Making Salami at Home

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The differences between the various types of salami are due to the kind of meat they contain, the proportion of lean to fat, and the fineness or coarseness of the grind. Salami can be exclusively pork, or be a mixture of pork and beef, but they can also be made with venison or other game meats, poultry, goose, lamb and goat. Generally the ratio is 70% lean and 30% fat, but that may vary depending of the recipe or style being made. Italian salami are different from region to region; they can be un-smoked or smoked, each with their own formulas, curing and maturation. There are two types Italian salami most familiar to Americans. The fine-grind type of salami that is similar to that made in Milan containing black pepper; the other is Soppressata, a coarse grind salami, often with red pepper, similar to the type found in Naples.

The Raw Materials:

The meats used in salami making should be kept at a temperature of 36°F in order to minimize any increase of the microorganisms brought on butchering and handling the meat. I prefer to use pork shoulder butts when the recipe calls for pork, beef chuck when beef is used. For fat, I prefer to use what is termed pork back fat, which is the fat trimmed of the loin area of the pig;

another choice would be "fat bellies.

When preparing your own formula, remember to compensate for the fat in a pork shoulder (often called Boston butts) which can contain approximately 20% fat. If you have access to a butcher that prepares primal cuts from slaughtered animals, you may be able to order bull or cow meat; not because its cheaper, but because the biochemical makeup of the muscle from older, leaner animals is best for making salami.

The Meat Paste:

The preparation of the meat paste begins with grinding the raw materials. Remove and discard as much sinew as possible from the meats. Keep the meats as cold as possible and grind the meat and fat separately. The dimensions of the grind will depend upon the style of salami you wish to make; for example, to make Soppressata or a Toscano style, choose a medium to large grind, whereas, a Milan style would require that the meat require that the meat be ground to a fine grain.

Pastes that are a medium or large grind, can be mixed with the salt and other ingredients fairly aggressively since the final product will not have a homogeneous texture of fat to lean. However, the fat in fine ground pastes can become excessively smeared during the mixing and blending stage if it is not kept very cold. Of the many variables in making salami, one of the most important is the temperature of the fat and the meats. Try to keep meats at 36°F (preferably a degree or two cooler).

I prepare the meat by cutting it into 1 to 1-1/2 inch cubes. Then I put them in the freezer until they are partially frozen; then I grind them to the desired consistency, returning them to the freezer while I prepare the fat, which I handle the same way.

Additives:

Immediately after mixing the meat with the salt and other additives the meat paste begins its transformation to salami. The additives need to be well amalgamated into the meat paste for the sausage to have a consistent taste throughout. Mixing should be done under the most strict sanitary conditions; if you mix by hand, use latex surgical gloves to protect your skin from absorbing the additives!

Salt: The salt is essential because it is involved in the biochemical

activities we call curing as well as the inhibition of some microorganisms found in the meat. The salt makes the proteins in the meat soluble, causing a sticky film (myosin) to form around the fat particles which in turn creates a stable emulsion. Salt is also necessary for the dehydration of the meat paste which also prevents growth of food-spoilage microorganisms.

Nitrite: In addition to the salt, nitrite is added for the inhibition and the selection certain bacteria found in the meat. In dry cured products, a mixture of both nitrite and nitrate are added to the meat. You sometimes see formulas that call for saltpeter (potassium nitrate). The current trend is to move away from saltpeter and use sodium nitrite/nitrate mixtures. In reality, the nitrate, to be useful in curing, must be converted to nitrite...this is accomplished by bacteria (Micrococcus, for example) present in the meat paste. Nitrite is used up quickly in the curing process so such a mixture is added to dry-cured meats to ensure a supply of nitrite in the later stages of maturation. The nitrite is particularly effective in the inhibition of Clostridium bacteria, which causes botulism. It also helps keep the meat an appealing red color.

Starter Cultures:

I recommend the use of a starter culture in order to control the myriad of microorganisms that may be in ground meat, especially food-spoilage microorganisms. Starter cultures can be difficult to find in small quantities; I've used one (*Pediococcus)* from Butcher-Packer [see links], they sell a freeze dried packet in 40 gram quantities. I've used both *Pediococcus cerevisiae* and *Lactobacillus plantarum*...I prefer the taste of the plantarum. The lactic bacteria includes species that are essential to the production of many foods we enjoy, such as, cheeses, yogurt, beer, and sourdough bread to name a few. The lactic bacteria used in salami making are salt tolerant and produce lactic acid from the dextrose in the meat paste, which has the effect of lowering the pH (or raising the acidity). This lowered pH is a hostile environment for spoilage bacteria, thereby minimizing their growth.

Spices: The purpose of the spices is to impart the desired the taste and aromas that the salami maker prefers. In the majority of the cases, Italian salami is often flavored with black pepper, cracked or ground,

wine infused with crushed garlic, red pepper or fennel seeds. It is absolutely essential that you use fresh spices for consistent results. If your ground spices are more than 6 months old, through them out and purchase new ones. It is always better to purchase whole, un-ground spices and grind them yourself as needed...you'll be surprised by the difference!

The Maturation Process:

In my opinion, the maturation of salami can be thought of being subdivided in three distinct phases: Curing, Incubating, Drying...all of which require different temperatures and relative humidity conditions. Depending upon the type of product that is intended, this process may last 21 or more days

Salami stuffed in natural casings

I. The Curing Phase: This is the beginning of the maturation process. This phase begins immediately upon the addition of salt. In the old, traditional method, after grinding and mixing, the paste was put under refrigeration for approximately 24-48 hours (depending upon the recipe being used). In the modern production of salami, this refrigeration period has been replaced by immediate fermentation at 85^{o}F or higher because of the addition of a lactic acid bacterial starter cultures added to the salami paste. This has the effect of lowering the acid content of the meat to a point were many harmful bacteria are inhibited.

It's helpful for me to keep notes on the entire process in order to help me evaluate the final product. Biochemical reactions occur between the salt and the muscle proteins.

Tied And Ready For In-cubation

After Incubation

The curing reactions are quite complicated and require some knowledge of biochemistry. The important thing to understand is that it is the salt and the curing salts that are responsible for curing the meat. The salt concentration should never be reduced in order to limit your intake of sodium. Besides curing the meat, salt and cure are necessary to kill any trichina worms that may be in the muscle meats. Generally, the concentration of salt is minimally 3.5% of the weight of the ground meat before any ingredients are added. The aging or maturation process is strictly defined by the USDA, and the reader is directed to review this document.

When the curing time is over, the meat paste is stuffed into casings and tied. The casing used must allow moisture to escape the salami during drying. The choices for casings are astonishing. They fall into two categories: natural and artificial. The artificial casings can be collagen (some edible others not) or fibrous; the natural can be intestine, bladder, stomach or esophagus from beef, pork or sheep. In Europe, horse and donkey innards can also be used in some countries.

I use a natural casing called a "beef middle". The size I use makes salami of 2-1/2 inches in diameter, stuffed. They are packed in salt and will keep for many months in the refrigerator. I like to use natural casing for two reasons: they give the salami an "old world" look and they contribute to the overall taste of the salami. I also believe the salami dries more evenly and consistently with natural casings. If you're going to spend money for casings, you might as well get the kind you can eat! The

Early Drying Phase

Freezer Modified For Drying

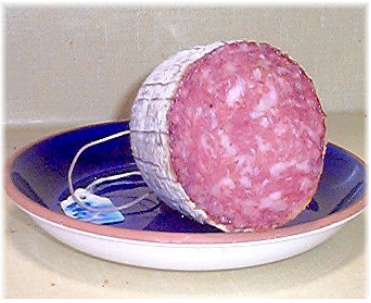
Ready to sample!

advantage of artificial casings are that they are easy to store, they are a consistent size, and they don't smell!

II. The Incubation Phase: The stuffed salami is incubated at 85°F - 90°F from 1 to 2 days...again depending upon the recipe. The relative humidity is kept at 75%-85% (although some formulations require as high as 90% R/H). I use a converted old freezer cabinet that I modified and set the thermostat to maintain 85°F and 9-85-90% R/H.

This temperature is ideal for bacterial growth, so the salami maker must use all possible means to favor the beneficial and hinder the spoilage bacteria by using a lactic acid bacteria starter culture. As you can imagine, the ground meats contain a whole host of bacteria; some beneficial, others harmful. One of these harmful bacteria can be *Clostridium botulinum,* which produces a toxin that causes botulism in humans. Sodium nitrite is added to dry cured salami in order to kill this organism, therefore it is an essential ingredient in the amounts regulated by USDA; too little and it won't control botulism; too much and it may kill you! Lactobacilli in starter cultures ferment the sugars in the paste, producing lactic acid, among other things. This has be shown to successfully hinder the growth of harmful bacteria by lowering the pH (increasing the acidity) of the meats.

III. The Drying Phase: After incubation, the salami are dried in order to lower the water content of the meat. At the conclusion of this drying phase, the salami can be held without refrigeration. The drying may lasts 30 days or more depending upon the diameter of the salami.



Large diameter salami, stuffed in beef bungs may require 65 days! During this phase the salami will loose between 35% to 45% of its water. The reduced availability of water prevents growth of spoilage bacteria. The temperature during this phase is generally 55-65°F with a relative humidity of 70-80%. The maintenance of this high humidity is necessary to prevent case hardening. That occurs when the outer circumference of the salami dries faster than the interior. An excessive superficial drying can also cause the formation of interior cavities within the salami and a general loss of compactness of the meat.

During this time, the casing of the salami will mold. This is natural and some say it imparts complexity to the flavor of the salami. If this is objectionable to you, rub the salami (when completely mature) with a cloth to partially remove the mold and dust it with rice flour.

A word about "salami mold": Old world style salami are generally covered with a fine white mold. This is considered extremely desirable characteristic in both European and San Francisco style dry-cured products. See Salami War.

There are two major groups of micro-organisms that contribute to this bloom: Yeasts and Molds. The very first organisms to appear after fermentation are single celled yeasts. They form a slightly "sticky" film over the surface of the casing. I have not yet been able to identify the exact species of yeast. When I do, I'll posts it here.

A few days after the growth of yeast, assuming the temperature and humidity of the recipe is adhered to, the appearance of a fine white mold begins to grow, supplanting the yeast cells. This mold will grow and mature over the coarse of the

aging period. Is is edible...I can only say that if grown on natural casings, I've eaten it with absolutely no ill effects. Its up to you to decide!

Fungal species of the genus *Penicillium* are a frequently used as commercial starter cultures for mold ripened foods, especially cheeses. *Penicillium roqueforti,* for example, is used in cheese to develop characteristic blue veins such as in Roquefort Blue, Danish Blue, Gorgonzola, Stilton and other blue style cheeses. It is common practice to use mold starters for salami-type products, especially in Europe….after stuffing, the salami casings are sprayed or dipped in the mold culture before they are sent off for fermentation. Three species of these fungi, *P notatum, P. nalgiovense and P. chrysogenum* have been isolated from both European and U.S. dry-cured salami. These molds help in flavor development by decomposing excess lactic acid and inhibiting the growth of other undesirable molds.

***P. notatum* was the first species of fungus that is used to commercially produce the antibiotic penicillin. From the physiologic, as well as the genetic, point of view *P. notatum* seems to be related very closely to *P. chrysogenum* and *P. nalgiovense* since these also both producers of the a-lactam antibiotic penicillin; all three contain the same gene sequence necessary for biosynthesis of penicillin. Starter cultures of these organisms are now available in small quantites here in the U.S. You can purchase them from Butcher-Packer Company. See Resources page for the link.**

I incubate, as well as dry, my salami in an old freezer. I purchased a discarded freezer from the landfill and removed the motor and innards and power washed it and wiped it out with a 10% bleach solution. I was thinking of putting a humidifier and humidistat in the box, but I found that a large pan of water gives me about 80-85% relative humidity. The unit in my garage and stays relatively cool. I monitor the temperature and humidity from the house by using a cable-free temperature and humidity unit from Oregon Scientific. I live in Sonoma, California and today (July 1) the air temperature was 98°F, but the box was 65°F. I'm thinking of installing a very small computer-type fan, just to create a slight air current.

Addendum: Since the original page was written, I was lucky enough to have a used "walk-in" refrigeration box given to me. Seems the original owner needed a bigger walk-in, so I got his old box. This is perfect for drying and holding cured salami. Ask around and maybe you'll get lucky! Now I've converted the old freezer used for drying to function as an incubator. More information on the project is on the page titled "Tips".

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