



Guideline Document: Product Design, Production and Preparation of Certain Ground Beef Products

The production of safe meat products is the single most important goal of the meat processing industry. Capital investments in the hundreds of millions of dollars have been made in beef slaughter facilities to install proven technologies that have enhanced meat safety. Industry invests tens of millions of dollars annually in their operating methods.

Collaboration between raw material suppliers, manufacturers of ground beef, new technology providers, customers, consumers and the Food Safety and Inspection Service (FSIS) has proven to be an effective method of continuous improvement in beef safety throughout the years. This guideline document is yet another approach to improve ground beef food safety.

Review of Historical Food Safety Improvements

In the last two decades, FSIS pathogen testing methodologies have become more sensitive resulting in improving the agency's ability to track foodborne illness outbreaks. It has become a popular notion that enhanced product testing and expanding the scope of the definition of adulteration to encompass other beef products are means to further improve food safety. This expansion of scope adds substantial costs to the processor either by diversion of products or increased testing costs.

Yet, the question remains "is this really a solution?" FSIS verifies establishment programs primarily by routine verification testing and follow-up food safety assessments. The current test and divert process employed by the meat industry is an important practice, but not the perfect solution to this issue.

The meat and poultry industry knows that the production of a "100% pathogen-free" product is not guaranteed through a microbiological testing regime as it is not possible to test its way to safe food. Nor can the agency continue to use the same methods to regulate its way to safe food without adverse effects on businesses through closures and undetermined increases in production costs.

However, in April 2010, the Centers for Disease Control and Prevention (CDC) announced that the U.S. has achieved its 2010 public health goal for *Escherichia coli* O157: H7. The incidence of *E. coli* O157:H7 infections in Americans dropped from 1.12

cases per 100,000 people in 2008 to 0.99 cases per 100,000 people in 2009. This represents an overall 51 percent reduction since 2000. Also, FSIS ground beef production volume weighted *E. coli* O157:H7 data shows a drop in incidence rates from 0.5% in 2005 to 0.26% in 2009. These data demonstrate that improvements in food safety have been made, despite some agency and stakeholder opinion that food safety improvements have plateaued.

The 1993 foodborne illness outbreak in the Pacific Northwest prompted quick service restaurants (QSR) to review and adjust their cooking methods to ensure pathogen lethality in their stores. This change has been a part of this sector's virtual elimination of beef related *E. coli* O157:H7 illnesses.

According to *Escherichia coli* O157:H7 in Ground Beef-Review of a Draft Risk Assessment,¹ a 2002 case control study conducted by the CDC to identify risk factors associated with sporadic *E. coli* O157:H7 infections determined that eating hamburgers cooked in the home was a major risk factor (Kennedy *et al*, 2002). Whereas an earlier case-control study based on data obtained through the same FoodNet system identified eating hamburgers served at table-service restaurants - but not restaurants of major fast-food - as a major risk factor (Kassenborg *et al*, 1998)

Furthermore, the most uncontrolled variable, the American consumer, creates an additional set of factors that increase the uncertainty of the safety of the ground beef product. These factors include transportation time from store to home refrigerator, thawing of the product versus cooking from frozen, potential cross contamination in the home, using a thermometer when cooking, *etc* and all can affect the final food safety of the ground beef product as well as any food product.

With so many variables, any breakdown from the raw material vendor supply chain to the consumers' home could possible result in potential human illnesses. *E. coli* O157:H7 outbreaks from ground beef must be investigated so improvements to the specific type of ground beef products or other causes that are associated with the outbreaks can be improved and lead to public health improvements.

Current Progress

The American Meat Institute (AMI) has evaluated FSIS's reported ground beef illness related recalls from 2005 to 2009. The information, gathered from agency data, shows 18 *E. coli* O157:H7 illness related recalls have occurred during this five-year period. Of these recalls, 13 or 72% involved² frozen, ground beef patties, 85% of which were

¹ *Escherichia coli* O157:H7 in Ground Beef-Review of a Draft Risk Assessment¹, Committee on the Review of the USDA *E. coli* O157:H7 Farm to Table Process Risk Assessment, Institute of Medicine of the National Academies, 2002. pg. 66.

²Determination if frozen product was based on recall release, product label, or product type. Only one of the 13 illness related recalls, 025-2007, involved both fresh and frozen product. Fresh and frozen product

intended to be prepared by consumers outside of a foodservice application. Further analysis shows that 44% of the illnesses occurred in 2007. The amount of illness related recalls demonstrate that improvements have been made, but research and continued focus on food safety should be considered to prevent ‘back sliding’ to higher levels of illness related recalls.

Three areas of focus need to be addressed to realize food safety improvement in the production of frozen retail ground beef patties:

1. Design of Frozen Ground Beef Patties for Improved Safety: Ground beef is a very complex product category. There are many types and styles of ground beef products produced. The variables to consider when determining the risk during the production of the product include:
 - Final product fresh/frozen category (raw fresh, raw frozen, partially cooked, fully cooked, or irradiated);
 - Size, shape, and weight;
 - Source of the raw material components (trimmings or subprimals);
 - Lean content;
 - Produced under federal inspection or at retail;
 - How the product is cooked by the consumer; and
 - Analytical tests conducted.

Industry research has shown that patty thickness and manufacturing methods are major factors that affect adequate cooking time for a frozen ground beef patty. In one study, frozen ground beef patties that were ½ inch thick cooked in just over 10 minutes to 160 degrees F compared to patties that were ¾ inch thick cooked to 160 degrees F in just over 18 minutes.³

Other design factors that impact the cooking time of frozen retail ground beef patties include whether the patty was seasoned, the source of raw materials, type of processing equipment, and if the patty was perforated during the forming stage⁴

2. Production Variables that Impact Cooking: When ground beef patties are produced opportunities exist that could cause the product to not perform as expected during the cooking procedure. Two common issues referred to are cupping or the separation of the patty when air pockets are formed in the patty; and excess mixing during the ground beef blending could overwork the meat protein matrix and create a patty that more dense than normal, which

were involved in recall 025-2007, but the product that caused illness was frozen (FSIS). All other recalls were frozen.

³ Siemens, Angie, Designing a Risk Reduced Ground Beef Patty, Cargill, Inc., 2009 Beef Industry Safety Summit

⁴ Biela, Timothy, Designing a “Safe” Ground Beef Pattie, AFA Foods, 2009 Beef Industry Food Safety Summit

could influence cooking times. These examples are specific to each production method and should be reviewed to determine process parameters.

3. Consumer Messages for Preparation of the Patties: In a complete systematic food safety program it is important that information be communicated to consumers in a clear and concise manner. Consumer research has shown that that in July 2010, only 14% of the respondents mentioned using a thermometer as the way to ensure proper doneness⁵.

In addition, Eco-Sure⁶ cooking data found that out of 580 consumers who cooked ground beef products, 39% of the time the ground beef was not cooked to at least 155 degrees F. This supports the need for improvements to ground beef patty design and cooking instructions to increase the ability to have ground beef patties properly cooked.

Although proper use of a thermometer provides the highest level of safety, it is a lofty goal on the part of our customers and consumers to rapidly change the habit of using a thermometer to assure ground beef is cooked to 160 degrees F.

In that regard, consumer messages about preparation methods should be reviewed and possibly changed. It is becoming more apparent that consumers do not follow cooking instructions. It is also believed that consumers are purchasing more ground beef patties to reduce the possibility of kitchen cross contamination.

Nevertheless, when used, cooking instructions should provide guidance to properly cook a ground beef patty.

⁵Consumer Perceptions of Beef Safety, Research Overview, October 2010, Funded by The Beef Checkoff

⁶ Ecosure 2007 US. Cold Temperature Evaluation, Design and Summary Pages



Ground Beef Patty Guidelines: Product Design, Production and Preparation

To enhance the safety of frozen retail ground beef patties, the following checklist should be used when considering factors that need to be addressed to impact the ability of frozen ground beef patties to be designed, produced and prepared so improvements in food safety could be achieved.

Product Design of Frozen Retail Ground Beef Patties:

- Does a relation exist with the raw material supplier that provides information about the processes applied to the raw material? Some of this information could be:
 - Sample and testing protocols
 - On-going verification of methods through supplier feedback
- Have the following factors that impact the cooking of retail frozen ground beef patties been considered in the design for quality specification of the patty?
 - Thickness and weight of the patty
 - Surface area enhancements such as perforation (scoring) of the surface of the patty
 - What method of filling the patty die is used, *i.e.* standard fill or Tenderform® or similar technology
 - Is the patty flavored with water and seasonings?

Production:

- Certain inconsistent methods of ground beef patty production can create cooking inconsistency. These processes should be monitored and controlled to best extent possible. The primary issues are:
 - Cupping and separation of the patty.
 - Blend time to reduce over worked final product
 - Forming temperature to limit surface smear

Preparation/Cooking of the Patties:

- Are the cooking instructions on frozen retail ground beef patties validated under realistic storage and cooking methods?
- Has a cooking protocol been developed to provide guidance to the cook/food preparer?
 - This may include multiple methods of cooking like a skillet and a charcoal grill.
- Have special considerations been given to cooking of frozen ground beef patties at large gatherings, possible inexperienced cook, the use of outdoor grills, *etc.*?
 - Outdoor grills can have very inconsistent temperatures. Therefore, it is crucial that the cook takes particular caution to cook the ground beef properly.
 - Since cooking ground beef from the frozen state could take up to twice as long, an estimated cooking time should be communicated to the consumer in order to provide proper event scheduling.
 - Procedures should be developed on how to measure grill temperature and finished cooked product temperature.
- Have you stated the use of a digital instant read thermometer must be required?
- Have you developed standardized information that should be used in cooking statements for frozen retail ground beef patties?
- Have certain basic cooking instructions been adopted by the industry and be included on consumer packages of frozen retail ground beef? That information should consider:
 - Consumers should only eat ground beef or ground beef patties that have been cooked to a safe internal temperature of 160° F.
 - Color is NOT a reliable indicator that ground beef or ground beef patties have been cooked to a temperature high enough to kill harmful bacteria, such as *E. coli* O157:H7.
 - The only way to be sure ground beef is cooked to a high enough temperature to kill harmful bacteria is to use a thermometer to measure the internal temperature.
- Does your labeling include statements that suggest ground beef packages must be handled and stored properly until the product is cooked to prevent cross contamination.
 - Labeling of certain products, *e.g.* frozen raw patties for consumers, should have enhanced ‘cook safely’ instructions or more label awareness information associated with the nature of this product.