



*Listeria* is a bacterium commonly found in the environment, such as in air, water and cold, moist places like refrigerators and sink drains. Much of the bacteria found in the environment are harmless, but one bacterium, *Listeria monocytogenes*, is a virulent strain and can lead to a serious disease called listeriosis among certain at-risk populations.

*L. monocytogenes* is found in water, soil and the digestive tract of warm-blooded animals including humans. It also is found unprocessed foods of animal origin like raw milk, meat, poultry and fish. While cooking destroys *Listeria*, it can be found on some processed foods like cheese, ice cream and processed meats if cross contamination after packaging occurs.

*Listeria* can thrive in cold, moist environments such as those commonly found in home refrigerators and food processing plants. Protein products, such as meat and cheese, are an excellent media or “food” for bacterial growth if contamination occurs. Furthermore, *Listeria* is known to create “biofilms,” web like coatings including bacteria, which are particularly resistant to sanitation.

When sanitation practices are insufficient, *Listeria* can harbor and thrive in many common pieces of equipment used in meat processing plants, such as conveyor belts, slicers, dicers and peelers. Also, machinery used for packaging products also may harbor and transfer the bacteria to products. When this occurs, scrupulous sanitation must occur to eliminate *Listeria*.

Both industry and government are working diligently to reduce the incidence of *L. monocytogenes* in foods and prevent its growth and spread in food processing plants. The AMI Foundation has made research related to the elimination of *Listeria* one of its top priorities. The Equipment Design Task Force (EDTF), established by the AMI *Listeria* Task Force in 2001, has developed operational and

equipment design guidelines to minimize the spread of *Listeria* in meat processing plants.

## Equipment Design Task Force

The EDTF was charged with developing equipment sanitary design principles that meet the expectations of the meat and poultry industries. The task force also developed a checklist tool that equipment manufacturers and processors can use to ensure their equipment meet these principles.

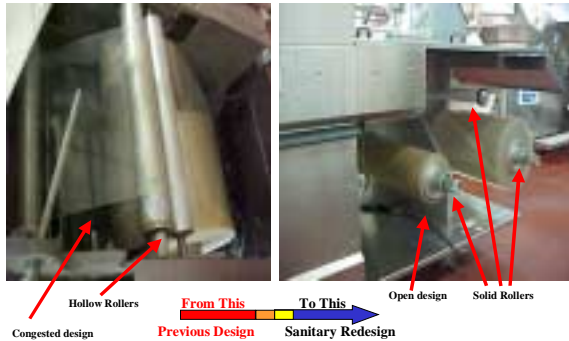
The AMI EDTF is comprised of representatives from ten meat and poultry processing companies. AMI EDTF designed the sanitary design criteria in consultation with equipment manufacturers, certifying organizations and government officials.

The EDTF identified the critical nature of equipment design in reducing the risk of contamination of food products by *Listeria*. Optimizing the design and performance criteria for equipment and related systems as well establishing industry-wide specifications benefit the entire industry by promoting one standard design that will help reduce contamination and associated recalls.

## 10 Principles of Sanitary Design

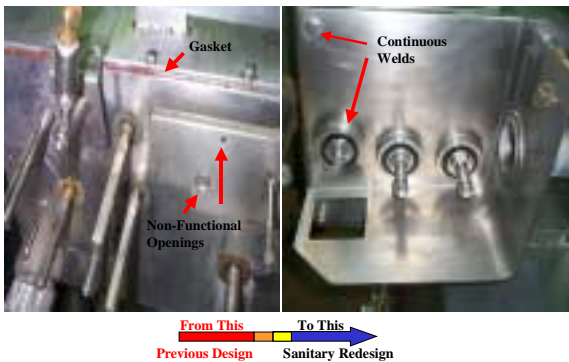
**1. Cleanable to a microbiological level:** Food equipment must be constructed to ensure effective and efficient cleaning of the equipment over its lifespan. The equipment should be designed as to prevent bacterial ingress, survival, growth and reproduction on both produce and non-product contact surfaces of the equipment.

**2. Made of compatible materials:** Construction materials used for equipment must be completely compatible with the product, environment, clean-



The sanitary redesign above features an open design and solid rollers so bacteria does not have the opportunity to survive, grow and reproduce. Hollow rollers and congested design allow for harborage of bacteria.

The sanitary redesign below also features a clean, more open design as well as continuous welds. Continuous welding of parts also prevents bacteria from harboring and growing in niches.



ing and sanitizing chemicals and the methods of cleaning and sanitation.

**3. Accessible for inspection, maintenance, cleaning and sanitation:** All parts of the equipment shall be readily accessible for inspection, maintenance, cleaning and sanitation without the use of tools.

**4. No product or liquid collection:** Equipment should be self-draining to assure that liquid, which can harbor and promote the growth of bacteria, does not accumulate, pool or condense on the equipment.

**5. Hollow areas should be hermetically sealed:** Hollow areas of equipment such as frames and rollers must be eliminated whenever possible or

permanently sealed. Bolts, studs, mounting plates, brackets, junction boxes, nameplates, end caps, sleeves and other such items should be continuously welded to the surface, not attached via drilled and tapped holes.

**6. No niches:** Equipment parts should be free of niches such as pits, cracks, corrosion, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets and dead ends.

**7. Sanitary operational performance:** During normal operations, the equipment must perform so it does not contribute to unsanitary conditions or the harborage and growth of bacteria.

**8. Hygienic design of maintenance enclosures:** Maintenance enclosures and human machine interfaces such as push buttons, valve handles, switches and touchscreens, must be designed to ensure food product, water or product liquid does not penetrate or accumulate in or on the enclosure or interface. Also, physical design of the enclosures should be sloped or pitched to avoid use as storage area.

**9. Hygienic compatibility with other plant systems:** Equipment design should ensure hygienic compatibility with other equipment and systems, such as electrical, hydraulics, steam, air and water.

**10. Validate cleaning and sanitizing protocols:** Procedures for cleaning and sanitation must be clearly written, designed and proven effective and efficient. Chemicals recommended for cleaning and sanitation must be compatible with the equipment and the manufacturing environment.

## Controlling Pathogens Through Equipment Design

Equipment sanitary design and operation are critical elements to the control of *Listeria* contamination in ready-to-eat meat and poultry processing plants. AMI believes that the sanitary design of equipment can be achieved through a non-competitive and cooperative effort between customers and suppliers.

The EDTF sanitary design principles will improve design and operation of equipment that is developed in the future to meet the needs of the ready-to-eat meat and poultry industry. The principles will help the meat and poultry industry in its continuing mission to bring consumers and customers the safest product possible.