**Hot Dog Production Steps**

The first steps are the same as we have previously covered: meat and/or poultry, other ingredients, and packaging materials are received and stored in the establishment until ready to use. Many establishments carefully control the quality of the incoming ingredients through purchasing specifications. Meat ingredients may have quality specifications such as percent fat, moisture, and protein. These are parameters that will affect the final quality of the product.

Raw meat ingredients used in these products will depend on the type of finished product desired. Not long ago, most hot dogs were either a combination of pork and beef, or they were all beef. Today, establishments still make these products, but many more combinations of ingredients are used. Many formulations include at least some poultry products (turkey or chicken), and some products are made exclusively with poultry.

The first step in the formulation process is weighing or measuring the meat and/or poultry ingredients. They are ground and mixed or blended with the non-meat ingredients. Often establishments will pre-blend, that is, they will grind and mix the meats with water and salt, and sometimes with the nitrite, and let it stand for a period of time in a cooler.

Antimicrobial agents, are substances such as acetates, diacetates, and lactates, added to an RTE product to reduce or eliminate a microorganism, including a pathogen such as *L. monocytogenes*, or suppress or limit growth of *L. monocytogenes* in the product throughout the shelf life of the product.

Binders and extenders, such as dry milk powder, cereal flours, and soy protein, have a number of uses in a sausage formulation. They increase the overall yield, improve binding qualities, and add certain flavor characteristics.

Cure accelerators, such as ascorbates and erythorbates, are used to speed up the curing process. They also stabilize the color of the final product.

Phosphates are used to improve the water-binding capacity of the meat, and contribute to the flavor and color of the product.

Spices and flavorings are used to add flavor to the sausage. The wide range of available spices, seasonings, and flavorings is a primary reason for the variety available in sausages in the marketplace.

After the non-meat ingredients are blended with the ground meats, the mixture is emulsified. This is done in an emulsifier, and further reduces the size of the meat particles to achieve a very fine texture. Fat, protein, salt, and water are mixed and combined into a semi-fluid emulsion. The meat muscle protein, myosin, is
solubilized, or released from the muscle fibers, by salt. The solubilized protein and water combine and surround the fat globules, and suspend the fat particles within the mixture.

Careful control of the amount of each ingredient is essential to the quality of the final product. The manufacturer must select a mix of raw meat materials with the appropriate binding characteristics. Different meats vary in their ability to bind. Lean beef, for example, bull, cow, and shank meat, have high binding ability. Regular pork or beef trimmings with more fat, and poultry, have medium binding ability. Low binding meats contain high levels of fat, such as jowls and briskets. Organ meats have no binding qualities. The binding capabilities are directly proportional to the myosin (red pigment) in the muscles. Thus, the paler the muscle, the less bind it contributes to the mixture.

Control of the emulsification process is also essential. Product defects result from too much chopping, or from an increase in temperature during the process. Over-chopping makes the protein fibers too short. It also creates heat from friction that melts fat. This results in product defects such as pockets of fat in the final product.

After emulsification, the mixture (or “batter”) is stuffed into casings, usually artificial plastic casings that allow moisture to cook out and smoke flavors to penetrate. Natural casings such as sheep small intestines may also be used.

Following stuffing, the product is linked by pinching and twisting the casing to form separate units of sausage. The sausages are still held together by the casing. These lengths of casings are then placed on racks or trees, and are ready to be loaded into the smokehouse. Some establishments load trees into individual smokehouses, however, some large volume establishments use continuous smokehouses.

The smokehouse parameters that must be controlled are temperature, time, and humidity. The product must be exposed to a high enough temperature in order to produce a fully cooked, ready-to-eat product. The temperature inside the smokehouse, and the internal temperature of the sausage, may be monitored by the establishment in order to verify that the critical limits are met. Cooking is a very important step, because it is here that any pathogens (e.g., Salmonella) that may be in the product will be eliminated and the numbers of spoilage bacteria will be lowered to an acceptable level. This is called a lethality treatment.

After product has reached the final temperature desired, the cooling process begins. This product is often showered with cold water inside the smokehouse. This removes some of the heat from the product, and immediately halts the cooking process. The shower is usually not sufficient to complete the cooling process. Usually product is moved to another chiller or cooler to finish cooling. Some establishments use very cold water as a chilling medium, sometimes with
salt added to lower the temperature below the normal freezing point of water. This is called a brine chiller. Other establishments may use cold air, and some use a combination of methods.

The cooling process is also known as stabilization. There are two types of bacterial contamination that must be addressed by the stabilization process.

- Spore-forming bacteria (*Clostridium perfringens* and *Clostridium botulinum*) can survive cooking when in the heat-resistant spore form, and these organisms need to be considered as the products are chilled. Growth (sometimes referred to as “outgrowth”) of these bacteria is slowed by rapid cooling. Cooling rates, or time/temperature relationships, must be carefully controlled in order to ensure that product does not remain at warm temperatures that would support the outgrowth.

- Recontamination with bacteria (e.g., *Listeria monocytogenes*) must be considered as cooked products are exposed to the environment, food contact surfaces, or cross-contamination with raw product prior to final packaging. Proper chilling and cold storage temperatures are essential to limit the growth of these bacteria.

After product has been chilled to the desired temperature, it is removed from the artificial casings in a machine called a peeler. This equipment quickly runs the sausage through a tunnel that has a tiny blade that slices the casing. Steam or air is then used to blow the casing away from the sausage. The sausage links are now separate. If you closely examine the outside of a hotdog, you might see where the casing had been cut. This blade is a potential source of contamination, since it contacts every hot dog!

Sometimes a product that has partially or fully completed the production cycle is not sellable but is still wholesome, and can be used for food. For example, the casing of some sausages may split during the cooking or smoking cycle. Manufacturers may reuse these edible but unmarketable products by removing the casing and adding the contents to the grinder to include in another run of the same product. This is called rework. Since the proteins are coagulated from cooking, rework has no bind capabilities. Of course, the ingredients of the rework must be compatible with the ingredients of the batch to which they are added for labeling purposes.

The final steps are packaging, labeling, and storage. The product is ready for distribution to retail stores, restaurants, or institutions.