops
  - Pork patties
  - Fermented sausage

**Outputs:**
- Number of cases attributable to product type in case study MS x per year
- Relative effect of interventions/reductions for MS
- NOT at EU level
Methodology (cont’d)

- Selection of case study Member States
  - Group EU MSs by relevant criteria
    - Choose criteria: should represent production practices across EU that are assumed to affect *Salmonella* risk
    - Use cluster analysis methods (k-means) to allocate each MS to groups as *objectively* as possible
  - Pick a case study MS from each grouping
    - Base on amount of data available
    - Aims to give examples of how the effect of interventions might change according to production practice etc throughout EU
Methodology (cont’d)

- **Original criteria**
  - Should be based on production characteristics that we assume affect Salmonella risk

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>UNIT</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Farm type – slaughter pigs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 All-in all-out intensive</td>
<td>% of all pigs/farms</td>
<td></td>
</tr>
<tr>
<td>1.2 Continuous intensive</td>
<td>% of all pigs/farms</td>
<td></td>
</tr>
<tr>
<td>1.3 Free-range</td>
<td>% of all pigs/farms</td>
<td></td>
</tr>
<tr>
<td>1.4 Backyard</td>
<td>% of all pigs/farms</td>
<td>For own production</td>
</tr>
<tr>
<td>2. Slaughter &amp; processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 In-line slaughter</td>
<td>% of pigs</td>
<td></td>
</tr>
<tr>
<td>2.2 Floor slaughtering</td>
<td>% of pigs</td>
<td></td>
</tr>
<tr>
<td>3. Processing - location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Cutting plant</td>
<td>% of produced pork</td>
<td></td>
</tr>
<tr>
<td>3.2 Supermarket</td>
<td>% of produced pork</td>
<td></td>
</tr>
<tr>
<td>3.3 Butcher</td>
<td>% of produced pork</td>
<td></td>
</tr>
<tr>
<td>4. Retail – storage conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1 Kept in a chill chain</td>
<td>% of distributed pork</td>
<td></td>
</tr>
<tr>
<td>4.2 Kept outside of a chill chain</td>
<td>% of distributed pork</td>
<td>e.g. at markets</td>
</tr>
<tr>
<td>5. Consumption – product types</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1 Minced pork</td>
<td>% of bought pork</td>
<td></td>
</tr>
<tr>
<td>5.2 Whole cuts</td>
<td>% of bought pork</td>
<td></td>
</tr>
<tr>
<td>5.3 Sausages</td>
<td>% of bought pork</td>
<td>Fermented, smoked, etc., but not cooked</td>
</tr>
</tbody>
</table>
Methodology (cont’d)

- **Grouping of MSs**

  - Surrogate criteria
    1. Have NOT used salmonella prevalence

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Data available</th>
<th>Value used in the cluster analysis</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Size of holdings (heads)</td>
<td>Ratio of big holdings/small holdings</td>
<td>EuroStat</td>
</tr>
<tr>
<td>Slaughter</td>
<td>Slaughterhouse capacity (heads)</td>
<td>Ratio of output from big SH / small SH</td>
<td>EU baseline study</td>
</tr>
<tr>
<td>Consumption</td>
<td>Pig meat consumed per capita</td>
<td>Amount pig meat consumed per capita (kg)</td>
<td>FAOSTAT</td>
</tr>
<tr>
<td></td>
<td>Relative consumption of sausages</td>
<td>Relative consumption of sausages</td>
<td>EuroStat</td>
</tr>
</tbody>
</table>
Methodology (cont’d)

- Picking a MS from Grouping 1 means that it should produce pig meat of different risk to a MS in Grouping 2, 3 or 4.
  - E.g. UK should have different risk to any non-blue MS
  - (Does not mean UK has same risk as blue MSs)

- Case study MSs chosen:
  - UK
  - Austria
  - Poland
  - Czech Republic
Representing the EU

- Risk assessment model has been developed to provide best balance between representing EU and producing realistic results
  - Data/resource issues

- 4 MS case studies provide examples of how intervention effects (on human risk) might vary according to different production practices across EU

- Risk assessment model has been designed to be flexible
  - If desired, each MS will be able to modify/add to model to best reflect intervention results in their own country
Summary and update

- Models in good progress
  - Interventions chosen
  - Case study MSs chosen
    - Now collecting data for specific MSs
  - Framework complete
  - Implementation of models in progress

- Extension requested to include breeder survey results into risk assessment
  - Delivery of final report to Working Group by November 09?

- Risk communication
  - Consortium have given update to EFSA Working group at their meetings
  - Consortium invited each MS through EFSA taskforce to workshop in Copenhagen to discuss approach to risk assessment and data needs
  - Risk assessment has been presented at number of meetings (including this one) to gain opinion and comment
  - Consortium will be in direct discussion with EC Cost Benefit Analysis team to ensure we provide sensible input to their project