Scientific Contributions Cont'd..

Time to take a fresh look at irradiation:

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The beef industry has invested millions of dollars in food safety research to reduce or eliminate the threat of foodborne illness from ground beef contaminated with deadly bacteria such as *E. coli* O157:H7, *Salmonella* and *Listeria*. The result has been the use of multiple interventions including steam, sprays, washes and now vaccines. Despite these efforts, harmful pathogens are still with us and there is no sign that these nasty critters are going away any time soon.

Background

Zero Tolerance: The US Federal Meat Inspection Act in 1994 defined the presence of *E. coli* O157:H7 in hamburger as an adulterant. Recalls of *E. coli* O157:H7 contaminated meat and related illnesses continued to grow over the next decade.

After 24 million pounds of contaminated beef were recalled in 34 separate incidents in 2002, recalls dropped to just over a million pounds a year for the next three years, and then to just 181,900 pounds in 2006. The US Centers for Disease Control (CDC) saw *E. coli* O157:H7 - related illnesses drop 48% between 2000 and 2006. That was encouraging news for the meat industry.

Cause for concern: In April 2009, the CDC published the latest FoodNet data on the incidence of disease caused by pathogens transmitted through food. Citing recent large, multi-state foodborne outbreaks as evidence, the report concluded that efforts to reduce foodborne disease in the United States have leveled off since 2004 and that fundamental problems with bacterial and parasitic contamination are not being resolved.

The CDC report should not be a surprise since the latest data from USDA show that *E. coli* contamination rates for ground beef are on the rise and at the highest levels since 2003. In 2008, 0.47% of ground beef samples tested positive for *E. coli* O157:H7 up from 0.24% in 2007. The percent of positive samples in 2006 was 0.17% compared to 0.16% in 2005. During the past two years, about forty million pounds of beef have been recalled in at least 40 incidents due to *E. coli* O157:H7. Experts don't seem to agree on reasons for the increase. The question is which year will 2009 resemble? As of No vember, thirty four positive samples have been obtained from slightly over 10,000 samples. While less than 2008, 0.34

percent is still double the percentage of positives found in 2006 and 2007 and the second highest year since 2003.

Possible Solutions

Pre-harvest Interventions: Much has been written about best management practices from "farm to fork" to reduce contamination. Since 1993, US beef producers alone have invested more than $27 million of their check-off dollars in beef safety research, and the industry as a whole invests $350 million annually on safety interventions. Steve Kay, Editor and Publisher of Cattle Buyer Weekly estimated that between 1993 and 2003, the ten largest packing companies invested more than $400 million on new food safety equipment and added $250 million to their operating costs to fight *E. coli* O157:H7.

Interventions currently being used include on-farm sanitation, steam, hot water, and organic acids. These technologies can reduce bacteria by two to three logs (99 to 99.9 percent). Recent approval of *E. coli* vaccines shows promise. However, vaccines are costly and producers will need to have an incentive to use them.

Testing: We often hear calls for increased product testing. The International Commission on Microbiological Specification for Foods in 2002 (Book 7), concluded the following, "No feasible sampling plan can ensure complete absence of a pathogen... It cannot be guaranteed that the lot is completely free of the organism, no matter how large the number of sample units."

Time to take a fresh look at irradiation

Despite our best efforts at every stage of beef production, harmful bacteria continue to plague the industry. Eventually the food safety discussion gets around to irradiation.

What is Food Irradiation? Food irradiation, sometimes referred to as "cold pasteurization," is the process of exposing food to an ionizing energy (gamma rays, x-rays or electron beams) to kill bacteria and extend shelf life without cooking or changing the food. Amounts of energy used are measured in kiloGrays (kGy). A dose of below one to 10kGy is usually sufficient to rid a product of harmful bacteria in most products.

The major benefit of food irradiation is greatly reducing, or even eliminating, the number of harmful organisms in a product. From a food safety standpoint, irradiation is comparable to pasteurization of milk. Other benefits include helping to keep meat, poultry and seafood fresh longer, and helping to reduce the need for chemical fumigants in foods by eliminating insects.

How effective is irradiation? Other than cooking, irradiation is the most effective technology available to reduce or eliminate pathogenic bacteria. At doses that are commonly used to irradiate ground beef, we can

expect the following levels of pathogen reduction:

E. coli O157:H7 - 99.99% to 99.9999%
Salmonella - 99% to 99.9%
Listeria - 99.9% to 99.99%

Despite widespread media attention from food recalls, serious illness, and death, food irradiation technology remains underutilized and sometimes misunderstood. An increasing number of food industry leaders are asking the question; is it time to take a fresh look at irradiation?

Consumer Acceptance

During the past decade a steadily increasing amount of irradiated food has entered commercial channels in the USA. Although irradiated fruits, vegetables, and poultry have been available commercially on a limited basis since the early 1990s, the introduction of irradiated ground beef in Minnesota during May 2000 significantly increased awareness and interest in the technology. Estimates are that approximately 15 to 18 million pounds of irradiated ground beef and poultry were marketed in the United States during 2008. The volume of irradiated meat and poultry sold in the US has remained steady during recent years. Irradiated ground beef is available from several retail outlets including Wegman's Food Markets in the Northeast USA, Publix in the Southeast, and nationally through Schwan's home delivery service and by mail order and retail sale through Nebraska-based Omaha Steaks. Omaha Steaks, Schwan's and Wegman's have recently expanded their offering of irradiated ground beef. Schwan's began selling irradiated ground beef in 2000 and has three ground beef offerings and recently introduced an irradiated breakfast steak. All Schwan's raw ground beef is irradiated for safety. Omaha Steaks also irradiates all of their raw ground beef and has seen ground beef sales double since they began to use irradiation.

Dr. Robert Tauxe of the CDC estimates that if 50% of poultry, ground beef, pork, and processed meats in the US were irradiated, the benefit would be a 25% reduction in the morbidity and mortality rate caused by these infections and prevention of nearly 900,000 cases of infection, more than 6,000 catastrophic illnesses, and over 400 deaths annually. Dr. Tauxe is currently updating his study but does not anticipate a significant change. The study does not include the cost and disability burden resulting from foodborne illness, hospitalization and litigation.

Mango Momentum

Currently much of the momentum is for irradiation use in produce. Highly publicized recalls of spinach, lettuce, tomatoes, jalapeño peppers, sprouts and even peanut paste have caused produce growers and marketers to seek permanent solutions. Research shows that irradiation is very effective at reducing bacteria in many produce items such as spinach and iceberg

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lettuce without compromising quality.

The availability of irradiated produce will increase dramatically in the future because of food safety concerns involving green leafy vegetables such as spinach and lettuce and an expanding market for exotic produce from Asian countries. Certain items, like tropical fruits arriving from India, Mexico, Thailand and several other countries must be irradiated to gain access to the U.S. Framework Equivalency Work Plans (FEWP's) have been signed with nine countries including India, Mexico, Thailand, Vietnam, Laos, South Africa, Pakistan, Philippines and Malaysia. These agreements allow importation into the US of produce from cooperating countries that was previously prohibited due to the risk of importing pests along with the produce. Irradiation prevents foreign fruit flies from damaging domestic product, and allows consumers to enjoy items like imported mango, mangosteen and papaya. Mangoes from India have been available at selected stores in the US since 2007. Irradiated mangosteen from Thailand and dragon fruit from Vietnam are also starting to appear at Asian specialty stores nationwide. In early 2009, Mexico began to export irradiated guavas and mangoes to the US. All foods that have been irradiated must be labeled as such and carry the "radura" symbol at retail.

Estimates are that some 18-20 million pounds of irradiated fruits and vegetables, mainly mango, mangosteen, papaya and guava, are sold annually by U.S. retailers. Hawaii Pride based in Keeau, Hawaii exports more than 9 million pounds of irradiated produce annually including papayas, rambutan, star fruit, purple sweet potatoes and bananas annually to major supermarkets on the US mainland.

A recent development that will likely increase the use of irradiation as a food safety intervention is the recent decision by USDA/FSIS to evaluate irradiation for purposes of carcass sterilization. The American Meat Institute (AMI) petitioned FSIS to accept irradiation as a "processing aid". The petition calls for surface pasteurization of beef carcasses at depths of mere millimeters. Should FSIS approve the petition which argues that irradiation of chilled beef carcasses should be considered a "processing aid" and therefore not subject to labeling requirements, meat packers will have another powerful weapon to combat deadly bacteria.

The Radura symbol, used to show a food has been treated with ionizing radiation (US FDA-version)

Interpretation of this symbol: denoting food - as an agricultural product - i.e., a plant (dot and two leaves) in a closed package (the circle) - irradiated from top through the package by penetrating ionizing rays (the breaks in the upper part of the circle). T aken from http://en.wikipedia.org/wik/Radura accessed Dec. 02-09.