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Inside

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Validating Your HACCP System for the Control of *E. coli* O157:H7

By Denise Amann

Escherichia coli (*E. coli*) is a bacterium commonly found in the lower intestine of most mammals. Most strains of *E. coli* are harmless and function to assist with digestion in their host. This is not the case for *E. coli* O157:H7, which is a particularly virulent strain that can cause serious human illness or death in the elderly, very young, or immunocompromised.

E. coli O157:H7 was first identified as a foodborne pathogen associated with the consumption of undercooked ground beef in 1982. In October 1994, the United States Department of Agriculture (USDA) declared *E. coli* O157:H7 as an adulterant in ground beef and began a sampling program to test for it in federally inspected establishments and retail stores. More recently, USDA's Food Safety and Inspection Service (FSIS) expanded its sampling program to include all raw beef products that are to be further processed into non-intact products. All beef

FSIS inspector inspecting beef carcass inside a processing plant. *(USDA photo)*

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TB or Not TB?

By Denise Amann

FSIS inspectors are an important part of this country's first line of defense against tuberculosis. Tuberculosis, or TB, is a potentially fatal infectious disease of humans and animals caused by a group of bacteria called mycobacteria, which have thick and waxy cell walls that contribute to the bacterium's hardiness.

Today, the most common cause of human disease is *Mycobacterium tuberculosis*. Typically, the disease is spread by inhaling bacteria released into the air after a person with the active disease coughs near a susceptible human host. Human disease is characterized by a prolonged, productive cough and is most commonly active in those with a weakened immune system.

In the past, a major cause of human tuberculosis was *Mycobacterium bovis*, a bacterium found in cattle and swine that causes bovine TB. Humans were infected with the bacteria by ingesting unpasteurized milk. With the introduction of milk pasteurization, this form of human tuberculosis has become very rare in the United States. *M. bovis* remains a common cause of human tuberculosis in countries where milk pasteurization is not universally performed.

For these reasons, plant personnel are not at an increased risk of contracting the disease by handling potentially TB positive tissues. FSIS inspectors have been trained to identify the granuloma (a medical term for a ball-like collection of immune cells trying to destroy a foreign substance) lesions characteristic of the disease in commonly affected species. Samples of all cattle lesions resembling the disease should be mailed to USDA's Animal and Plant Health Inspection Service's (APHIS) National Veterinary Services Laboratory (NVSL) in Ames, Iowa, for further analysis.

"Tuberculosis surveillance standards require inspectors to submit one granuloma sample per 2,000 cattle killed," said Dr. Leslie Bulaga, an area epidemiology officer of APHIS' Veterinary Services. "This allows APHIS and FSIS personnel to work together in USDA's efforts to eradicate TB from the United States."

Even with extensive surveillance and positive herd eradication, bovine TB has not been completely eradicated from this country. Recently, two bovine carcasses were identified as positive for *M. bovis* in Minnesota and Pennsylvania slaughter establishments. Granuloma lesions characteristic of the disease were identified in both carcasses as part of routine inspection procedures and mailed to NVSL for confirmation. The carcasses were traced back to herds in South Dakota and Indiana, respectively. South Dakota has been in "TB-free" status since 1976 and Indiana has been "TB-free" since 1984.

"This serves as a reminder of the importance of granuloma surveillance for TB at slaughter," added Bulaga.

Health officials in both States tested the herd of origin and closely tracked the movements of the positive animals as they traveled to their final destination. Under Federal guidelines, USDA classifies States based on the presence of bovine TB in their cattle population. No distinction is made in dairy or beef cattle when determining the State's status. If two TB positive herds are identified in the same State within a 48-month period, USDA is required to downgrade the State's TB status.

For more information about TB, visit *www.fsis.usda.gov/OPHS/tbbroch.htm* or call (800) 336-3747.

Food Safety Resources

By Sally Fernandez

FSIS developed the second edition of the "Compliance Guideline for Controlling *Salmonella* and *Campylobacter* in Poultry" in May 2008. This updated document includes recommendations for controlling both *Salmonella* and *Campylobacter* and describes concerns and validated controls for each step in the broiler slaughter process.

The second edition includes guidance for the control of *Campylobacter,* both at pre-harvest and during slaughter and processing, and updated information regarding progress on implementation of the *Salmonella* verification program. In addition, information is given on controlling *Salmonella* Enteritidis at pre harvest. The guideline also contains information on current research by FSIS and USDA's Agricultural Research Service. Examples of case studies are given as additional ways of validating your food safety system.

You can use this resource to improve management practices in your plant. For easy use, some sections of the guideline begin with best practice recommendations, and then explain controls and concerns specific to that step.

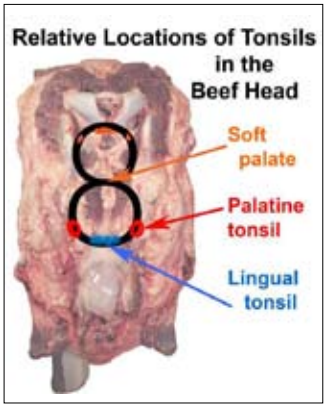
To order your free copy, complete and submit the online order form at *www.fsis.usda.gov/Science/HACCP_Resources_Order_Form/index.asp.* You can also fax the order to (202) 690 6519. For more information, call (800) 336-3747.

Identifying and Removing Lingual and Palatine Tonsils as SRMs: A Practical Guide

By Jane Johnson

As cattle slaughter plant owners and operators already know, the removal of specified risk materials (SRMs) is an important part of the slaughter dressing procedure. SRMs are the tissues in cattle that have been determined to carry the highest risk of infection when they are harvested from cattle affected with bovine spongiform encephalopathy (BSE). Scientific and epidemiological studies have linked the fatal human disease variant Creutzfeldt-Jakob Disease (vCJD) to exposure to BSE, most likely through human consumption of beef products contaminated with the BSE agent. SRMs are defined in Title 9 of the *Code of Federal Regulations*, Section 310.22 (a) [9 CFR 310.22(a)].

Among the trickiest SRMs to remove are the palatine and lingual tonsils. Removing these tonsils may be more difficult when dealing with beef market heads, as opposed to ensuring their removal from the tongue alone. Beef market heads are typically sold as whole beef heads with the tongue included. Just as a reminder, heads can only be saved from cattle less than 30 months of age since the entire skull and non-meat components of cattle 30 months of age and older are considered SRM material. The palatine and lingual tonsils must be removed from all cattle, regardless of age.



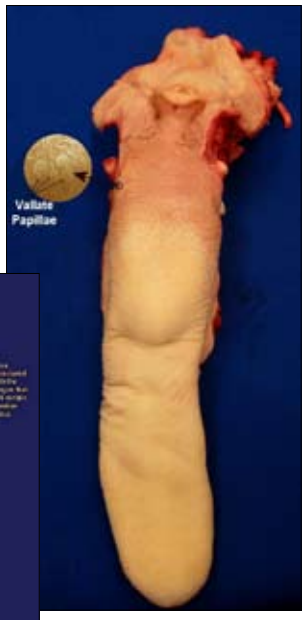
A typical tongue-in head presentation. *(figure 1)*

The two palatine tonsils are located at the four and eight o'clock positions of the oropharynx (opening into the mouth cavity) when looking at the back of the head, as you would see it in a typical tongue-in head presentation (see figure 1). They are adjacent to the soft palate, below the mucosal surface and the opening of the sinus of the palatine tonsil. The sinus of the palatine tonsil looks like a hole on each side of the soft palate. The palatine sinuses contain the palatine tonsils. The palatine tonsils tend to be more congested and inflamed at the time of post-mortem, making them easier to see. The congestion decreases as the length of post-mortem increases.

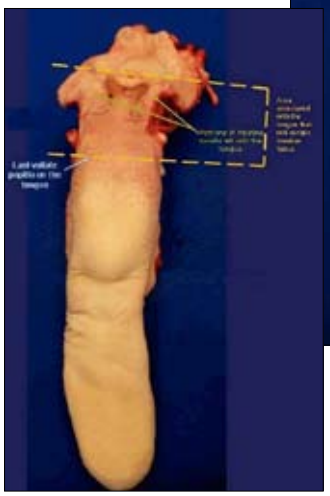
The lingual tonsils are located at the base of the tongue behind the last, or most rear, vallate papillae (the large bumps at the back of the tongue), and in front of the sinus of the palatine tonsil (see figure 2). In other words, the lingual tonsils are between the last large bumps at the back of the tongue and the two holes on the sides of the soft palate.

Photo demonstrating the location of the palatine fossa (crypts) which contain the palatine tonsils. *(figure 2)*

Two methods may be used to remove the palatine and lingual tonsils, whether the tongue is being saved alone or as part of a beef market head. The simplest is to make a transverse cut just behind the last vallate papillae of the tongue (see figure 3). All tissue must be removed from the tongue at the site of, and caudal to, the cut. This should be sufficient to remove both sets of tonsils. The second method involves removing the epithelium and underlining muscle to a depth of at least 5 millimeters (or roughly ¼ inch) behind the last vallate papillae (see figure 4). Again, all tissue caudal to the "skinned area" must also be removed. All tissue of the palatine and lingual tonsils must be completely removed to be in compliance with FSIS regulations.



The vallate papillae. *(figure 3)*



The specific portion of the tongue containing both sets of tonsils (i.e., lingual and palatine). *(figure 4)*

For more information and pictures depicting removal of the palatine and lingual tonsils, visit the following links on FSIS' Web site at *www.fsis.usda.gov/PDF/Beef_Market_Head_SRM.pdf*; *www.fsis.usda.gov/Regulations_&_Policies/Notice_Images/index.asp*; and *www.fsis.usda.gov/Frame/FrameRedirect.asp?main=http://www.fsis.usda.gov/OFO/TSC/removal_of_tonsils.htm.* If you need assistance, call the Office of Outreach, Employee Education, and Training at (800) 336-3747.

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products that test positive for *E. coli* O157:H7 must be processed into a ready-to-eat product or they are deemed adulterated.

Cattle are a major reservoir for this bacterium. *E. coli* O157:H7 contaminates the hides of live animals when animals come in direct contact with infected feces. Contamination of the beef carcass during slaughter most commonly occurs when the hides are removed and during evisceration.

As part of your Hazard Analysis and Critical Control Point (HACCP) system, your plant must prevent, eliminate, or reduce carcass contamination with *E. coli* O157:H7 using antimicrobial steps that will reduce or eliminate the pathogen. Commonly used intervention steps include: knife trimming, hot water washes, organic washes, steam vacuuming, and chilling. A combination of antimicrobial steps is usually more effective at reducing surface contamination than the use of only one step.

FSIS' regulations require that you validate your plant's HACCP system's effectiveness in preventing, reducing, or eliminating *E. coli* O157:H7 (See "What's All the Buzz About Validation" in *Small Plant News,* Vol. 2, No. 12). In-plant validation will be unique to your plant's system and will provide you with scientific proof that your system is working as it was designed to control *E. coli* O157:H7.

In general, small plants do not have the resources larger plants have to validate their HACCP system by testing for actual pathogens or conducting challenge studies. For this reason, indicator organisms may be used to validate the performance of a plant's HACCP system.

Bacterial contamination typically occurs on the surface of the carcass. Researchers have identified similarities between the response of more commonly found surface pathogens and the response of *E. coli* O157:H7 to certain interventions. This link allows you a way to practically validate your HACCP system using certain surface pathogens as indicator organisms for *E. coli* O157:H7. With proper scientific technique and data collection, significant reductions in the numbers of certain indicator organisms seen before, and after, an intervention step may be used to validate the effectiveness of that intervention to reduce *E. coli* O157:H7.

The following six pointers are helpful to consider when validating your small plant HACCP system for the control of *E. coli* O157:H7.

1. **Know the scientific documents you have chosen to support your HACCP decisions.** This is critical. It's important to have supporting documentation that is pertinent to your system and be able to understand the general gist of how the information supports your HACCP decisions. Documentation should include scientific justification for the method and indicator organisms you have chosen to validate your system.

2. **Indicator organisms should share similar characteristics to *E. coli* O157:H7.** Linking the measured reduction of an indicator organism to a particular intervention requires that the indicator have similar growth and response characteristics to *E. coli* O157:H7. It's important to understand this connection. All pathogens found on a beef carcass during slaughter are not appropriate indicator organisms for *E. coli* O157:H7.

3. **Validation sampling methods using indicator organisms can be easily performed in-plant by plant personnel.** Sampling methods are similar to those already used in other testing programs. Techniques are non-invasive with no product loss. Results may also be used as an indicator of employee hygiene and general carcass cleanliness from start to finish.

4. **Validation studies should include more than one indicator organism.** Indicator organisms respond differently to varying in-plant conditions and product types. A more comprehensive picture of your HACCP system's effectiveness would be reflected using multiple indicator organisms.

5. **Validation is not a one-time event.** Your plant's HACCP system is fluid. Products change; vendors change; personnel and equipment change. Does it make sense that validating your HACCP system 4 years ago is an accurate depiction of your system today? You're required to control food safety hazards. Periodic, ongoing validation provides scientific data that your HACCP system is doing just that.

6. **The presence of indicator organisms should not be used to determine the presence or absence of specific pathogens.** Indicator organisms are analyzed to predict the distribution, number, and response of specific pathogenic organisms on a particular product as it travels through a HACCP system. Predictions should be made based on the scientific findings within your supporting documentation. To date, no direct connection has been found between the presence of indicator species and the presence or absence of pathogenic organisms.

Hopefully, these pointers will assist you in validating your HACCP system so you can continue to ensure your product's safety for the customers and business you care so deeply about into the foreseeable future. If you have any further questions about in-plant validation or using certain pathogens as indicator organisms for *E. coli* O157:H7, call the Office of Outreach, Employee Education, and Training at (800) 336-3747.