Food Safety BULLETIN

ALL ABOUT LISTERIOSIS*

The "L" Word

Listeria is a dirty word in the food processing industry

In 2008, health officials investigated an increase of *Listeria* cases in Canada. The source of the deadly Listeria was eventually traced back to a ready-to-eat deli meat processor in Ontario, Canada. All products manufactured from this single establishment were recalled. Health officials confirmed 48 cases of listeriosis, and 18 deaths where listeriosis was the underlying or contributing cause[2]. The outbreak investigation was still ongoing when this article was written, so the final number of confirmed cases and deaths linked to this outbreak may be higher than what is reported here.

The manufacturing facility was shut down for 1 month, while the source of *Listeria* contamination was investigated. When 2 meat slicers were completely disassembled, the investigators discovered that organic material was trapped deep within the slicing equipment and remained there even after routine cleaning and sanitation had been completed in accordance with the manufacturer's specifications. Investigators determined that the meat slicers were the likely source of the *Listeria* contamination.

Listeria is a potential contaminant of food products. It is a reminder that we must all be vigilant when it comes to food safety. Good food safety practices prevent costly recalls, preserve the reputation of our plants and our products, and help our industry remain strong.

Know What You're Dealing With

What is it?

Listeriosis is a disease caused by a bacterium called *Listeria monocytogenes*. This bacterium is found widely in the environment including in soil, water, silage and many other environmental sources. It is also found in the intestines of both animals and humans. It is more heat-resistant than most food-borne bacterial pathogens, can survive freezing and drying, and is resistant to high salt levels, nitrite and acid. It can grow at low (refrigeration) temperatures and with low oxygen levels such as those found in vacuum packaged meats.

Who is at risk?

Listeria monocytogenes is especially dangerous to high-risk populations including newborns, pregnant women, the elderly and people with weakened immune systems such as transplant patients and those suffering from cancer and AIDS. Healthy people are generally at low risk but, if the food is heavily contaminated, anyone can become ill.

What are the symptoms?

Most people experience flu-like symptoms such as nausea, vomiting, diarrhea, headache, constipation and persistent fever. In pregnant women this can lead to infection of the fetus and may cause miscarriage or birth of a severely ill baby. Pregnant women are 20 times more likely to develop listeriosis than healthy adults. People with AIDS are 300 time more likely to develop listeriosis than those with a normal immune system. In fact, 20 to 30 percent of foodborne listeriosis infections in high-risk individuals may be fatal[3].

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*(Modified with permission from Alberta Agriculture and Food[1])

BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

In-plant Potential Sources

Cross-contamination – four main sources

- The environment - either through airborne bacteria or aerosol moisture droplets generated from condensation, pooling water, reefer unit drip pans, disturbances in work areas including disruptive construction projects, disassembly of equipment or other parts of the plant;
- Employees - through clothing, gloves, boots or coming into direct contact with the product;
- Improperly cleaned and sanitized equipment; and
- Animals entering the plant for slaughter.

Before Cooking

Listeria monocytogenes is widely found in the environment, in livestock and in humans, so it is not surprising that it is frequently found on uncooked meat. In a plant it may be found in:

- Raw products and ingredients,
- Solutions used to chill or cure foods (e.g., brine solutions), and
- Returned products.

After Cooking

In most cases, ready-to-eat (RTE) foods that become contaminated with *Listeria monocytogenes* prior to cooking are properly processed. When contamination occurs, it is usually between the cooking and packaging steps (during cooling, slicing and packaging). Areas of concern are:

- Slicers, dicers, saws, casing peelers,
- Shelves and racks, lugs, tubs, containers,
- Hand tools, gloves, aprons,
- Packaging materials,
- Tables,
- Conveyor belts, and
- Sponges and brushes for cleaning.

Reservoirs

In addition to the product contact areas mentioned above, contamination can also occur from environmental reservoirs. For example, hose spray may carry *Listeria monocytogenes* from a contaminated drain onto the product or a product contact area. Dust associated with construction could transfer bacteria onto food contact areas. Possible reservoirs to be aware of include:

- Floors and drains,
- Standing water,
- Ceilings and overhead pipes,
- Refrigeration and condensation units,
- Wet insulation,
- Overhead rails and trolleys,
- Wooden pallets,
- Cracked or pitted hoses, door seals, walls, inadequately sealed surface panels,
- Vacuum pumps, lines, hoses, rollers, switch boxes, motor housings, and
- Ice makers, air filters, open bearings.

Controlling Listeria

Controlling *Listeria* is not an easy task given the fact that it is widespread in the environment. This can be accomplished with proper sanitation, proper RTE products handling procedures, proper plant design and maintenance, and proper temperature control in all phases of handling and transportation.

Sanitation

The high prevalence of *Listeria monocytogenes* in raw ingredients and in the environment means that at some point this organism is likely to be present in the food processing environment. Sanitation is the key to ensuring that RTE processed products do not become re-contaminated after processing.

Here are some sanitation and cleaning tips to control *Listeria*

- Drying after sanitation is important to reduce the opportunity for Listeria to grow on floors - this organism needs moisture to grow! Floors should be kept free of standing water and as dry as possible.
- Determine the frequency of cleaning based on the type of products and the risk involved. RTE products have the highest risks when it comes to *Listeria* contamination.

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- You can assess the effectiveness of your sanitation program by conducting microbial testing after sanitation.
- Thoroughly clean and maintain floor drains to prevent drain back up. Clean drains in a way to prevent contamination of other equipment. If back up occurs, clean extensively.
- Coolers should be emptied, cleaned and sanitized. Clean and sanitize refrigeration units regularly. Coolers and other rooms should never be cleaned with exposed RTE products present.
- Make sure that waste containers in your RTE processing area are properly cleaned before operation. Use these containers only in the RTE processing area.
- Never clean or sanitize equipment or tools on the floor. This can result in splash contamination of the tools from bacterial reservoirs on floors or in drains.
- Keep hoses cleaned and off the floor after use.
- Consider using boot dip stations for re-entry to RTE processing areas.
- Consider using sanitizers that have proven most effective against *Listeria monocytogenes*. Quaternary ammonia compounds (quats) and newer products containing peracetic acid have been found to be most effective against Listeria.
- Rotating sanitizers periodically is generally a good practice, as it will provide more effectiveness against Listeria and other bacteria. Also, rotating sanitizers used in other applications, such as boot dip stations, is also generally recommended.
- Alternate alkaline-based detergents and acid-based detergents to avoid "soapstone" or hard-water buildups and biofilms. Alternating detergents also prevents adaptation of bacteria to a particular environment. Processors should work with suppliers of these products or sanitation professionals to develop a plan best suited for a particular operation.

Care must be given when cleaning rooms used for storing equipment and products so as not to splash water from the floor onto the product, which could contaminate it with bacteria.

RTE handling

You can reduce the chance of *Listeria contamination* of your product after processing by limiting the amount of contact the product has with surfaces and hands before it is packaged.

- Clean gloves, smocks, sleeves and aprons are essential to prevent the spread of Listeria.
- Gloves must be changed and hands thoroughly washed after touching an unclean surface.
- Knives and other equipment should be dedicated for use only in RTE processing areas and should be sanitized.
- New employees unfamiliar with proper handling need to be instructed and trained properly. All employees must clearly understand the need for clean garments and wearing waterproofed footwear that can be properly cleaned and sanitized after use.

Plant design and maintenance

Many plants in operation today were not designed to prevent cross-contamination of processed meat products. Here are some tips to help you to decrease the chance of cross-contamination in your operation:

- Observe product flow in your plant and avoid any chance of processed product coming in contact with tools, equipment or people that may have been in contact with raw ingredients. Raw products and processed products should each have their own dedicated equipment and tools that are sanitized before and after use.
- Traffic flow between RTE processing areas and raw product areas should be drastically reduced or eliminated if possible. Staff should wash hands and change protective clothing when moving from one area to another.
- Raw products and RTE products should be stored in different areas.
- Ceiling, floors and walls should be smooth, sealed and moisture-free.

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- Air supply should be filtered to prevent contaminants from entering the building or the room. Rooms used for processing and storing processed products should be under positive air pressure so that air is not received from a non-filtered or raw product area.
- Light fixtures should be designed so as not to harbour dirt or moisture. Remove any difficult-to-clean overhead light fixtures from areas where processed products are exposed.
- Make all efforts to eliminate condensation in ready-to-eat work areas and coolers.
- If eliminating condensation is not possible, consider implementing measures to capture condensation, such as wiping it off. Redirect the products away from areas that are prone to condensation.
- Install equipment that is easy to clean, eliminating sites where bacteria could collect.
- Floors should be properly designed to slope towards drains to prevent accumulation of water.
- Avoid maintenance activities and repair work during work hours. Disruption in production is often associated with contamination. Activities that generate dust have clear association with Listeria contamination.

Proper Temperature Control

Controlling the temperature of the product during processing, storage and delivery inhibits the growth of all bacteria including Listeria.

Foods Involved

Foods can be contaminated with *Listeria* at any stage in the food chain: from the farm, through processing and distribution, to the consumer's kitchen.
Studies have shown that *Listeria monocytogenes* can be found in a wide range of foods including raw and cooked chicken and red meats, paté, sausages, milk, soft cheese, vegetables and seafood.

One third of raw ground chicken and turkey and about 10 per cent of broiler carcasses, cow and bull carcasses, and raw ground beef harbour *Listeria monocytogenes*. Four to 7 per cent of turkey carcasses, hog carcasses, and steer and heifer carcasses have also been found to harbour the bacterium.

RTE products (cooked prior to final packaging and consumable as packaged without further heat treatment) present a higher risk to consumers if contaminated with Listeria. In general, once proper cooking has occurred, the burden for producing a safe product depends on proper sanitation and handling, elimination of cross-contamination and minimizing time-temperature abuse during handling, storing and transportation. Understanding what the potential sources of contamination are in your plant is very important to produce RTE products: most *Listeria* outbreaks and recalls are caused by post-cooking contamination.

It All Comes Down to This

- Controlling *Listeria monocytogenes* in processed foods is really up to each of us. Every year this organism causes costly recalls for our industry as well as illnesses and deaths for our consumers. When every employee understands the organism, basic sanitation principles and gains a sense of personal responsibility, we will be able to eliminate this potentially dangerous bacterium from our finished products.

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References:

[1]Alberta Agriculture and Food , Food Safety Division. Food Safety Sentinel, January 2008. http://www1.agric.gov.ab.ca/$department/newslett.nsf/pdf/fss13574/$file/fss_jan_2008.pdf?OpenElement, Accessed on September 18, 2008.

[2]Public Health Agency of Canada. Listeria Monocytogenes Outbreak. http://www.phac-aspc.gc.ca/alert-alerte/listeria/listeria_2008-eng.php. Accessed on September 22, 2008.

[3]Health Canada. *Listeria and Food Safety*. http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/food-aliment/listeria-eng.php#th. Accessed on September 22, 2008

The following are useful sources of information:

Health Canada's Policy on *Listeria monocytogenes* in Ready-to-Eat Foods
http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/legislation/policy_listeria_monocytogenes_politique_toc-eng.pdf

Health Canada's Frequently Asked Questions
http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/legislation/listeria_faq-eng.pdf

Guidelines on the Application of General Principles of Food Hygiene to the Control of *Listeria monocytogenes* in Ready-to-Eat Foods. http://www.codexalimentarius.net/download/standards/10740/cxg_061e.pdf

Grant County Health District: *Salmonella Seftenberg* Investigation.
http://www.granthealth.org/_content/Eh/Seftenberg_report_graph07.pdf

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