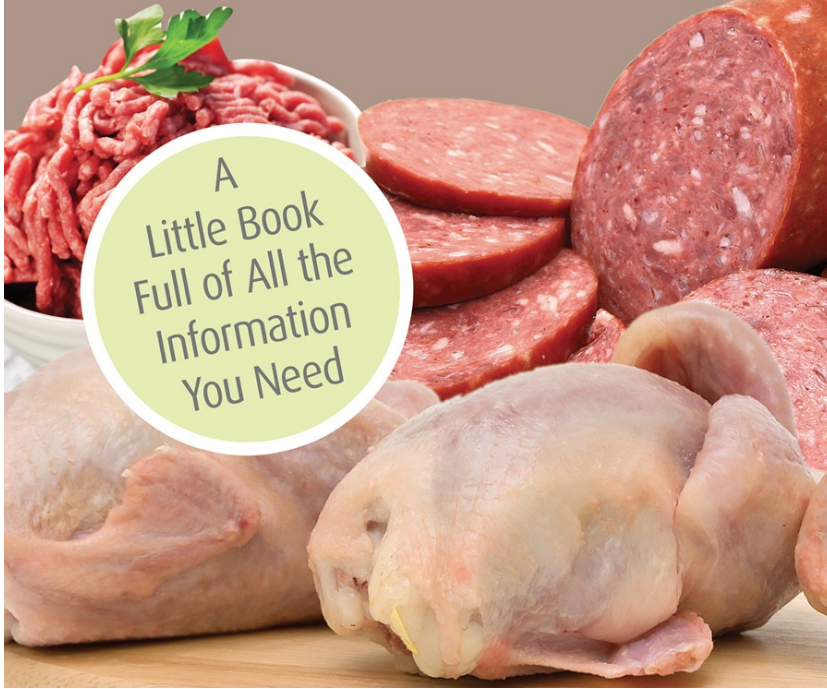


*The Art of*



*Preserving*  
**GAME BIRDS**  
**AND BIG GAME ANIMALS**

A  
Little Book  
Full of All the  
Information  
You Need



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THE ART OF  
**Preserving Game Birds and Big Game  
Animals**



*A Little Book Full of All the Information You Need*

## The Art of Preserving Game Birds and Big Game Animals: A Little Book Full of All the Information You Need

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1210 SW 23rd Place • Ocala, Florida 34471

Phone 800-814-1132 • Fax 352-622-1875

Web site: [www.atlantic-pub.com](http://www.atlantic-pub.com) • E-mail: [sales@atlantic-pub.com](mailto:sales@atlantic-pub.com)

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**A few years back we lost our beloved pet dog Bear, who was not only our best and dearest friend but also the “Vice President of Sunshine” here at Atlantic Publishing. He did not receive a salary but worked tirelessly 24 hours a day to please his parents.**

**Bear was a rescue dog who turned around and showered myself, my wife, Sherri, his grandparents Jean, Bob, and Nancy, and every person and animal he met (well, maybe not rabbits) with friendship and love. He made a lot of people smile every day.**

**We wanted you to know a portion of the profits of this book will be donated in Bear’s memory to local animal shelters, parks, conservation organizations, and other individuals and nonprofit organizations in need of assistance.**

**– Douglas & Sherri Brown**

**PS: We have since adopted two more rescue dogs: first Scout, and the following year, Ginger. They were both mixed golden retrievers who needed a home.**

Want to help animals and the world? Here are a dozen easy suggestions you and your family can implement today:

- *Adopt and rescue a pet from a local shelter.*
- *Support local and no-kill animal shelters.*
- *Plant a tree to honor someone you love.*
- *Be a developer — put up some birdhouses.*
- *Buy live, potted Christmas trees and replant them.*
- *Make sure you spend time with your animals each day.*
- *Save natural resources by recycling and buying recycled products.*
- *Drink tap water, or filter your own water at home.*
- *Whenever possible, limit your use of or do not use pesticides.*
- *If you eat seafood, make sustainable choices.*
- *Support your local farmers market.*
- *Get outside. Visit a park, volunteer, walk your dog, or ride your bike.*

Five years ago, Atlantic Publishing signed the Green Press Initiative. These guidelines promote environmentally friendly practices, such as using recycled stock and vegetable based inks, avoiding waste, choosing energy-efficient resources, and promoting a no-pulping policy. We now use 100-percent recycled stock on all our books. The results: one year, switching to post-consumer recycled stock saved 24 mature trees, 5,000 gallons of water, the equivalent of the total energy used for one home in a year, and equivalent of the greenhouse gases from one car driven for a year.



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# Introduction

For more than 8,000 years, humans have been preserving meat and fish through canning, curing, smoking, and freezing, using techniques that remove the moisture and make it possible to keep meat for much longer than its natural shelf life.

This book will introduce you to the art of preserving game birds and big game animals, how to go about the process of storing it for long-term use in a variety of methods, plus a few great recipes. As a bonus for all types of meat preservation, there is a chapter on the basic understanding of canning, curing, and smoking, and also a chapter on equipment, methods, and general instructions. This is followed by case studies of real stories from real people, along with a list of resources to help you learn more about the art of preserving all types of meat. We hope you enjoy!

*Be sure to check out the other books in this series:*

- The Art of Preserving **Beef**: A Little Book Full of All the Information You Need
- The Art of Preserving **Poultry**: A Little Book Full of All the Information You Need
- The Art of Preserving **Pork** A Little Book Full of All the Information You Need
- The Art of Preserving **Lamb and Mutton Meat**: A Little Book Full of All the Information You Need
- The Art of Preserving **Goat Meat**: A Little Book Full of All the Information You Need
- The Art of Preserving **Bison Meat**: A Little Book Full of All the Information You Need
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# Chapter 1: Basic Understanding of the Canning, Curing, and Smoking Process

This chapter is designed to help the beginner and challenge the experienced meat preserver to learn about the different ways that meat can be preserved. There is some interesting chemistry involved in the process of making meat safe to eat after a long period of storage. Along with some basic instructions, general safety issues will be discussed, with more specific information to come later in the book. All temperatures in this book are in Fahrenheit, unless otherwise stated.

## WHAT IS CANNING, AND HOW IS IT BENEFICIAL?

The process for preserving food in glass jars was invented by Nicolas Appert in 1809 in response to a challenge from Napoleon to find a way to feed his army. As the size and complexity of armies increased, it became more difficult to provide food when the army was on the move. The traditional method of an army scavenging and living off the land could not be sustained during long-term campaigns. When Appert first discovered the canning process, he did not have any knowledge of the science of bacteriology or food decay. Over a period of 14 years of experimentation using trial and error, he discovered that food heated to temperatures above 212 degrees and sealed in glass bottles could be preserved safe for human consumption for long periods of time.

Appert preferred using glass bottles for food preservation. Since the preservation process that was discovered was initially in response to a need to feed troops on long campaign, glass bottles presented a problem due to the risk of breakage during transport. By 1822, Appert had discovered how to store preserved food in tin-plated steel cans, solving the problem of food loss during long-distance transportation. Over time, the technology was developed to mass-produce preserved foods in metal cans. This is where the word “canning” came from. Today, only specialty food products are commercially packaged in glass jars.

To make it simple, canning is the process of sterilizing the container, preparing the food to be stored, and sealing the container so no contaminants can enter and spoil the food. Care in each of these three steps is essential. The jars used must be cleaned and sterilized to ensure that no bacteria can come in contact with the food that is being preserved. Different kinds of food require specific preparation

methods depending on the chemical makeup of that particular commodity. The difference primarily revolves around the temperature the food must be prepared at. Modern canning jar manufacturers have provided the home canner with a special lid that makes it easy to seal canning jars. When the home canning jars have been filled with properly prepared food and the canning lids put in place, the prepared jars are set out to wait for the distinctive “pop” that indicates the jar is sealed and ready for storage. Canning jar lids also provide a means to indicate when a jar is unsealed and allowed air and moisture to enter the jar. Sealed lids are slightly concave, while an unsealed lid will no longer have a concave appearance but will be level or slightly bulged. Food jars that are found in an unsealed condition should be disposed of in a manner that will not contaminate other food being prepared in the kitchen. Spoiled food products should not be allowed to come in contact with any surface being used for food preparation. Dispose of spoiled food items in the garbage disposal, or dump the spoiled food into a trash bag and put in a dumpster outside.

Many can remember going to grandmother’s cupboard or basement and seeing shelves stacked with jars full of all kinds of nutritious food, food that was prepared to feed the family through the long winter months. Preserved food stored in grandmother’s basement or your own basement can provide you and your family with a significant measure of security and well-being. When the electricity goes out because of a big storm, food preserved in glass jars is not affected by the lack of electricity. It can be a valuable resource to get your family through difficult times. The safety of food stored for a long time can be easily inspected by making sure the lids remain sealed and by simply looking at the appearance of the food in the glass jars.

## **CURING AND SMOKING FISH AND MEAT**

Curing and smoking meat represent a two-part process, so they are usually considered together. Curing meat in the home involves using salt and nitrates to preserve or save the meat for use in the future. The length of time that cured meat can be safely stored depends on the actual curing process and the temperature the meat will be stored at. For example, chicken and turkey are usually exposed to a light cure so that the salt does not overwhelm the taste of the meat. A light cure does not use heavy salt concentrations, and the meat is not exposed to the cure for more than a few hours. Chickens and turkeys are usually smoked just enough to add flavor to the meat, and they are not smoked sufficiently enough to be stored without refrigeration. A chicken or a turkey that has been lightly cured and smoked will require refrigeration at or below 40 degrees Fahrenheit. The safe refrigeration time for poultry that has been smoked and cured in this manner is extended for up to three weeks, and it can be kept frozen for up to one year. Chicken and turkey cured and smoked sufficiently enough to store without refrigeration would be a very salty product that would not be acceptable taste-wise to most people.

Fish that has been lightly cured can be stored in the refrigerator for a period of ten to 14 days and may



be kept frozen for two or three months. Since many smoking processes do not raise the temperature meat high enough to cook it, the meat will need to be put through a curing process to preserve it from spoilage. Preparation of meat for smoking begins by curing the meat in either a brine solution that has been mixed according to a specific recipe determined by the type of meat, or dry cured with a salt mixture that is rubbed into the meat.

The availability of refrigeration will determine the level of curing that meat must be exposed to. If the meat will be used in areas where refrigeration is not readily available, it will be very important to follow through with the complete salting process. A point to remember is that not all curing and smoking processes cook meat. For example, cold smoking does not raise the temperature of meat to a high enough temperature to cook meat, so these products will need to be fully cooked before human consumption. A product such as salt pork may be fully preserved, but was not cooked prior to the salting process, and will still need to be cooked before it is consumed. It is essential to follow the cooking directions that are a part of the curing and smoking recipe being used.

## ***The benefits of curing and smoking meat***

An important benefit to curing meat for use in the home is to maintain a readily available source of meat when the electricity goes out and there is no refrigeration. Home-cured meat might also be very important to your family in a natural disaster when normal sources of commercially available food supplies are not available. For some people, the greatest benefit might be to know that their family will not be exposed to some of the various chemicals that are found in commercially prepared meats. People who cure and smoke meat at home can effectively eliminate these chemicals from the family's diet. The following list describes many of the non-food additives that can be found in processed meats. Consumers should always read ingredient labels to understand exactly what they are consuming when they purchase processed meats. This list alone should be enough to convince people of the value of preserving good quality meat in the home.

## **Non-food chemical preservatives and additives in processed meats**

1. Alkaline phosphates are chemicals that increase the pH factor in meat. The abbreviation pH stands for potential hydrogen. Alkaline phosphates are used to increase the amount of water processed meat has the capacity to hold. All meats except fresh sausage and ground beef contain this chemical. The level of alkaline phosphates consumed will affect the balance of acids and alkalinity in the human body.
2. Sodium erythorbate is sodium salt of erythorbic acid. This chemical is added to meat to reduce nitric oxide in meat, which brings about a faster cure and helps meat to retain a pink color. It is produced from sugars derived from sugar beets, cane sugar, and corn. If consumed in excessive amounts, it may be considered a carcinogen.

3. Sodium nitrite is used in meat and fish to control changes in color and to control the bacterium that causes botulism. If consumed in high amounts, it can be toxic to humans and animals. Its concentration in meat is regulated since it can form carcinogenic nitrosamines when exposed to excessive heat.
4. Monosodium glutamate, also known as MSG, is a sodium salt that is used as a flavor enhancer in processed meats. It is made through a fermentation process from sugars derived from such crops as sugar beet or sugar cane. Some people claim to have MSG intolerance, but scientists have yet to substantiate these claims.
5. Maltodextrin is derived from cornstarch in the United States, and it is derived from wheat in Europe and Asia. It is used to manage the amount of moisture in processed meats and can be used as an artificial sweetener. Wheat-based maltodextrin is a concern for people with intolerance for gluten. It is important to read the ingredients label of processed meats very carefully if you have celiac disease, as these people cannot digest gluten properly.
6. Antioxidants are used to slow the process of meat becoming rancid, which gives meat a longer shelf life. Proponents of the use of antioxidants claim significant health benefits from consuming these agents. There is significant on-going scientific research into the validity of these claims.

## **Additional non-food chemical preservatives and additives in processed foods**

1. Aluminium silicate is a mineral salt that is used to keep dried milk in vending machines from caking. Although consumption of small amounts of this additive has not been found to present a serious health risk, reproductive and development problems have been found in experiments with animals exposed to aluminum compounds.
2. Amino acid compounds are used to fortify processed vegetables and are important to the human body in the correct combinations.
3. Ammonium carbonates are used in baked goods. These chemicals can affect the mucous membranes and can contribute to the loss of calcium and magnesium from the human body.
4. Antimicrobials are used to prevent the growth of molds and bacteria.
5. Antioxidants are used to keep foods from turning rancid and developing dark spots, as well as to aid in preventing the loss of important vitamins.
6. Butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) are used to inhibit fats and oils in foods from becoming rancid. They have been linked to several types of cancer.
7. Magnesium oxide is used as an anti-caking element in dairy products, canned vegetables, and can be used as a medicinal laxative.

8. Sorbitol is a sugar-alcohol based sweetener used in various food products. It has been linked to irritable bowel syndrome.

## TIPS FOR SMOKING MEAT

After meat has been prepared in salt brine or packed in dry salt, the smoking process can begin. Smoking uses the heat of burning wood to cook the meat while adding flavor to the meat through the variety of wood being used. In America, the wood varieties that are used are hickory, mesquite, oak, pecan, alder, maple, apple, cherry, and plum.

Depending on how much heat the meat is exposed to during the smoking process, further cooking may be necessary before the meat is consumed. Meat exposed to temperatures of 165 to 185 degrees will fully cook. The best method to insure meat in the smoker is fully cooked is to use a meat thermometer and probe into the deepest part of the cut to insure the heat has reached all the way to the center. Hot-smoked meat can be considered fully cooked under these conditions. Although hot-smoked meat is fully cooked, most people will heat it thoroughly before serving it to their family and friends. Cold smoking does not expose meat to temperatures above 100 degrees, so cold-smoked meat must be cooked prior to consumption. Cold smoking is designed to give flavor to the meat, not cook it.

Cold-smoked meats that were only lightly cured must be refrigerated. The availability of refrigeration expands the range of curing and smoking options that are available in two ways. Meat that can be kept refrigerated does not need to be fully cured, but it can be cured to impart a desired taste. Meat that can be kept refrigerated does not need to be fully cooked in the smoking process, but it can be cooked to impart a desired taste also. Smoked meat being carried in a backpack for long hiking and camping trips without refrigeration should be fully cured and hot-smoked. If prepared and packaged properly, smoked meats will be a wonderful addition to your outdoor activity.

The primary benefit of smoking meat is the flavor that is imparted to the meat by the wood that was used in the smoking process. Each type of wood gives the meat a distinctive flavor. Flavor is a matter of opinion, so if you are just learning how to smoke meat, you may want to do some experimentation or find someone who is an experienced meat smoker and taste some samples of his or her work. The best type of wood to use is purely a matter of opinion and depends also on the size and capability of the smoker.

Woods such as hickory, mesquite, and oak give meats a stronger flavor than woods such as pecan and alder. Other woods such as maple, apple, cherry, and plum will give meat a sweet flavor. The decision as to which type of wood to use will probably be determined by what is available in your area for a reasonable cost. Purchasing wood at the lumberyard or a major home improvement store probably will be cost prohibitive. You will need to look for places that create scrap pieces, like carpenter shops or wood mills that may be in your area. The fun of exploration and discovery may even be an enjoyable

activity for the whole family. The following chart will provide some guidance on which woods work best with different varieties of meat:

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- Alder produces a slightly sweet flavoring that works well with fish, pork, and poultry.
- Apple produces a fruity, sweet flavoring that works well with pork and poultry.
- Cherry produces a sweet, fruity flavoring that works well with beef, pork, and poultry.
- Hickory produces a strong flavoring that works well with any meat that you want to impart a strong smoky flavor to.
- Maple produces a milder sweet flavoring that works well with pork and poultry.
- Mesquite produces a strong flavoring that works well with beef, fish, pork, and poultry.
- Oak produces a medium flavoring that should work well with any meat you choose to smoke.
- Pecan produces a nutty flavoring that will work well with poultry and ribs (beef or pork).

## ***What is cold smoking?***

Cold smoking is the process of using smoke to flavor meat without bringing the meat to a cooking heat. A good example of the value of cold smoking is the cold smoking of fish such as salmon. Salmon has been an important food resource for many cultures living near the sea for centuries. Ancient people had to fully cure salmon in a wet brine solution and hot smoke the fish to preserve it as a food source that would last several months. Since the modern world now has dependable refrigeration, cold smoking has become the preferred method to enjoy smoked salmon. Since cold smoking does not heat the meat to a cooking temperature, the result is a more delicate texture.

Commercial producers of cold-smoked salmon from locations around the world use a wide variety of wood types, imparting a unique flavor. People have come to prefer cold-smoked salmon from places like the Pacific Northwest or from Scotland. To protect the financial value of their product, nations such as the United States and the United Kingdom have enacted food labeling laws that require the label on cold-smoked salmon to indicate where it was smoked, where the fish was caught, and which smoking process was used. The exact flavor that is imparted to salmon, or any other fish or meat, by the cold smoking process is very important to people.

A good example of cold smoking today that people might recognize is cold-smoked ham. A quality commercially cold-smoked ham may cost from \$45 to more than \$100, but it is a price that many people are willing to pay to get the flavor that the cold smoking has imparted to the meat. Curing and smoking are the reasons that pork products have the distinctive tastes that people enjoy so much. It is possible to find fresh pork that has not been cured or smoked, but most of the pork in the grocery store has been cured and smoked. Fresh pork that is slaughtered and sent straight to the cooking pot, and

then to the table, would not have the wonderful taste that you have come to look forward to. This is why we have names like “cold-smoked ham,” or “sugar-cured ham;” these are the processes that make the meat so good to eat.

The cold smoking process itself does not preserve meat. The initial preservation process in salt brine or a dry salt pack will still need to be accomplished before smoking the meat. The cold smoking process can take several days or even weeks, depending on how deeply you desire the smoke to penetrate the meat. The ideal temperature for cold smoking meat or fish is 80 degrees or lower, and certainly never above 100 degrees. There is a dangerous temperature zone you must be aware of when cold smoking. In the temperature range between 100 and 140 degrees, dangerous bacteria such as salmonella can grow and multiply. These bacteria are not killed until cooking temperatures rise above 140 degrees. Cold smokers are not designed to heat meat to temperatures that high. The important thing to remember is that fish and meat that are cold smoked will need to be cooked to the proper safe temperature when the time comes for consumption.

## **THINK ABOUT FOOD SAFETY AS A FAMILY SAFETY ISSUE**

Foodborne illnesses are serious issues to consider when preserving meat and fish at home. Since the bacteria that cause foodborne disease and illness are commonly found in the animals that enter the slaughterhouse, commercially prepared foods must meet strict safety regulations that have been established by the Food and Drug Administration (FDA). People who hunt and fish, or people who raise animals on their own property for slaughter, need to follow the same safety standards that have been established for commercial food producers.

Fish and meat that reach our dinner table have been monitored for safety from the farm or hatchery through the slaughterhouse, through the packing facility, and all the way through the retail distribution system. Even after all of the inspections, tainted food still makes it through the system occasionally and onto our dinner tables. This is why it is so vitally important for the person preserving food for consumption in the home to know exactly what the safety rules are. The first place to begin is to look at the chemistry that goes on behind the scenes.

### ***Common foodborne diseases***

1. Campylobacter is found in the intestines of healthy birds. This bacterial pathogen is almost always found in uncooked poultry of any variety. The symptoms of the illness it causes will include fever, diarrhea, and abdominal cramps. Humans contract this disease by eating raw or undercooked chicken and other poultry. Additionally, other foods are infected when they come in contact with juices dripping from affected uncooked chicken and poultry. When handling raw poultry, it is essential to contain drippings from the bird and sanitize any kitchen surfaces uncooked poultry juices have dripped on.

2. Salmonella is a bacteria found in the intestines of birds, reptiles, and mammals. Symptoms of the disease may include fever, diarrhea, and abdominal cramps. People with weakened immune systems are particularly susceptible to this disease invading their bloodstream and causing life-threatening infections.
3. E. coli O157:H7 is the most common type of the E. coli bacteria. It is a bacterial pathogen present in cattle and other animals. Humans are infected when food or water has come in contact with very small amounts of feces. This disease may cause bloody diarrhea and painful abdominal cramps with very little fever. In rare cases, it can cause a related complication called hemolytic uremic syndrome (HUS), which will not appear until several weeks after the initial symptoms caused by E. coli. The most serious problem HUS can cause is kidney failure. Again, the best precaution is proper food handling procedures and keeping slaughtered meat away from animal waste products.
4. Calicivirus or Norwalk-like viruses cause a very common form of foodborne illness called gastroenteritis. This disease is rarely diagnosed because most labs do not have the necessary tests available. This disease causes acute gastrointestinal illness with vomiting and diarrhea. The disease is usually over in two days for most people. This disease is passed from person to person through kitchen workers handling food products with unwashed hands.

## ***The chemistry behind meat preservation***

Many interesting and curious chemical interactions take place when the meat preservation process starts. Conversely, if meat and fish are not preserved, chemical processes quickly lead to spoilage and disintegration of the product. This may not be a very pleasant process to consider, but it is important to understand so that you can keep your family safe when consuming the foods that are preserved at your home. Bacteria are very small organisms that you must use a microscope to see. Bacterium begins working on meat and fish just as soon as the animal dies of natural causes or is slaughtered. Since many destructive bacteria are found on the skin or in the intestines, incomplete or sloppy slaughtering and cleaning procedures can accelerate the spoilage of the meat or fish. The following chart provides some ideas and precautions to observe when slaughtering and butchering animals for human consumption.

## ***Slaughtering and butchering meat safety precautions***

1. Never harvest an animal for human consumption that is obviously sick.
2. When cleaning or field dressing an animal, never allow the contents of the intestines or bladder to come in contact with the meat.
3. Deer harvested in states where chronic wasting disease (CWD) is known to exist must be tested before the meat is butchered for human consumption. CWD is a neurological condition that affects

deer and elk and causes a deterioration of body condition with behavioral problems and leads to death. Although there is no evidence that the disease has been transmitted to humans, the possibility does exist. When butchering in areas like Colorado, Utah, Wyoming, and other Midwestern states, do not allow any spinal fluid or brain tissue to come in contact with the meat until after the animal has been tested and declared free of CWD. The brochure published by the state game and fish department that lists hunting regulations will inform hunters if CWD infected animals are present in the state. The game and fish department also has information on laboratories that can test for the presence of this disease.

4. When butchering an animal, always be on the lookout for any sign that the animal is sick and the meat may not be safe for human consumption. Sick animals will act strangely, look weak, and have a deteriorated body mass. Normally healthy animals will run from contact with people, but sick animals may be overly aggressive or seem to be seeking assistance with their abnormality.
5. Do not hang the carcass up for aging for long periods of time when temperatures are above 50 degrees Fahrenheit. In any case, it is not recommended to hang the carcass for more than a few days. While the carcass is hanging, keep dirt, dust, and rodents away from the meat.
6. During slaughtering and butchering, it is recommended that anyone handling the meat use protective gloves as a preventative measure against spreading disease.
7. When cleaning fish, do not return the internal organs to the water the fish came from.
8. If fish or birds are cleaned in the kitchen, ensure that all waste materials are properly disposed of and counters and sinks are sanitized to prevent the spread of disease. To dispose of unwanted animal parts, place the unwanted items in a plastic trash bag and tie the bag closed securely. Take the bag outside and place in a trash container or dumpster. If you run unwanted parts down the disposal, you will need to ensure that all parts are flushed clear, and you should sanitize the disposal with a chlorine bleach solution.

Enzymes are important elements in the biological processes that make life on earth possible. Enzymes are proteins that facilitate chemical and biological processes in the body. They can be described as the workmen in cells that break down nutrients providing the energy needed to fuel life. After an animal dies, the enzymes in the body continue to work, reducing biological components down to small elements. The actions of the bacteria and enzymes will bring about a change of color in the meat and the smell of spoilage.

A third chemical process in the decaying of meat and fish is the oxidation of fat as it comes in contact with the air. Oxidation is easily defined as a process of reduction, or the transfer of electrons from one element to another. During oxidation, electrons from the fatty material in meat transfer to the oxygen the meat is exposed to. When fatty pieces of meat are left in contact with oxygen over

long period of time, the meat will develop a very bad smell. This smell signifies that the meat is turning rancid. Because of this chemical process, meat that is used for drying should always be of a leaner cut.

Meat and fish preservation techniques are designed to inhibit the decaying process for as long a period of time as possible. Some preservation techniques even enhance fresh taste and appearance. To the extent of the material covered by this book, techniques that inhibit decay in meat and fish are heating, drying and curing, refrigeration and freezing, the use of sugars, salts, and nitrates. Commercial meat processing companies use several other chemical preservatives that were discussed earlier. Commercially applied food preservation chemicals are not readily available to the general public and are not necessary in home food preservation projects, since these products are not being mass produced for sale to the consumer.

Heating food prior to consumption destroys the biological and chemical processes that lead to spoilage. Heating food to the proper temperature kills dangerous bacteria that lead to food poisoning. Of all the preservation methods available, heating food to preserve it for later use is the easiest and most cost-effective way to prepare meat and fish. Try to imagine what life would be like without the aid of fire in your everyday life.

Drying and curing meat and fish removes moisture that microorganisms need to live and develop. Dried and cured meat can be kept safely in a refrigerator for up to three weeks. Refrigerating below 40 degrees and bringing meat down to freezing temperatures stops bacteria from growing. The sugar curing process increases the temperature of the food to temperatures higher than microbiological organisms, such as the ones described earlier in this chapter, can survive. Sugar curing has the benefit of adding wonderful flavor to meat such as pork. The other side of curing is the use of salt and nitrates. Bacteria cannot live in meats that have been soaked in salt brine or dry packed in salt in a curing box. In high concentrations, salt is toxic to bacteria.

## ***General understanding of sanitation rules***

The elimination of pathogens that cause foodborne illnesses is the reason for adhering to strict sanitation rules when preserving meat and fish. It takes very little contamination to cause spoilage of the meat you have worked so hard to put up for your family's enjoyment and nutrition. Sanitation begins with the meat product itself. If you have gone into the field and harvested an animal or were fishing and caught a great fish, field dressing and cleaning should be done with great care and clean water. Most states no longer allow fish to be cleaned in the body of water they were caught in because people in the past have left a dirty mess that someone else had to be paid to clean up.

Tables and counters used as working surfaces should be sanitized with cleaners that have been certified safe around food preparation processes. The most effective sanitizing agent is still a chlorine



bleach solution. Bacterial organisms, such as E. coli and salmonella from the intestinal tract, can contaminate meat and fish if proper handling procedures were not followed when the animal was slaughtered and cleaned. These disease-causing organisms can be transferred to non-contaminated products if working surfaces are not properly cleaned between pieces of meat. If you process your wild game in the garage or out on the porch, you will still need to ensure that all surfaces that come in contact with the meat have been sanitized.

The following chart by All QA Products provides excellent information on sanitation procedures to help you keep a work area sanitary and safe from contaminants that could harm your family.

## How to mix and use bleach solutions

Normally, 1 tablespoon of concentrated bleach per gallon of water at room temperature is considered to be the equivalent of 200 parts per million (PPM). This is the standard for cleaning food preparation surfaces.

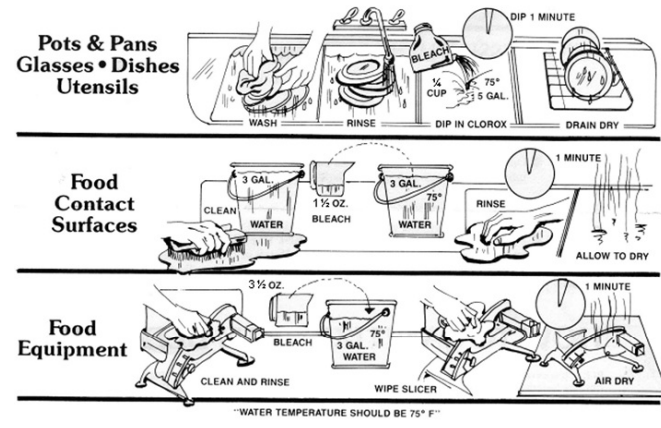


Chart courtesy of All QA Products

As you can see in these simplified instructions, there are some constant procedures.

- First, the temperature has to be right (hotter temperatures decrease the effectiveness of bleach solutions).
- Second, the time of exposure has to be at least one minute for a bacterial kill.
- Third, and perhaps most important, the concentration of chlorine must be adequate.

Here is a guideline for mixing bleach solutions:

Sanitizing activity	Ratio
Pots, pans, dishes, and utensils	2 oz. / 5 gal (about 0.3%)
Food contact surfaces	1.5 oz. / 3 gal. (About 0.4%)
Food processing equipment	3.5 oz. / 3 gal. (About 10%)

Sanitation concerns also apply to all the utensils being used to prepare your meat or fish. Cro

contamination of meat products from unsanitary use of food processing equipment is a valid concern. All of this discussion of sanitation and cleaning may seem extreme, but the next time you hear a report on the news about someone getting sick from the food they have eaten, remember what you have read in this book.

The final part of this discussion on sanitation is canning jars and lids. Please do not assume that the new canning jars and lids you just purchased are clean and ready for use right out of the box. The jars may still contain some residue from the manufacturing process and any contaminants that were picked up in shipping. Just think how terrible it would be if all of your hard work canning healthy food was spoiled and ruined for use because you sealed jars that were not properly cleaned.

Please follow all the cleaning instructions that came with that box of new jars you purchased at the hardware store. If you are using used jars and do not have cleaning instructions, just remember that the jars, lids, and metal band should be thoroughly cleaned with hot water and soap. If you have a dishwasher, that would be the best place to clean your canning equipment. Canning jars being used for meat do not need to be sterilized separately because they will be sterilized along with the meat in the canning process. Canning jars that are used for other foods such as jams, jellies, and pickled products that are processed for less than ten minutes and are not prepared in a pressure cooker canner do need to be sterilized separately.

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## Chapter 2: Equipment, Methods, and General Instructions

This chapter is not designed to provide an exhaustive description and list of every imaginable brand and type of equipment used in the preservation of different kinds of meat and fish. There should be sufficient information presented on different kinds of equipment that you will be able to understand what equipment you need to preserve any type of meat or fish you are interested in.

### **FREEZING APPLIANCES, EQUIPMENT, AND SUPPLIES**

Because most people have access to a refrigerator, kitchen stove, and a freezer, the simplest method for preserving meat and fish is to cook it and put it in the freezer. Simple freezing projects, like bringing a package of meat home from the grocery store and dividing it up into portions that the family can use at a single meal, do not require a long list of complicated instructions or equipment. All that is needed is a clean place to cut the meat, a sharp knife, and some freezer bags or plastic containers to put the meat in. This size of a project is just about right for those of us who like to enjoy good food with minimum work.

There is some controversy about the ability to preserve or enhance the freshness of meat or fish products by “fast freezing” them. Fast freezing food means to bring the food down to extremely cold temperatures immediately after it is cooked and packaged. Fifty percent or more of the seafood that is caught is fast frozen in freezing equipment that uses liquid nitrogen at about -320 degrees. Immediately fast freezing fresh food products in this manner not only stops bacterial growth, but also preserves the food in its fresh condition for a longer period of time than conventional freezing methods. Other commercial processes exist that accomplish the same ends, but these results are obviously not possible with the freezer in your home since most in-home freezers only bring food down to about -18° F. Additionally, home freezers take a little time to get the food down to the lowest temperature they possibly can. The only way for the home preserver to accomplish anything close to this process would be to make arrangements with a local locker plant.

Many people who read this book may not be familiar with what a meat locker plant is. With the diminishing number of people raising animals at home to supply meat for their family, locker plants

are slowly disappearing. The locker plant is the place people bring the steer they have been raising for slaughter or the game they have harvested for butchering and processing. Some may call this a butcher shop; however, a locker plant not only butchers animal carcasses, but it also provides storage lockers for people who have large quantities of meat that needs to be kept frozen. The freezers at a locker plant are much more efficient than those found in the average home, so the closest the home preserver can get to fast freezing is to bring their meat products to a locker plant.

The quick freezing and fast freezing processes that commercial meat processing companies are able to use are not realistic options for home meat preservers. You can use a freezer thermometer to determine just exactly how cold of a temperature your freezer will reach. If you are going to purchase a new freezer, pay close attention to the specifications provided by the manufacturer. If the freezer specifications show the freezer is only going to reach -8 degrees, for example, this would not be the best freezer for long-term storage of meat products. Remember that fast freezing to very cold temperatures freezes food without creating large ice crystals. Most people have probably tasted ice cream that had not been frozen properly, and the milk has turned to crystals, ruining the texture and taste of the product. People who want to preserve meat in a freezer for six months or more need to use a freezer that is capable of holding the product consistently at the lowest possible temperature. Meat stored in freezers that do not keep the product at a constant temperature should not be stored for more than six months. Remember that even if your freezer reaches -18 degrees, every time you open the door, the temperature in the storage compartment rises and must be brought back down to the lowest temperature again over a period of time. For the person who is going to store large quantities of meat for over six months, using the cold storage facilities at a locker plant may be the best option.

A reality check would be good at this point. Commercial food processors are preparing their products to be shipped all across the country and cannot absolutely control all of the conditions the products may encounter, so the product must be frozen to standards that exceed home freezing expectations. Commercial meat handling standards begin at the processing plant. Meat processing facilities are rigorously inspected for safe and sanitary handling of animal carcasses and finished meat products. Meat-handling standards also are concerned with any substance that is artificially added to the products and ensuring meat product labels accurately reflect the contents of the finished product. Meat handling regulations also specify that fresh and frozen products should be maintained at the proper temperature throughout storage, transportation, and presentation in the retail outlet. Although food frozen for commercial sale is packaged with expiration dates, manufacturers cannot be sure the food will be consumed by the expected expiration date. Consumers have the responsibility to protect themselves by not using meat products that have been in storage beyond the date that is printed on the package. Commercial packaging, freezing, and distribution standards must meet the highest possible food safety expectations.

Your home freezer will do just fine as long as it is in good working order and as long as you have prepared your meat and fish according to proper food-handling standards. Another factor to consider is how long you plan to store your meat or fish in the freezer. Larger cuts of meat, like roasts, steaks, or whole poultry products such as a turkey, can be safely stored in the freezer for up to 12 months. Items like ground beef and some fatty fish products are only safe in the freezer for around three months. Fatty fish such as salmon, tuna, sardines, mackerel, and trout should not be stored in the freezer beyond three months. Meat and fish left in the freezer beyond recommended safe storage limits will have a deteriorated taste and will lose the natural tenderness you expect. Pork sausage should not be stored for more than two months. In any case, we are not talking about years and years of storage in your freezer. The following list provides a quick list of safe meat storage limits. Meat and fish products that have reached the end of the safe storage life in the freezer must be immediately cooked and consumed or properly disposed of.

## GENERAL SAFE MEAT AND FISH STORAGE LIMITS

- Large items such as beef and lamb roasts: 12 months
- Lean fish, duck, and goose: 6 months
- Fatty fish and ground meats: 3 months
- Pork chops: 4 months
- Light items such as bacon: 1 month

The University of Georgia Cooperative Extension Service has a Web page titled “Preserving Food by Freezing Animal Products” that provides a detailed chart of proper time limits for leaving meat and fish in the freezer. *The Internet address for this Web page is listed in the Appendix.*

After the freezer, the rest of the equipment you will need is much smaller by comparison. Good kitchen knives are essential tools for people who are preparing meat for storage or for cooking. Kitchen knives should be kept sharp to avoid wasting valuable meat products and to keep you from injuries that are caused by using dull knives. The dangers that go with using dull knives cannot be understated. Dull knives only tear meat products, which leads to waste and makes the meat difficult to cook because the torn edges will not heat uniformly with the rest of the cut of meat. Dull knives can also be dangerous to the user because of the force that is needed to saw through meat products. The best kitchen investment any family can make is to purchase the best quality knives the budget will allow. Modern knives that are made of high-carbon stainless steel are considered the best choice. Carbon steel is soft enough to respond well to sharpening, but has the strength of stainless steel. Two quality knife companies are Zwilling J.A. Henckels® and Wusthof®, both of Germany. Regardless of which company you choose to purchase knives from, make sure you select knives that you would

expect to use for a lifetime. Many people are now turning to the new ceramic knives as the best choice. The best approach to take when the time comes to make a significant investment in knives is to do some research on your own. If you purchase knives from an established company that provides a good warranty, you probably will not regret the decision. *There are sources for good quality knives referenced in the Appendix to help you get started in your search.*

Using good quality cooking pots and skillets ensures that meat is thoroughly cooked without burning or scorching. Buying brand-new equipment does not mean you will have the best quality possible. If you look in your grandmother's kitchen cupboards, you will probably find some well-used equipment that will do a better job than a lot of the new stuff that is on the market today. For example, your grandmother may have some old-fashioned, high carbon steel knives in the drawer that will sharpen to a very fine cutting edge and yet remain very flexible. The only drawback to these knives is that they require extra care to keep them from tarnishing. Cooking pots and skillets that have been in use for many years and are still in good shape will continue to serve very well if you continue to take good care of them.

If you are going to grind meat to make hamburger or deer sausage, you will need as good of a grinder as your budget will allow. There are several items to consider when selecting a grinder for home use. The following short chart lists some important features to look for. *Sources for grinders have been included in the Appendix.*

- Can you get by with a hand-crank meat grinder, or do you need an electric grinder? This is an important question as you consider the volume of meat product that will be processed each year. There is not a specific recommendation for the amount of meat that would justify an upgrade to an electric grinder. If you will only use your grinder occasionally for small amounts of meat, then you may do very well with a manual machine. If you will use the machine on a regular basis, then the time and effort an electric machine will save may be sufficient to justify the extra expense of an electric machine. If you decide you need an electric model, then you must consider whether the power rating of the grinder is sufficient. You may be able to get along with a 150-watt machine that will handle most non-commercial kitchen meat grinding chores, or you may need a 1000-watt machine that is capable of grinding up to 175 pounds of meat in an hour. Purchasing a machine rated a little higher than you expect to need should ensure that you can meet any projected meat grinding chores that you may encounter throughout the life of your machine.
- Grinders that use stainless steel grinding and cutting blades will provide easier cleaning with the expectation of a longer useful service life than blades that are not made of high-quality stainless steel. Stainless steel blades may last up to three times longer than carbon steel blades because the carbon steel blades are more susceptible to corrosion and will not keep a sharp edge.

as long.

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- Does the grinder include a food-pushing tool? A food-pushing tool provides the user with an extra measure of safety since the machine keeps fingers away from grinding blades.
- Is the rated capacity sufficient for the size of grinding projects you expect to accomplish?
- What is the durability rating of the grinder; does it have a good warranty?

To prepare your product for freezing, you will need freezer or butcher paper to wrap the meat or fish in. Some items, such as pork chops and ground beef patties, store better and separate easier when they are separated by freezer paper. There are a wide variety of plastic freezer containers you can use. Freezer bags are different than sandwich bags. Freezer bags are made of thicker material than sandwich bags, and they are manufactured with sealing features that are specifically designed to keep out air and moisture during long-term storage of food products. Sandwich bags will not provide the protection that frozen meats will need for long-term storage. Freezer storage bags come in many sizes. The key is to ensure that you use storage containers that have been made expressly for containing frozen food. Frozen food that will be consumed in small quantities should only be put in smaller bags as it will be easier to close up the bag with the least amount of air left in the bag. Air and moisture that are allowed to remain in the bag will lead to freezer burn. Vacuum-sealing systems pull the air and moisture out of the freezer bag, and heat seals the bag securely.

An additional concern that needs to be addressed is how to keep track of what each freezer bag or container contains, and how long it has been in the freezer. Losing track of how long meat has been stored in the freezer will lead to waste. To solve this problem, you will need freezer labels to indicate what is in each container and the date it should be consumed by. A well-organized freezer will ensure that everything that has been prepared and stored will be available to feed your family and nothing will be lost. *A number of good resources for storing food have been listed in the Appendix.*

Farmers Bill and Kay Tomaszewski, along with their children, are very involved in preserving meat and fish in their home. With their extensive experience preserving meat, they provided another idea that would be helpful for people trying to preserve meat and fish in the home environment. “The ideal place to process meat is in a walk-in cooler to keep the meat cool to prevent deterioration and spoilage,” Bill said. “We don’t have that, but in the past we have processed in an outside room in the cold of winter. We process inside now — arthritis and age played a part in that — so we make sure everything is kept cool. The meat is maintained between 34 to 38 degrees. The room is kept less than 70 degrees Fahrenheit.”

## ***Temperature requirements to fully cook meats***

The finished cooking temperature of meat in restaurants has been much in the news the last few years

Many people like a good steak just a little on the “rare” side. The problem is that if the internal temperature is not high enough to kill dangerous bacteria, people can get very sick. The best way to ensure that the meat and fish you are preparing has been cooked enough is to use a meat thermometer. Satisfactory meat thermometers are not very expensive and can be easily obtained in the nearest hardware or department store.

## General safe meat internal cooking temperatures

- Ground beef as in patties and meatloaf: 160° F
- Ground poultry: 165° F
- Well-done beef roast: 170° F
- Well-done pork: 170° F

The important point to remember is that meat must be cooked sufficiently to destroy bacterium that would cause a foodborne disease. *A complete meat temperature chart from the University of Illinois is provided in the Appendix.*

## CANNING EQUIPMENT AND SUPPLIES

An essential piece of equipment for the home canner is the pressure canner, also called a canning pressure cooker. A canning pressure cooker heats both the meat and the jars to sufficient temperature to ensure safe and sanitary preparation of the product. Meat being canned must be heated to 240 degrees to ensure the canning jars seal and the product remains safe for consumption for as long as possible. Simply boiling the product and the jars on the stove top will only bring the heat to 212 degrees, which is 28 degrees below the safe temperature level.

A pressure cooker works on the same principle as the radiator in a car does. In order to raise the temperature of water above the boiling point without the water turning to steam, water must be heated in a sealed container under pressure. The pressure cap on a radiator, depending on the application, holds between 13 to 15 pounds of pressure before it vents off some of that pressure. Pressure must be vented off to keep the radiator or some other cooling system component from exploding. The pressure on the radiator allows the cooling system to handle temperatures much higher than the boiling point, keeping your car engine from boiling over on hot days.

A pressure cooker designed for canning will have a lid that seals tightly with a pressure gauge and a vent. It is very important to follow the manufacturer’s instructions for your elevation. Water boils at different temperatures according to elevation, so there will be different pressure requirements between coastal Florida and mile-high Colorado. Always inspect the seal and sealing mechanism for the lid, whether the cooker is new or used. A lid that loses its seal after the pressure has built up is a formula



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