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Safety of Beef Processing Method Is Questioned

By MICHAEL MOSS

Eight years ago, federal officials were struggling to remove potentially deadly E. coli from hamburgers when an entrepreneurial company from South Dakota came up with a novel idea: injecting beef with ammonia.

The company, Beef Products Inc., had been looking to expand into the hamburger business with a product made from beef that included fatty trimmings the industry once relegated to pet food and cooking oil. The trimmings were particularly susceptible to contamination, but a study commissioned by the company showed that the ammonia process would kill E. coli as well as salmonella.

Officials at the United States Department of Agriculture endorsed the company's ammonia treatment, and have said it destroys E. coli "to an undetectable level." They decided it was so effective that in 2007, when the department began routine testing of meat used in hamburger sold to the general public, they exempted Beef Products.

With the U.S.D.A.'s stamp of approval, the company's processed beef has become a mainstay in America's hamburgers. McDonald's, Burger King and other fast-food giants use it as a component in ground beef, as do grocery chains. The federal school lunch program used an estimated 5.5 million pounds of the processed beef last year alone.

But government and industry records obtained by The New York Times show that in testing for the school lunch program, E. coli and salmonella pathogens have been found dozens of times in Beef Products meat, challenging claims by the company and the U.S.D.A. about the effectiveness of the treatment. Since 2005, E. coli has been found 3 times and salmonella 48 times, including back-to-back incidents in August in which two 27,000-pound batches were found to be contaminated. The meat was caught before reaching lunch-rooms trays.

In July, school lunch officials temporarily banned their hamburger makers from using meat from a Beef Products facility in Kansas because of salmonella — the third suspension in three years, records show. Yet the facility remained approved by the U.S.D.A. for other customers.

Presented by The Times with the school lunch test results, top department officials said they were not aware of what their colleagues in the lunch program had been finding for years.

In response, the agriculture department said it was revoking Beef Products' exemption from routine testing and conducting a review of the company's operations and research. The department said it was also reversing its policy for handling Beef Products during pathogen outbreaks. Since it was seen as pathogen-free, the processed beef was excluded from recalls, even when it was an ingredient in hamburgers found to be contaminated.

The Beef Products case reveals a schism between the main Department of Agriculture and its division that oversees the school lunch program, a divide that underscores the government's faltering effort to make hamburger safe. The U.S.D.A. banned the sale of meat found to be contaminated with the O157:H7 strain of E. coli 15 years ago, after a deadly outbreak was traced to Jack in the Box restaurants. Meat tainted with salmonella is also a hazard. But while the school lunch program will not buy meat contaminated with salmonella, the agriculture department does not ban its sale to the general public.

Even so, E. coli outbreaks nationwide have increased in recent years. And this summer, two outbreaks of particularly virulent strains of salmonella in hamburger prompted large recalls of ground beef across several states.

Although no outbreak has been tied to Beef Products, officials said they would thoroughly scrutinize any future industry innovations for fighting contamination "to ensure that they are scientifically sound and protect public health," and that they were examining the government's overall meat safety policies.

The founder and owner of Beef Products, Eldon N. Roth, declined requests for interviews or access to the company's production facilities. Responding to written questions, Beef Products said it had a deep commitment to hamburger safety and was continually refining its operation to provide the safest product possible. "B.P.I.'s track record demonstrates the progress B.P.I. has made compared to the industry norm," the company said. "Like any responsible member of the meat industry, we are not perfect."

Beef Products maintains that its ammonia process remains effective. It said it tests samples of each batch it ships to customers and has found E. coli in only 0.06 percent of the samples this year.

The company says its processed beef, a mashlike substance frozen into blocks or chips, is used in a majority of the hamburger sold nationwide. But it has remained little known outside industry and government circles. Federal officials agreed to the company's request that the ammonia be classified as a "processing agent" and not an ingredient that would be listed on labels.

Within the U.S.D.A., the treated beef has been a source of friction for years. The department accepted the company's own study as evidence that the treatment was effective. School lunch officials, who had some doubts about its effectiveness, required that Beef Products meat be tested, as they do all beef used by the program.

School lunch officials said that in some years Beef Products testing results were worse than many of the program's two dozen other suppliers, which use traditional meat processing methods. From 2005 to 2009, Beef Products had a rate of 36 positive results for salmonella per 1,000 tests, compared to a rate of nine positive results per 1,000 tests for the other suppliers, according to statistics from the program. Beef Products said its testing regime was more likely to detect contamination.

Despite some misgivings, school lunch officials say they use Beef Products because its price is substantially lower than ordinary meat trimmings, saving about $1 million a year.

Another snapshot of processed beef's performance emerges from confidential records of tests in 2007 by the food giant Cargill. In the preceding year and a half, Cargill, which used more than 50 vendors, suspended three facilities for excessive salmonella; two were Beef Products plants,

records show.

Since introducing the treated meat, Beef Products has faced the challenge of balancing safety with taste, records and interviews show.

Pathogens died when enough ammonia was used to raise the alkalinity of the beef to a high level, company research found. But early on, school lunch officials and other customers complained about the taste and smell of the beef. Samples of the processed beef obtained by The Times revealed lower levels of alkalinity, suggesting less ammonia was used.

Beef Products acknowledged lowering the alkalinity, and the U.S.D.A. said it had determined that "at least some of B.P.I.'s product was no longer receiving the full lethality treatment."

Beef Products said it had submitted new research to the agriculture department showing that its treatment remained effective with lower alkalinity. Agriculture officials said Beef Products' latest study is under review.

A Safety Solution

Headstrong and self-assured, Eldon N. Roth had the good fortune of being in the right place at the right time.

Mr. Roth spent the 1990s looking to give Beef Products a competitive edge by turning fatty slaughterhouse trimmings into usable lean beef.

Mr. Roth and others in the industry had discovered that liquefying the fat and extracting the protein from the trimmings in a centrifuge resulted in a lean product that was desirable to hamburger-makers.

The greater challenge was eliminating E. coli and salmonella, which are more prevalent in fatty trimmings than in higher grades of beef. According to a 2003 study financed by Beef Products, the trimmings "typically includes most of the material from the outer surfaces of the carcass" and contains "larger microbiological populations." Beef Products said it also used trimmings from inside cuts of meat.

Mr. Roth was well suited to tackle the problem, friends say. Though lacking a science background, he had a knack for machinery and obtained patents for over two dozen pieces of equipment and methods used in processing beef.

"He looked and looked at stuff and always wondered, why can't it be done this way?" said Dr. David M. Theno, a food safety consultant and friend of Mr. Roth. "He is like a lot of inventors. Not everyone sees Eldon's vision."

One of Mr. Roth's early trials involved running electricity through the trimmings to kill bacteria, Dr. Theno and others said. Mr. Roth eventually settled on ammonia, which had been shown to suppress spoilage. Meat is sent through pipes where it is exposed to ammonia gas, and then flash frozen and compressed — all steps that help kill pathogens, company research found.

The treated beef landed in Washington in 2001, when federal officials were searching for ways to eliminate E. coli. Beef Products already had one study showing its treatment would do that; another company-sponsored study by an Iowa State University professor that was published in a professional journal seconded that finding.

Mr. Roth asserted that his product would kill pathogens in untreated meat when it was used as an ingredient in ground beef — raising the prospect of a risk-free burger. "Given the technology, we firmly believe that the two pathogens of major concern in raw ground beef — E. coli O157:H7 and salmonella — are on the verge of elimination," Mr. Roth wrote to the department.

The Food and Drug Administration signed off on the use of ammonia, concluding it was safe when used as a processing agent in foods. This year, a top official with the U.S.D.A.'s Food Safety and Inspection Service said, "It eliminates E. coli to the same degree as if you cooked the product."

Carl S. Custer, a former U.S.D.A. microbiologist, said he and other scientists were concerned that the department had approved the treated beef for sale without obtaining independent validation of the potential safety risk. Another department microbiologist, Gerald Zirnstein, called the processed beef "pink slime" in a 2002 e-mail message to colleagues and said, "I do not consider the stuff to be ground beef, and I consider allowing it in ground beef to be a form of fraudulent labeling."

One of the toughest hurdles for Beef Products was the Agricultural Marketing Service, the U.S.D.A. division that buys food for school lunches. Officials cited complaints about the odor, and wrote in a 2002 memorandum that they had "to determine if the addition of ammonia to the product is in the best interest to A.M.S. from a quality standpoint."

"It is our contention," the memo added, "that product should be labeled accordingly."

Represented by Dennis R. Johnson, a top lawyer and lobbyist for the meat industry, Beef Products prevailed on the question of whether ammonia should be listed as an ingredient, arguing that the government had just decided against requiring another company to list a chemical used in treating poultry.

School lunch officials said they ultimately agreed to use the treated meat because it shaved about 3 cents off the cost of making a pound of ground beef."Several packers have unofficially raised concern regarding the use of the product since the perception of quality is inferior," the 2002 memo said. "But will use product to obtain lower bid."

In 2004, lunch officials increased the amount of Beef Products meat allowed in its hamburgers to 15 percent, from 10 percent, to increase savings. In a taste test at the time, some school children favored burgers with higher amounts of processed beef.

Beef Products does not disclose its earnings, but its reported production of seven million pounds a week would generate about $440 million in annual revenue, according to industry records.

Dr. Theno, the food safety consultant, applauds Mr. Roth for figuring out how to convert high-fat trimmings "with no functional value."

"There were some issues with that," Dr. Theno said. "But he, and God bless him, amassed a tidy fortune for it."

As sales took off, Mr. Roth started offering a buy-back guarantee: If any of the most virulent E. coli was found in ground beef containing Beef Products meat, the company would buy the tainted meat.

This was based on Mr. Roth's initial prediction that his treated beef could kill E. coli in any meat

it was mixed with. The company acknowledges that its subsequent study found no evidence to back that up, although it says it is now trying with an enhanced treatment. The guarantee remains on the company Web site: "Contact a B.P.I. sales representative today to take the challenge!"

Odor and Alkalinity

As suppliers of national restaurant chains and government-financed programs were buying Beef Product meat to use in ground beef, complaints about its pungent odor began to emerge.

In early 2003, officials in Georgia returned nearly 7,000 pounds to Beef Products after cooks who were making meatloaf for state prisoners detected a "very strong odor of ammonia" in 60-pound blocks of the trimmings, state records show.

"It was frozen, but you could still smell ammonia," said Dr. Charles Tant, a Georgia agriculture department official. "I've never seen anything like it."

Unaware that the meat was treated with ammonia — since it was not on the label — Georgia officials assumed it was accidentally contaminated and alerted the agriculture department. In their complaint, the officials noted that the level of ammonia in the beef was similar to levels found in contamination incidents involving chicken and milk that had sickened schoolchildren.

Beef Products said the ammonia did not pose a danger and would be diluted when its beef was mixed with other meat. The U.S.D.A. accepted Beef Product's conclusion, but other customers had also complained about the smell.

Untreated beef naturally contains ammonia and is typically about 6 on the pH scale, near that of rain water and milk. The Beef Products' study that won U.S.D.A. approval used an ammonia treatment that raised the pH of the meat to as high as 10, an alkalinity well beyond the range of most foods. The company's 2003 study cited the "potential issues surrounding the palatability of a pH-9.5 product."

Soon after getting initial approval from the agriculture department, the company devised a plan to make a less alkaline version of the beef, internal company documents show. Beef Products acknowledged in an e-mail exchange that it was making a lower pH version, but did not specify the level or when it began selling it.

In 2008, after the school lunch program temporarily suspended a Beef Products plant for salmonella contamination, the company wrote in a letter that its effort to combat ammonia "aroma" might have reduced the alkalinity below the initial target levels. It said it was taking steps to ensure that the alkalinity remained elevated.

Samples of the treated beef obtained by The Times this month showed a pH as low as 7.75, according to an analysis by two laboratories. Dr. Michael P. Doyle, a food industry consultant and director of the Center for Food Safety at the University of Georgia, said one point on the exponential pH scale was a considerable difference, and "could have a significant effect on the antimicrobial effectiveness of the ammonia."

This month, Beef Products provided The Times with new research that the company said showed that E. coli and salmonella were undetectable at a pH level of 8.5. The agriculture department said it did not learn that Beef Products was using lower levels until October, after inquiries by The Times, and that it was studying the company's research.

McDonald's, whose hamburgers have contained Beef Products meat since 2004, declined to say if it monitored it for pH. But Danya Proud, a chain spokeswoman, said, "We expect the pH level to meet the specifications that are approved by the U.S.D.A."

Contamination and Notification

At 6:36 a.m. on Aug. 10, the Beef Products plant in South Sioux City, Neb., started up its production line for the school lunch program. In 60 minutes, the plant produced a batch of 26,880 pounds of processed beef that tested positive for E. coli.

Six days later at the same plant, another 26,880-pound lot was found to have salmonella, government records and interviews show.

Within hours of confirming the contamination, the school lunch division of the Agriculture Department in Washington began investigating.

Just down the hall at department headquarters, the division that oversees meat for the general public did not conduct its own inquiry for another month and half, after receiving questions from The Times.

The problems in South Sioux City came shortly after school lunch officials had suspended a Beef Products plant in Holcomb, Kan., for excessive salmonella. The main U.S.D.A. was not notified of the suspension by school lunch officials, and the plant continued to supply other customers.

Agriculture Secretary Tom Vilsack has since directed school lunch officials to share information about their suspensions with the department's meat safety division.

In addressing the latest contamination cases in Nebraska, Beef Products said it suspected a glitch in its treatment operations, referring to ammonia gas by its chemical name, NH3, according to an e-mail message to school lunch officials.

"The system was stopped for two minutes in order to install a new valve," the company said. "When the system was restarted, there was product flow for approximately one minute without NH3 flow."

After the school lunch officials replied that the glitch might explain only one of the two episodes, Beef Products shifted focus to its suppliers, saying it would more closely scrutinize them for contamination.

Under the U.S.D.A.'s new policy for Beef Products, the company itself is also likely to get more scrutiny.

Cargill, one of the nation's largest hamburger makers, is a big buyer of Beef Products' ammoniated trimmings for its patties. Company records show that Beef Products, like other suppliers, has periodically exceeded Cargill's limits on acceptable bacteria levels. That led Cargill to stop buying meat from two Beef Products plants for several months in 2006 after company tests showed excessive levels of salmonella.

But the following year, when Cargill faced an E. coli outbreak, it ruled out Beef Products as a possible culprit, citing the U.S.D.A.'s view that the ammonia treatment provided a "lethality step" for the pathogen. In addition, Cargill officials said recently, they suspect that another supplier, not Beef Products, was the problem. As a result, Beef Products did not face as wide a recall as

other Cargill suppliers.

Recently, another E. coli outbreak was traced to a hamburger maker in upstate New York that also used multiple suppliers, including Beef Products. This time, the agriculture department said Beef Products was being recalled with other suppliers, although a source of the contamination had not been identified.

"This will continue to be our approach going forward," the department said.

Griff Palmer contributed reporting.