Rendering Code of Practice for Safety and Quality
2013 IPE

David L. Meeker, Ph.D., MBA
Senior Vice President, Scientific Services
National Renderers Association
Salmonella Detectives
Research validates safety of animal proteins

Rendered Proteins Not to Blame
For Salmonella outbreak in eggs

Nutrient-based Feed Formulation: Strategies for Cost Reduction
Fiction
Media: “In the egg recall case, which now has been linked to contaminated chicken feed…”

Fact
In the famous egg recall case last summer, the meat and bone meal was contaminated after it arrived at the farm’s feed mill.
Many Common Feed Ingredients Contain *Salmonella*

FDA research shows that many common feed ingredients contain *salmonella*. Overall *salmonella* incidence for all feed, ingredient and supplement samples (including soybean meal and corn) FDA analyzed in 2007 and 2008 was 5.8%.
Prevalence of *Salmonella* in Animal Feeds Decreases from 2002 to 2008

*Salmonella* Contamination of Animal Feeds

*Salmonella* Contamination of Domestic Feeds

*Salmonella* Contamination of Imported Feeds
Recent Rendering Industry Research

A total of 8,783 samples have been analyzed from Jan. 1 to Dec. 31, 2010 by N P Analytical Laboratories. *Salmonella* was positive in 731 (8.3%) of total analyzed samples.
Recent Rendering Industry Research

Further serotyping on 100 randomly selected positive samples showed no foodborne *Salmonella* serotypes such as *Enteritidis* or *Typhimurium*, and none of Salmonella serotypes identified in the recent FDA draft Compliance Policy Guide on Salmonella in feed and pet food as pathogenic to animals were found.
The Role of Testing in Rendering

Testing of protein meals for bacteria is used to check the system, not to check every load made.

Widespread testing of rendered ingredients for the presence of *Salmonella enteritidis* is not necessary, cost efficient or practical.
The Role of Testing in Rendering

• Processes should be designed to minimize hazards
• Testing should be used to validate processes
• Testing programs should be designed to find problems
• Corrective action should be taken when problems found
• Plants should not be penalized for finding positives and taking action
• We know that cooking works, need to verify temperatures
• Plants work hard on sanitation to prevent recontamination
• Transportation and storage out of our control has an impact (as it does on all ingredients).
• Plants that adhere to our Rendering Code of Practice produce safe, quality feed ingredients
• Modern rendering has come a long way
• Rendered products are an easy target to blame, but simply eliminating those ingredients is likely a false sense of security.
The Rendering Industry Commitment

• Is committed to producing quality products that are safe for use as animal feeds and feed ingredients.
• The Rendering Code of Practice is a feed safety program based on Good Manufacturing Practices and process controls that are consistent with HACCP-based principles.
• The Rendering Code of Practice is the rendering equivalent of the AFIA Safe Feed/Safe Food program.
• Feed manufacturers should source ingredients from certified renderers.
• The current list is here: http://nationalrenderers.org/biosecurity-appi/code/certified-plants/
The Key Is Process Control

It’s much more effective to concentrate on improving the system, identifying hazards, and verifying controls than attempting to test every load of output in a timely manner.
The Rendering Industry Commitment

- Make Clean Product
- Keep it Clean
Rendering is Cooking and Drying

- Continuous flow or batch
- Steam cookers
- 115° to 145° C. for 40 to 90 minutes (245° to 290° F.)
- Inactivation of bacteria, viruses, protozoa, and parasitic organisms.
Hazard Analysis and Critical Control Point

HACCP Principles

1. Conduct a **Hazard Analysis**
2. Identify **Critical Control Points** (CCPs)
3. Establish **Critical Limits**
4. Establish **Monitoring Requirements** for CCPs
5. Establish **Corrective Actions**
6. Establish **Record-Keeping** Procedures
7. Establish **Verification** Procedures
Rendering Code of Practice (What)

A Hazard Analysis and Critical Control Point (HACCP) - based Program

Types of hazards to consider:
- Physical – glass, metal, wood etc.
- Biological – bacteria, viruses, etc.
- Chemical – pesticides, PCBs, toxic substances
Rendering uses HACCP principles for feed safety

Rendering Code of Practice
• Based on HACCP-like (Hazard Analysis Critical Control Point) principles
• Follows written procedures and process controls for feed safety
• Verified by third party auditors
• Fits FDA’s emphasis in implementing FSMA
Rendering Code of Practice (What)

- Basic elements of sanitation and hygiene
- Good manufacturing practices (GMPs)
- Process Controls
Rendering Code of Practice (Why)

• To promote the safety of animal proteins and rendered fats
• Establish process controls
• Accreditation to verify the controls are in place
• Participation is voluntary
• Realities of the marketplace

• More than 115 rendering plants certified
Rendering Code of Practice (How)

The program is not prescriptive

• Expected outcomes and performance
• Practices are not dictated
• You are expected to consider all hazards
• You are expected to deal with all hazards
• HOW you do that depends on your own situation
Process Controls in Rendering

Process Controls are very formal ways to closely monitor, control, and record manufacturing processes that are defined as Critical Control Points (CCPs).
Process Controls in Rendering

It is critical that sufficient temperatures are attained, so cooking would be a CCP in any rendering HACCP plan (Biological hazards).

Cooking temperatures should be closely monitored, controlled, and recorded.
Decomposing Tissues Contain Bacteria of Concern

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Raw Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Clostridium perfingens</em></td>
<td>71.4%</td>
</tr>
<tr>
<td><em>Listeria species</em></td>
<td>76.2%</td>
</tr>
<tr>
<td><em>L. Monocytogenes</em></td>
<td>8.3%</td>
</tr>
<tr>
<td><em>Campylobacter species</em></td>
<td>29.8%</td>
</tr>
<tr>
<td><em>C. Jejuni</em></td>
<td>20.0%</td>
</tr>
<tr>
<td><em>Salmonella species</em></td>
<td>84.5%</td>
</tr>
</tbody>
</table>

### Rendering Destroys Bacteria of Food Safety Concern

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Raw Tissue</th>
<th>Post-Press</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Clostridium perfingens</em></td>
<td>71.4%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Listeria species</em></td>
<td>76.2%</td>
<td>0%</td>
</tr>
<tr>
<td><em>L. Monocytogenes</em></td>
<td>8.3%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Campylobacter species</em></td>
<td>29.8%</td>
<td>0%</td>
</tr>
<tr>
<td><em>C. Jejuni</em></td>
<td>20.0%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Salmonella species</em></td>
<td>84.5%</td>
<td>0%</td>
</tr>
</tbody>
</table>

## Potential Biological Hazards - Bacteria

<table>
<thead>
<tr>
<th>Type</th>
<th>D - Value</th>
<th>Z - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salmonella</strong></td>
<td>$D_{70-82} = 15$ sec</td>
<td>7.5°C</td>
</tr>
<tr>
<td><strong>Listeria monocytogenes</strong></td>
<td>$D_{70} = 10$ sec</td>
<td>7.5°C</td>
</tr>
<tr>
<td><strong>Campylobacter jejuni</strong></td>
<td>$D_{60} = 12-18$ sec</td>
<td>6.1°C</td>
</tr>
<tr>
<td><strong>E Coli</strong></td>
<td>$D_{60} = 30-45$ sec</td>
<td>6.1°C</td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td>$D_{60} = 120$ sec</td>
<td>4.7°C</td>
</tr>
<tr>
<td><strong>Clostridia perfringens</strong></td>
<td>$D_{60} = 300-900$ sec</td>
<td>7.8°C</td>
</tr>
<tr>
<td></td>
<td>$D_{100} = 0.3 - 38$ min</td>
<td>8.4°C</td>
</tr>
</tbody>
</table>

D-value: The time required at a given temperature to kill 90% (1 log) of the organisms
Z-value: The increase in temperature required to reduce the D-value by 1 log.
## Predicted Bacteria Death Rate

<table>
<thead>
<tr>
<th>Organism</th>
<th>Time to kill 1 log (90%), seconds</th>
<th>% killed at 240° F for 30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridium perfringens</td>
<td>273</td>
<td>99.9999%</td>
</tr>
<tr>
<td>Salmonella</td>
<td>&lt;.001</td>
<td>Essentially all</td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td>&lt;.001</td>
<td>Essentially all</td>
</tr>
<tr>
<td>Camplylobacter jejuni</td>
<td>&lt;.001</td>
<td>Essentially all</td>
</tr>
<tr>
<td>E. Coli</td>
<td>&lt;.001</td>
<td>Essentially all</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>.001</td>
<td>Essentially all</td>
</tr>
</tbody>
</table>
Recordkeeping
Cooker
Temperature
Trending and
Statistical Analysis
Recent Cases of Concern

- 2010 Iowa Egg Recall Due to Salmonella
- 2011 Germany Dioxin Contamination
The Rendering COP Recommends

- Written procedures in place to reduce the likelihood of collecting raw materials contaminated with hazardous chemicals, such as dioxins and PCBs.
- Further, certified renderers test finished products to insure compliance with federal government tolerances for chlorinated pesticides and other toxic substances, including PCB’s.
- Elevated PCB levels are accepted as indicators of potential dioxin contamination. Federal Agencies and The European Commission accept PCB testing as a means of detecting dioxin adulteration of food and feed. Should PCB’s that exceed the federal tolerance be encountered, the contaminated products are not released for use in animal feed and are instead diverted to non-feed uses such as a biofuel.
Code of Practice Audits
Verify that Controls are in Place
Facilities Certification Institute Audits

NRA/APPI has an agreement with the FCI to offer voluntary third party audits on plants’ adherence to the Code of Practice. The audits cost $1100 plus travel costs.
Facilities Certification Institute

The **Facility Certification Institute** (FCI) is an internationally respected and recognized third-party certification provider, and is now a division of Validus Ventures, LLC (Validus) Urbandale, Iowa.

FCI provides non-biased, third-party certification programs and ensure the continued safety of feed and food products.

Validus is ISO 9001 certified, and assists food companies and producers by providing specialized services at the farm and plant level.
Certification

- Apply to FCI for audit
- Include fee and form for each location
- FCI will schedule audit
- Auditor used industry developed checklist
- FCI makes certification decision
- FCI issues certificate
- Report is sent to APPI @ NRA
- Plant is listed on NRA website:
  
  http://nationalrenderers.org/biosecurity-appi/code/certified-plants/
Rendering Code of Practice (Results)

- Safe rendered products
- High quality rendered products
Rendered Products Are Safe.

As an essential link in the food chain, the rendering industry is conscious of its role in the prevention and control of bacteria and virus, to provide safe feed ingredients for livestock, poultry, aquaculture, and pets. Every effort is made to ensure that cooking destroys microbes, and that recontamination does not occur after the rendering process.

Since 1985, the Animal Protein Producers Industry (APPI) has coordinated a program of education and laboratory testing for renderers to control Salmonella. Now, APPI offers a sophisticated training and process testing to offer the most appropriate controls and practices to best assure safe products. Our advanced feed safety programs include strategies to control biological, chemical, and physical hazards that can occur in animal production and processing systems. A concerted effort is made to foresee any hazard likely to occur and to build prevention of risk into manufacturing. Process controls in rendering verify that cooking temperatures control microbial and viral contamination. These programs also concentrate on recontamination prevention with rodent control, plant and transport sanitation, and other biosecurity measures.

More than 90% of rendered product in the U.S. and Canada are produced under principles in the Rendering Code of Practice or equivalent programs such as HACCP. If you are a customer—ask for these credentials and rest assured. If you are a renderer, make sure you take advantage of these excellent programs.

For information, contact Dara John at 660-277-3469 or appi@cvalley.net, or visit us on the web at http://www.nationalrenderers.org/biosecurity-appi/.