Quality Assurance 101

By Tina Caparella

Editor’s Note – The following is written based on a presentation co-authored by Tom Dobbs and Ross Hamilton of Darling International, Inc. and given earlier this year at the International Rendering Symposium in Atlanta, GA.

The goal of the rendering industry is to provide safe, quality ingredients to its customers for the use in pet food and other animal feeds, such as livestock. This is done via a physical transformation of animal by-products using a variety of equipment and processes involving the application of heat, the extraction of moisture, and the separation of fat. Dobbs and Hamilton estimate the amount of by-products available to the United States rendering industry to be over 76 billion pounds (see table 1) from slaughter by-products of the food processing industry that includes cattle, poultry, and pork; fat and bone scrap and meat products beyond sale-by date from grocery stores; processing waste from meat lockers and butcher shops; recovered used cooking oil from restaurants and other food service establishments and institutions; and animal mortalities from certain facilities such as farms, slaughter plants, and diagnostic labs.

Besides producing quality feed ingredients, the rendering process also kills pathogenic organisms, protects the environment, recycles carbon and energy, and provides control, verification, and traceability that condemned or expired meat products are not re-used for human food. Most importantly, the industry does this all within a matter of hours of receiving the raw materials, not over weeks or months as does some popular alternative disposal methods.

The rendered products produced – fats such as tallow, yellow grease, and choice white grease, and protein meals like meat and bone, poultry by-product, blood, feather, chicken, and pork – fulfill the demands of domestic and international customers in a variety of industries, from livestock and pet feeds to biofuels, industrial applications, and fertilizers. These customers expect fresh, food-safe ingredients free from foreign materials and contaminants such as metal, wood, plastic, rubber, glass, and chemicals, and that consistently meet or exceed ingredient quality and nutritional specifications sourced from traceable and sustainable raw materials.

Some of the multitude of potential hazards renderers face in raw material collected include foodborne pathogens (i.e., Salmonella, Clostridium perfringens, and E. coli); chemicals (i.e., insecticides, rodenticides, fungicides, euthanizing agents, toxic chemicals such as anti-freeze, and heavy metals including lead and cadmium); physical contaminants like metal, glass, and plastic; and regulated substances such as cattle material prohibited in animal feed (CMPAF) in the United States, which is the brain and spinal cord of cattle 30 months of age or older. In order to mitigate identified hazards, renderers should put in place a series of checks and balances. For physical hazards, raw material inspection, magnets, sifters, grinders, screens, centrifuges, and filters are good options to use.

For regulated substances, raw material supplier certifications and audits will confirm suppliers have standard operating procedures in place.

Although the rendering process is effective in destroying pathogens due to the time and temperature relationship, establishing critical control points will ensure pathogens are destroyed. Good manufacturing practices (GMPs) or prerequisite plans to hazard analysis and critical control points also help create a pathway to safe and quality feed ingredients. These include:

- sanitation and pest control;
- trailer load out inspection for cleanliness;
- employee plant practices;
- magnet and sifter installations;
- CMPAF removal and disposal;
- product handling practices;
- building and equipment design and maintenance; and
- routine pesticide testing (tallow and restaurant grease).

Renderers should also have biosecurity programs in place covering facility security, human resources, raw material, finished product, distribution biosecurity and traceability, housekeeping and product protection, and emergency response/product recall. For facility security, renderers are required to register with the Food and Drug Administration (FDA) under the Bioterrorism and Preparedness Act of 2002 and the Food Safety Modernization Act passed in 2010, which also requires renewal every two years beginning in 2012. Renderers might consider using security cameras and gates/fencing to control access to a facility, have employees wear identification badges, and accompany visitors while on the premises to up the level of security. Although not typical, intentional contamination could happen so renderers need to lock up and limit access to hazardous substances in the plant such as antifreeze, petroleum-based solvents, and cleaning chemicals that could be used for deliberate contamination. In addition, limit access to finished product storage areas, locking them down if possible, and inspect product at load out for physical and chemical contagions.

Rendering companies and employees are proud of what they do and take their role in feed safety very seriously. Still, it’s important for renderers to perform new employee background checks, observe new employee probationary periods, and train new and current employees annually on feed safety and GMPs and the intent behind them as added...
The first line of defense for renderers to ensure feed ingredient safety is the raw material. The cleaner the raw material is, the cleaner the finished product will be. Educate suppliers so they know what is expected of them and why various types of contamination must be avoided. Work with suppliers on improvements by providing feedback on contaminants found and the quality of the raw material. Audit suppliers to evaluate their feed safety programs (with a focus on higher risk raw material streams) and put in place supplier agreements/raw material contracts on specifications and avoidance of hazardous substances in raw material. Suppliers should also provide annual certification of the integrity of raw material, such as being ruminant free, no harmful levels of heavy metals or mycotoxins, and no polychlorinated biphenyls, pesticides, or rodenticides. In addition, train and have collection drivers inspect raw material upon pick-up to look for uncharacteristic odors; suspicious raw material containers; powder, pellets, or granules; CMPAF material (brains/spinal cords); metal, wood, or plastic; and cattle ear tags. Provide a process so the driver can document and report any possible contamination. These same procedures can be applied to material that arrives at the rendering plant.

Biosecurity for finished products should consist of documented risk-based feed safety programs that include, among other things, a cooking critical control point of 240 to 255 degrees Fahrenheit (F). Using *Clostridia perfringens* as a marker organism for validation, it has been documented that rendering temperatures kill conventional pathogens (e.g., the avian influenza virus is killed at 230 degrees F for 15 seconds). Enterobacteriaceae testing of finished products confirms that thermal inactivation during cooking eliminates microbial hazards and plant sanitation programs are effective.

In addition, fats, primarily tallow and recovered cooking oil, should be monitored for signs of pesticide and PCB contamination. Written procedures for compliance with FDA’s bovine spongiform encephalopathy feed rule and CMPAF regulation must be in place to prevent prohibited material from entering animal feed and the commingling of ruminant and non-ruminant material. Make sure non-feed chemicals and substances that are used in and around the plant are locked in a secure area with access limited to authorized personnel; take routine inventories of these substances. A finished product biosecurity program should also include:

- product hold procedures to control non-conforming product and document disposition;
- documentation of customer complaints and the corrective action taken (monitor trends in types and frequency of complaints);
- examination of production samples for signs of chemical and physical contaminants; and
- procedures for product testing and retention.

To ensure finished product meets customers specifications, renderers should have onsite capability to test for protein, fat, ash, moisture, and free fatty acid levels; peroxide value; oxidative stability; and in-vitro indicators of digestibility. Biosecurity and traceability of finished product distribution can best be met with load out procedures to document the cleanliness and condition of carriers (i.e., do doors/hatches close tight) and the inspection of product during loading. Apply tamper evident seals to carrier access and discharge points before the carrier leaves the premises. Carriers are required to certify that trucks haul only feed-grade materials so insist on verification of last product hauled. Implement “one up – one back” product traceability procedures for both raw material and finished products, and include lot numbers for ingredients such as antioxidants and antifoams in the traceability process.

When it comes to housekeeping and sanitation, rendering plants should have written cleaning schedules and document the completion of cleaning to ensure a workplace that is free of debris and pests that could potentially contaminate rendered products. Pest control is essential for ensuring product integrity and preventing contamination/infestation (i.e., eliminate rodents as a potential vector for *Salmonella* contamination). Use color-coded tools (i.e., shovels, scoops, brooms, etc. that are red for raw, green for finished product) to help avoid cross contamination issues from raw to finished product areas of the plants. Avoid employee traffic from the raw material to finished product areas of the plant, and keep finished product areas as dry as possible to prevent post-process microbial contamination.

It’s imperative that renderers have in place and implement a written emergency response plan to address the handling and management of biosecurity threats. This should include emergency contacts, an action plan to respond to suspicious substances or threats, and a recall plan. Conduct mock recalls to test the process for traceability and retrieval of product.

All the above programs need continual maintenance and verification to ensure compliance with inspections by FDA and audits by the United States Department of Agriculture, customers, and third parties under such programs as the Animal Protein Producers Industry Code of Practice and the American Feed Industry Association’s Safe Feed/Safe Food. Conducting an internal audit will help ensure programs are being met as intended.

In conclusion, it comes down to a few simple procedures to make certain rendered products are of the utmost safe and quality ingredient for feed customers:

- Analyze raw material streams for risks that are likely to occur.
- Design processes and programs to minimize hazards and to prevent intentional and accidental contamination.
- Maintain and strengthen existing programs by way of employee training.
- Verify programs are doing what they are designed to do with internal and third party audits, mock recalls, and customer complaint reviews.

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**Table 1. Wastes generated by the meat and food industries in the United States**

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount (million pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inedible by-products removed at slaughter</td>
<td>39,047.6</td>
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<tr>
<td>Downstream</td>
<td></td>
</tr>
<tr>
<td>Fat, bone, and trim from processing</td>
<td>23,850.7</td>
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<tr>
<td>Expired meat from retail stores</td>
<td>3,960.4</td>
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<tr>
<td>Used cooking oil</td>
<td>5,629.4</td>
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<tr>
<td>On-farm and pre-slaughter</td>
<td>3,702.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>76,190.2</strong></td>
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</tbody>
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