What Is This Module About?

One of the skills that can come in handy during difficult economic times is food preservation. Most of the vegetables, fruits, fish and meat that we buy spoil easily. However, thanks to scientific knowledge, we can preserve food and prevent it from being wasted.

This module will show you how science can be used to preserve meat, fruits, vegetables and fish. In particular, you will learn how to make *tocino* and *longganisa*. These skills will be covered in three lessons, namely:

Lesson 1 — *Meat Preservation*

Lesson 2 — *You Can Make Tocino and Longganisa*

Lesson 3 — *Preserving Fruits, Vegetables and Fish*

What Will You Learn From This Module?

After studying this module, you should be able to:

- discuss and explain the scientific methods for preserving meat, fruits, vegetables and fish;
- describe and follow the instructions for preserving meat; and
- apply knowledge of food preservation to solve the problem of food spoilage.

Let's See What You Already Know

Before you start, try to answer the following questions. They will help you find out what you already know about the topics to be covered in the module.

The following statements are about food preservation. Put a **T** next to the statements that are true, and an **F** next to the statements that are false.

Examples:

(**T**) 1. Meat used for making *tocino* is sliced thinly.

(**F**) 2. Pork is the only meat that can be preserved.

The first statement is true so a **T** is written beside it. The second statement is false and is marked **F**.

Now, answer the following:

( ) 1. Meat is preserved to prevent it from spoiling.

( ) 2. The drying method uses sunlight and artificial light.

( ) 3. Many fruits may be made into jams, jellies, candies, juices and pickles.

( ) 4. The addition of salt in meat and other food products does not destroy microorganisms that spoil food.

( ) 5. Vinegar is used in making `tocino` to help prevent the growth of microorganisms.

( ) 6. `Longganisa` is an example of preserved meat.

( ) 7. Pork belly is the preferred pork cut for `longganisa`.

( ) 8. The pickling method is usually used in preserving green vegetables and fruits.

( ) 9. *Daing* and *tinapa* are examples of foods preserved by drying.

( ) 10. Jelly is a vegetable product prepared by extracting the juice from boiled vegetables.

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 46.

If all your answers are correct, very good! This shows that you already know much about the topic. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well!

If you got a low score, don't feel bad. This only means this module is for you. It will help you understand important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more. Are you ready?

You may go now to the next page to begin Lesson 1.

Meat Preservation

Did you know that there are ways to prevent the spoilage and wastage of food that cannot be eaten at once? For thousands of years, people from all around the world have sought ways to preserve food. They have used scientific knowledge, materials and technology to find ways and means of delaying the spoilage of food by microorganisms.

After studying this lesson, you should be able to:

- explain the importance of food preservation;
- discuss how the growth of microorganisms spoils food; and
- describe the advantages of the scientific method of food preservation.

Let's Study and Analyze

Aling Tinay is an ideal housewife. One day, in her desire to help her husband earn a living, she decided to buy a fattened pig. She knew that she could earn more by having the animal butchered herself. However, Aling Tinay failed to sell all the meat. She became worried because she knew that meat spoils easily and they did not have a refrigerator. She also did not know how to preserve meat.

1. Why was Aling Tinay worried about the unsold meat?

   _____
   _____
   _____

2. Have you ever bought meat which became spoiled or rotten? Why did it rot?

   _____
   _____
   _____

3. How does rotten meat look and smell?

   _____
   _____
   _____

4. How might refrigerating meat prevent it from spoiling?

_____

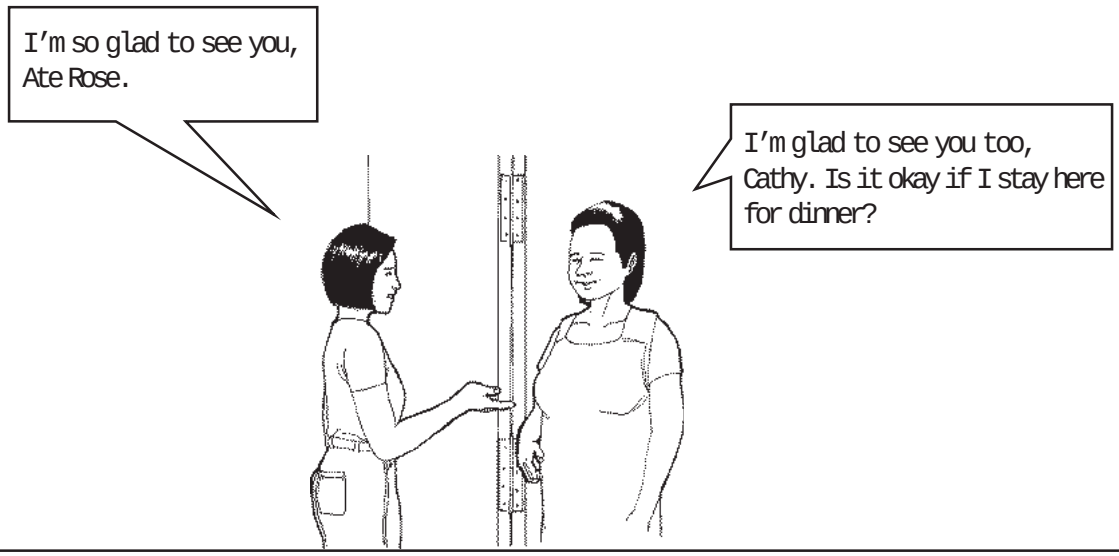
_____

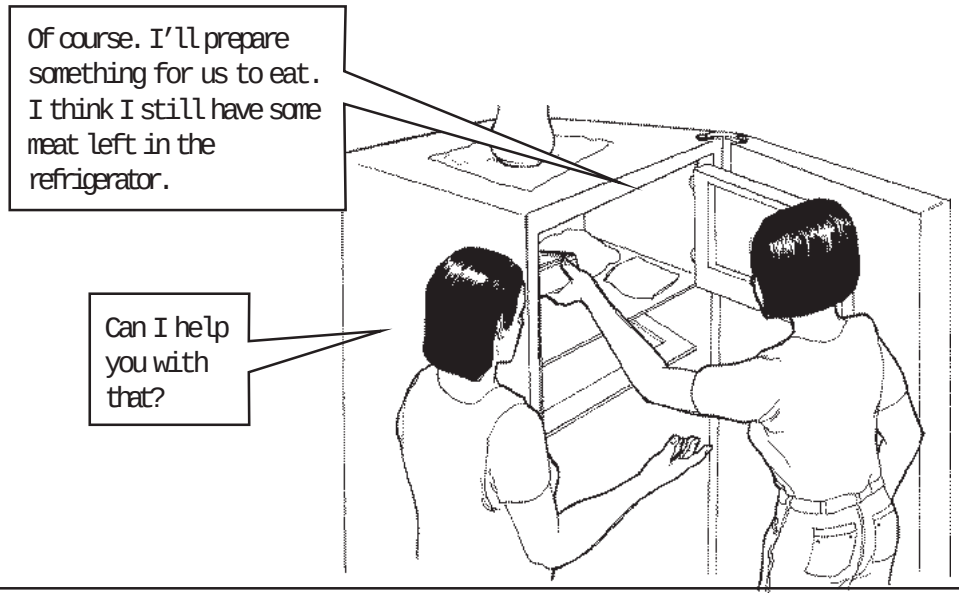
_____

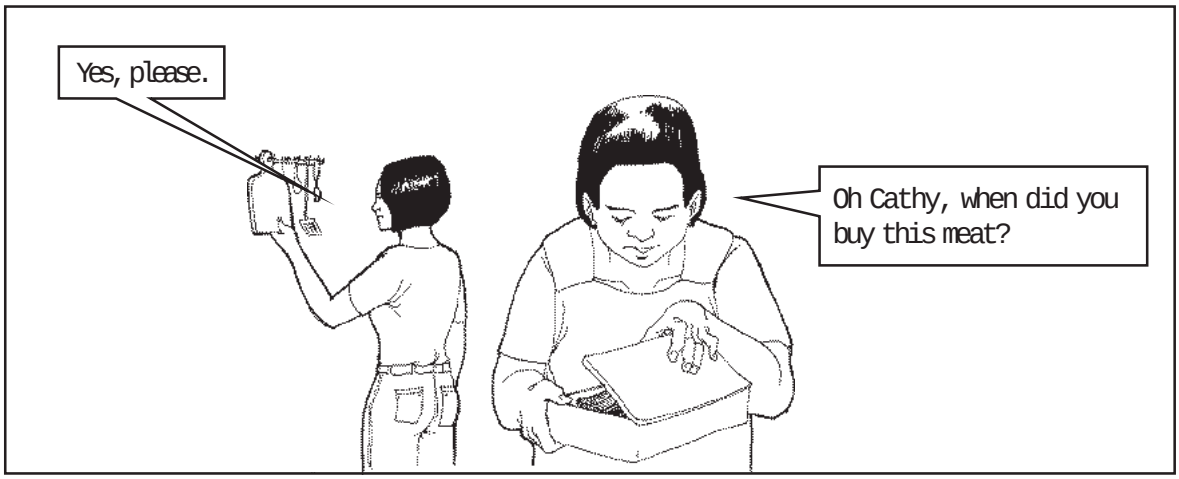
Compare your answers with those in the *Answer Key* on pages 46–47.

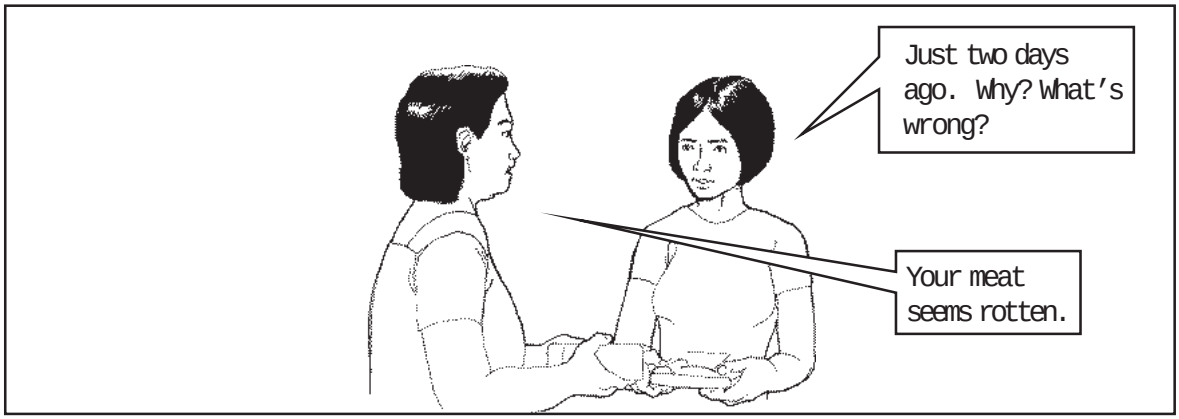
Let's Read

Cathy is a young housewife who knew little about preserving meat. One day, her older sister Rose came to visit her at home.

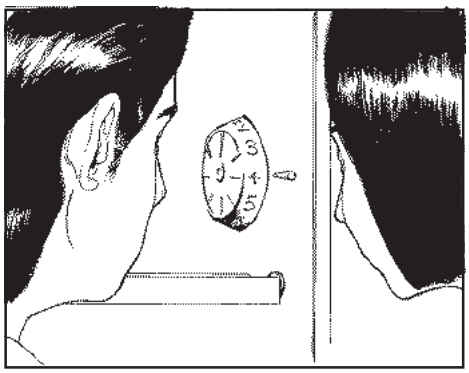








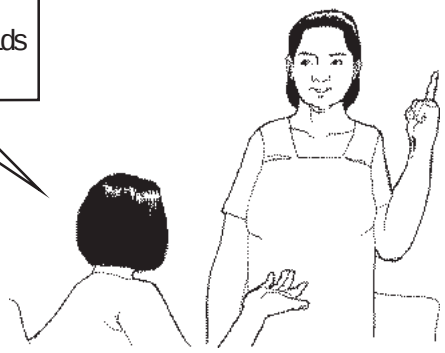
Cathy and Rose checked the temperature of the freezer, and found out that it was set to 4°C.



I didn't think that it would spoil because it was in the refrigerator. I didn't really want it to become frozen, because it takes so much time defrosting it.

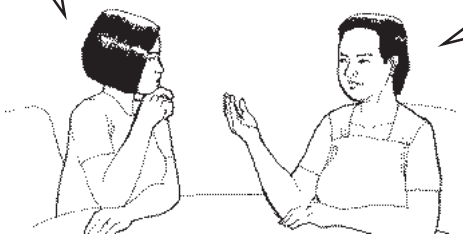
Cathy, you have to remember that meat will spoil due to microorganisms such as bacteria, molds and yeast if it's not stored or preserved properly.

What are bacteria, molds and yeast?



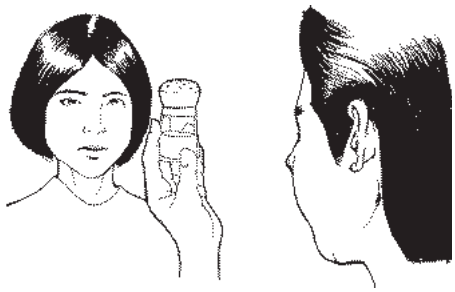
These are harmful microorganisms that are capable of spoiling meat. It is important that you know how meat looks and smells when it becomes rotten or spoiled.

So, what does rotten meat usually look and smell like?

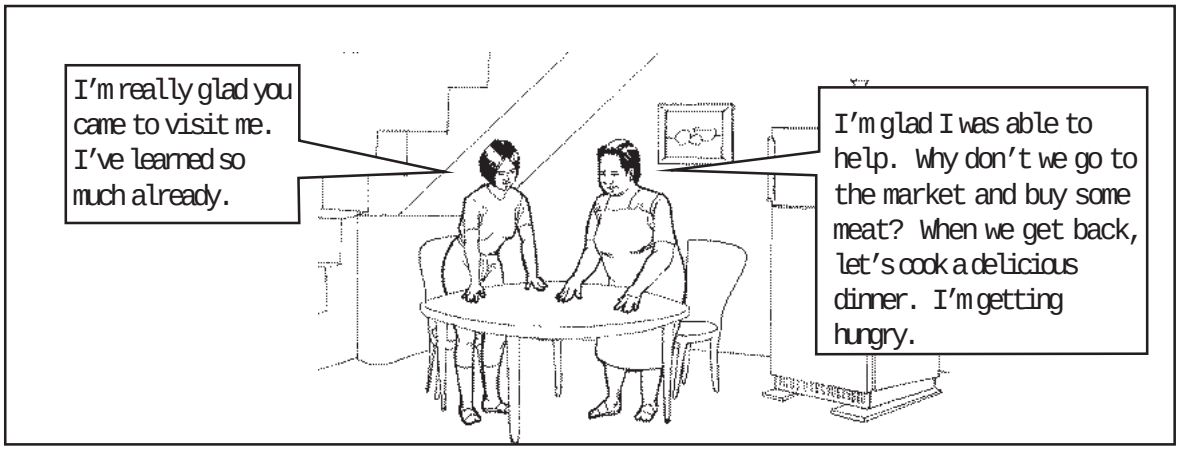


The color or smell of rotten meat varies depending on the type of organism involved. If it appears dry and fuzzy, molds are present. They're commonly white, green or black. Spoilage caused by bacteria appears as various colored spots, usually red, yellow and blue. Greenish-blue to brownish-black spots found on stored beef are also caused by bacteria. Rotten meat has a foul smell like that of ammonia.

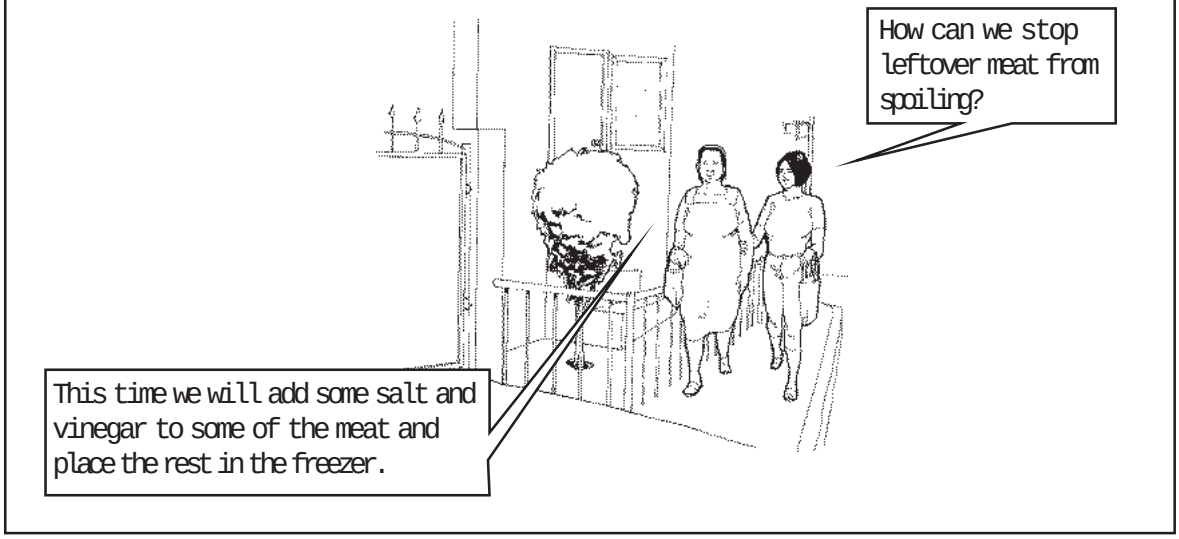
How does ammonia smell like?



It smells peppery.



The two sisters left the house to go to the nearest market.



Let's Try This

Encircle the letter of the correct answer.

1. What did Ate Rose notice about the meat?
   a. It looked good.
   b. It seemed rotten.
   c. It smelled sweet.
   d. It was cold.
2. Why did the meat spoil?
   a. Cathy forgot to store it in the refrigerator.
   b. Ate Rose dropped it on the floor while preparing to cook it.
   c. Cathy stored it in the freezer but did not set the temperature at 0°C or lower.
   d. The meat has been stored in the freezer for several months.
3. Ate Rose mentioned another way to preserve meat. What is it?
   a. Adding some spices or seasonings like salt and vinegar.
   b. Placing the meat in a sealed container.
   c. Cooking the meat before storing it in the refrigerator.
   d. Storing the meat in a dry and dark place.
4. According to Ate Rose, what might be the result of eating rotten meat?
   a. diarrhea
   b. nausea and vomiting
   c. food poisoning
   d. all of the above
5. What are the harmful microorganisms capable of spoiling meat?
   a. bacteria, molds, yeast
   b. molds, insects, viruses
   c. bacteria, viruses, insects
   d. molds, viruses, insects

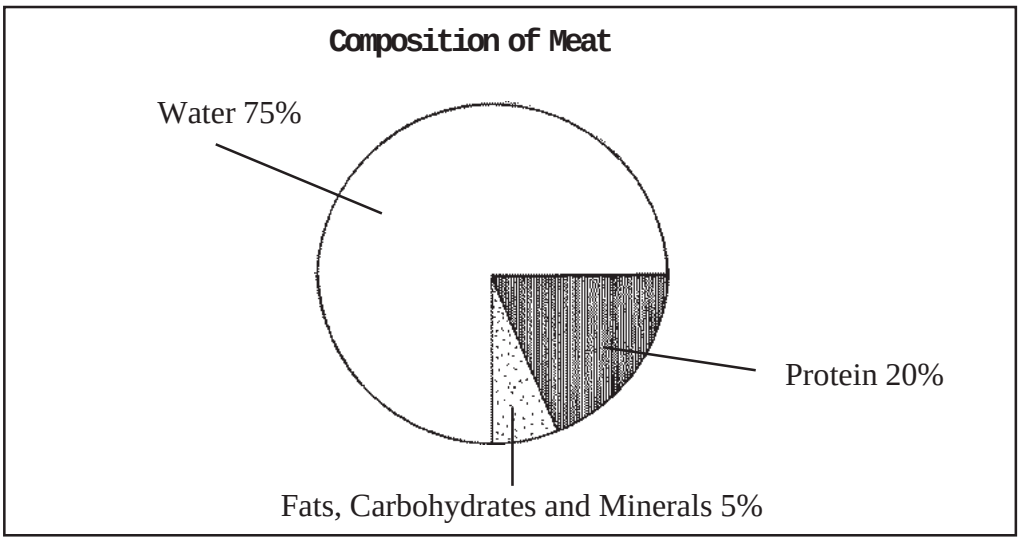
Compare your answers with those in the *Answer Key* on page 47.

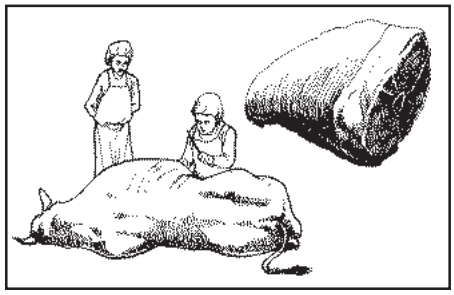
Let's Learn

There are many different ways of preserving meat, such as by freezing or by adding some spices or seasonings like salt and vinegar. These methods prevent bacteria, molds or yeast from spoiling the meat.

But why does unpreserved meat spoil? Let's study the reasons.

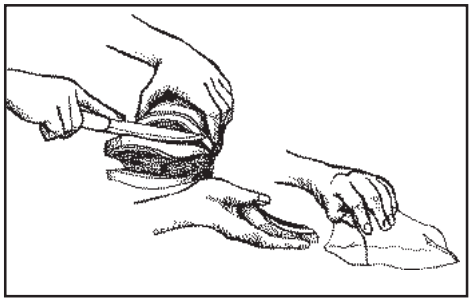
Without the scientific methods of food preservation, meat easily spoils because it is high in moisture and rich in nutrients, minerals, and carbohydrates that microorganisms feed on. Meat is composed of approximately 75 percent water and 20 percent protein. The remaining 5 percent are fats, carbohydrates and minerals, as shown below.





The process of **food contamination** begins during the slaughtering of the animal from which the meat is taken. At this point, the contents of the meat are exposed to changing temperatures, possible juice loss and bacterial contamination.

When meat is handled and packaged, this again introduces possible contamination. Thus, scientific methods such as refrigeration and drying are used to preserve the meat. It needs to be preserved so that the multiplication of microorganisms is prevented.



So, if I go to a market to buy meat, I will make sure that the quality of the meat I will buy is good. I will know this by looking at the meat and smelling it. Then, I will ask myself, "Does the meat look dark? Does it smell bad?"

We must remember that the meat we buy from the market is probably contaminated, so we must preserve it to avoid further contamination and eventual spoilage.

Let's Review

Answer the following questions:

1. Why do you think meat spoils easily?

   _____
   _____
   _____

2. Why do you think there is a need for food preservation?

   _____
   _____
   _____

3. How can you prevent food from spoiling?

   _____
   _____
   _____

4. Why is food preservation valuable in your everyday life?

   _____
   _____
   _____

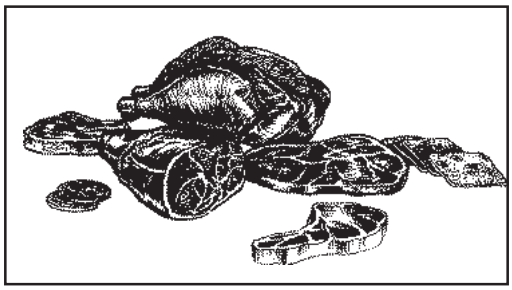
Compare your answers with those in the *Answer Key* on pages 47–48.

Let's Learn

Preserved Food

Some types of food, like meat, have to be preserved in order to:

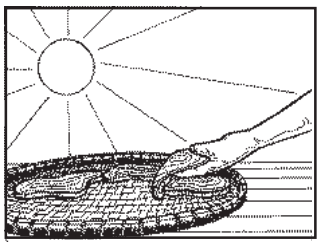
- prevent them from rotting or spoiling; and
- prevent the growth of harmful microorganisms.



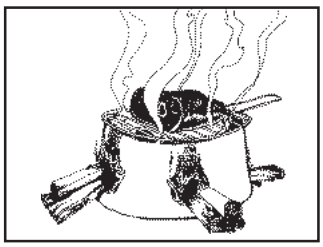
Meat spoilage is caused by microorganisms. Knowing this, scientists have developed appropriate methods for dealing with harmful microorganisms. These methods have been adopted by people who have to deal with the problem of the food spoilage in their everyday lives. Food preservation not only solves this problem, it also helps people save money, time and effort.

Some examples of meat preservation methods are shown below. They are called scientific because these methods have been tested and found to be effective.

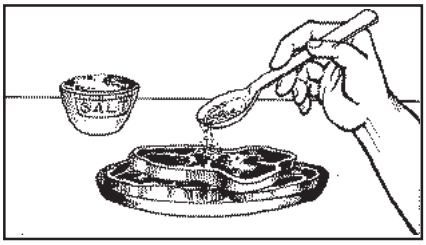
Methods of Food Preservation



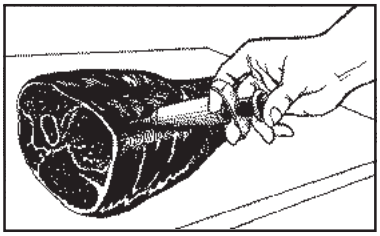
Drying



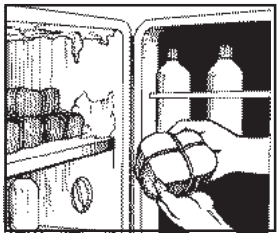
Smoking



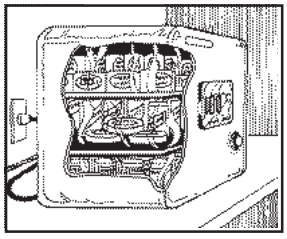
Salting



Curing



Refrigeration/Freezing



Canning

When we preserve meat using any of the methods mentioned above, we prevent it from spoiling. In addition to this, preserved meat is also:

- tasty and delicious;
- easy to prepare and cook;

- easy and convenient to stock at home; and
- definitely hygienic, especially when properly prepared in your own home.

The level of contamination of meat preserved at home is lower than that of meat preserved in the public market because public markets are more open and exposed to germs. The quality of the meat depends not only on its source, but also on the cleanliness of the people who handle it and of the area in which it is handled and stored, and on the efficiency of cleaning and sterilizing procedures.

Let's Try This

Which of the methods of food preservation have you tried doing yourself? Give a brief explanation of how you did it on the lines below.

_____

_____

_____

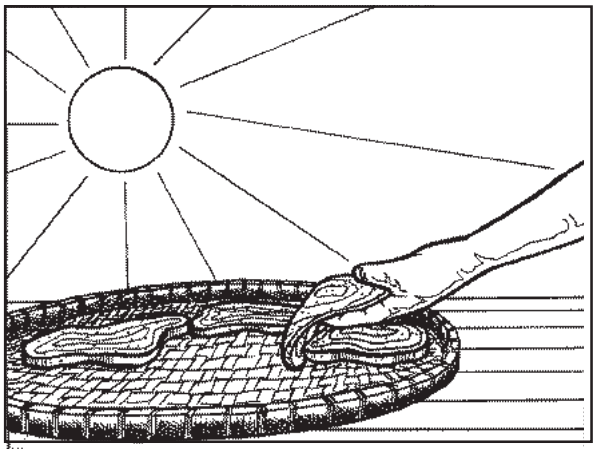
_____

_____

_____

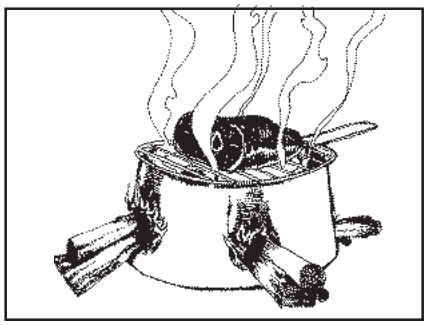
Let's now compare them with the methods discussed below.

Let's Learn

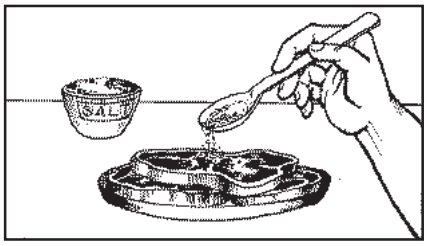


Drying – This method reduces the moisture of meat by as much as 15 percent. There are two ways of doing this, namely, by using sunlight and artificial light. In the first method, the meat is simply exposed to direct sunlight. In the second method, the meat is placed in a container with 85 percent humidity and the temperature is maintained at the range of 43°– 49°C. This permits gradual drying, allowing sufficient control to avoid overheating that might result in discoloration. Although the use of artificial light is more expensive, this method assures a high quality product that can be sold for a higher price. The meat is prepared and processed using proper precautions and adequate sanitation to protect it from infection by dust, insects and other animals.

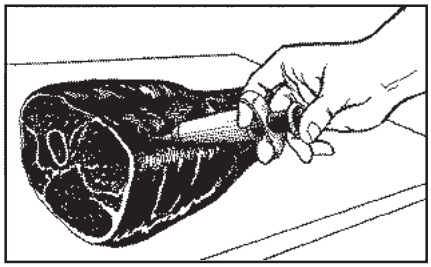
Smoking – Fish and meat are smoked using burning wood, wood shavings or guava leaves**.** **Pyroligneous acid**, which comes from the burning wood or leaves, penetrates the meat. This preserves the meat and enhances its taste. This method is used for making ham and bacon. A pickling solution (a mixture of salt, sugar and citric acid or vinegar) is used to further improve the taste.



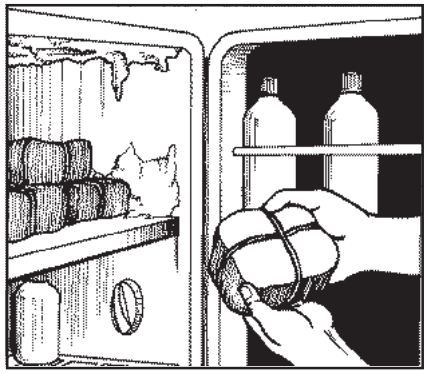
Salting – Salt is used in meat packing, sausage making, fish curing and in other food processing methods. The addition of salt when preserving meat not only dries the meat but also destroys the microorganisms that are capable of spoiling it. However, the correct amount of salt has to be applied so that the preserved product will remain edible and tasty.



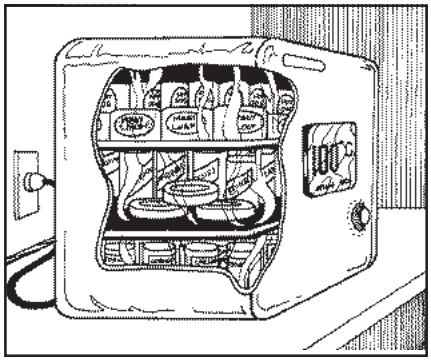
Curing – This is primarily used to provide flavor and to allow the retention of meat color during cooking. Meat may be preserved with a curing salt. The ingredients used in curing are salt (2 tablespoons), sugar (2 tablespoons) and saltpeter (1 teaspoon). Other ingredients, such as spices, vinegar or wine, may also be used. Vinegar prevents the multiplication of harmful microorganisms. Essential oils from spices add flavor. Curing may be combined with smoking. Smoke acts as a drying agent and coats the meat surface with pyroligneous acid, including some amount of formaldehyde, which acts as a disinfectant and preservative.



Refrigeration/Freezing – This method has been proven highly effective because of its inhibiting effect on microorganisms. This is the most widely used method of preserving fresh meat. Meat can be stored in the freezer for several months at a temperature of 0°C or below. It is even better if the temperature is lowered to maybe negative 20 degrees Celsius (–20°C) to prevent the multiplication of harmful microorganisms.

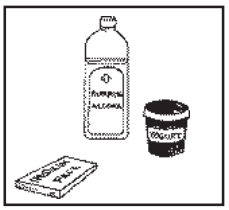


Canning – This method is used for longer storage periods that demand more complete protection against harmful microorganisms. Prepared raw food is placed in a sealed container at a temperature of 212°F or 100°C for a specified period of time, after which it is cooled.

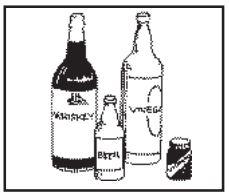


All these methods of food preservation form part of what we call **biotechnology.** Biotechnology means the application of advances made in biology to industry, agriculture, medicine, manufacturing and waste management.

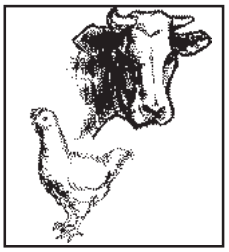
One application of biotechnology is food preservation. Examples are:



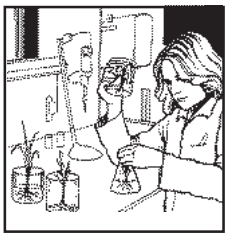
- the use of bacteria for the manufacture of alcohol, yogurt and insulin;



- the use of microorganisms in the production of beer, wine, vinegar, vitamins and protein;



- the selective breeding of animals and plants to improve production and to bring about desired traits;



- the manipulation of genetic material to develop pest-resistant crops, medicines, vaccines and cures for genetic diseases; and

- the use of biological methods to control insects and pests.

Biotechnology is essential to humans, animals and plants. Therefore, all of the examples above can be applied in our daily lives.

Let's See What You Have Learned

To test how much you have learned in this lesson, complete the following statements by writing the correct word in each blank.

1. Storing meat at a temperature of 0°C or below is called_____.
2 _____ is the method used for making ham.
3. The application of salt, sugar and saltpeter is a way of preserving meat. This method is called _____.
4. _____ live in a moist environment and multiply rapidly in meat.
5. Meat has a high moisture content. It is approximately_____ percent water.
6. Food preservation is an example of the scientific field called _____.

You can check your answers with those in the *Answer Key* on page 48.

Let's Remember

- Meat has to be preserved in order to prevent food spoilage and the multiplication of harmful microorganisms.
- Meat spoils easily because it is high in moisture, rich in nutrients, minerals and carbohydrates that allow the growth of microorganisms.
- There are scientific methods used in preserving meat such as drying, smoking, salting, curing, refrigeration or freezing, and canning.
- If meat is not preserved properly, it spoils due to the growth of harmful microorganisms. Eating spoiled meat can lead to diarrhea, food poisoning and other illnesses.
- Preserving meat is a simple form of biotechnology.

You Can Make Tocino and Longganisa

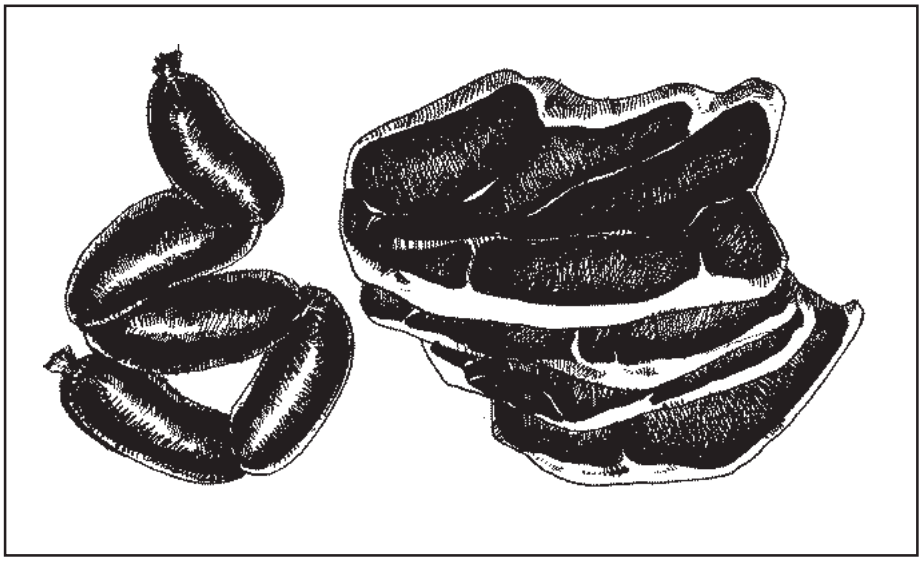
Tocino and longganisa are examples of meat preserves. In Lesson 1, you learned that preserving meat helps prevent spoilage. Some of the methods of meat preservation we discussed in the previous lesson can be used to make tocino and longganisa. You will learn exactly how to do this in this lesson.

In making tocino and longganisa, you prevent the meat from spoiling, so it lasts longer, becomes more tasty and delicious, and is always ready to cook.

Have you tried making tocino and longganisa? What were the ingredients you used? How did you go about making them? Did your products turn out delicious?

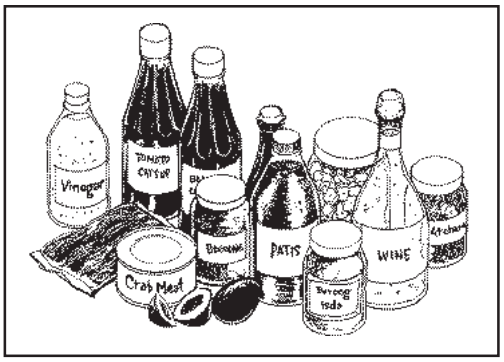
After studying this lesson, you should be able to:

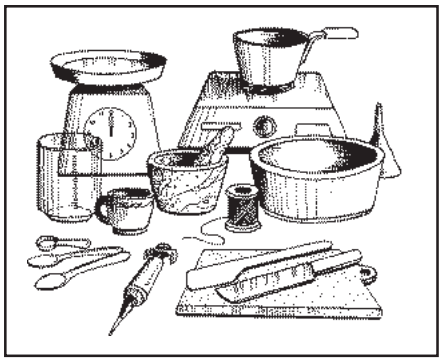
- follow the instructions for making tocino and longganisa; and
- use your knowledge of food preservation to make tocino and longganisa.



Let's Learn

Suppose you talked to your favorite butcher or meat shop owner. You asked him what ingredients to buy and what equipment to use for making tocino and longganisa. He probably mentioned some of the ingredients and equipment pictured below. Are you familiar with any of them?

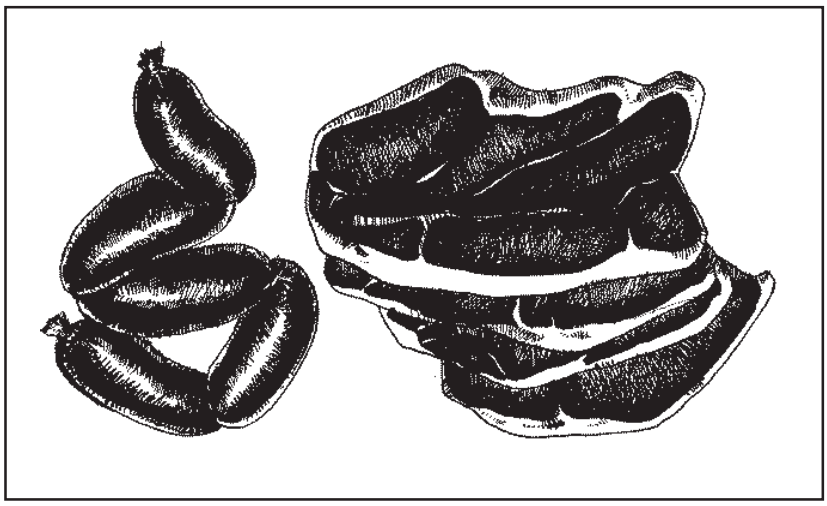




The ingredients that you will be needing are: soy sauce, salt, sugar, food coloring, chili pepper, garlic, vinegar, ground pepper and *salitre* (saltpeter).

Meanwhile, the equipment needed are the following: a weighing scale, a mortar and pestle, a mixing bowl, measuring cups and spoons, a spatula, some thread (for longganisa), a syringe, a funnel, a catch basin, a knife and a chopping board.

If you were able to name them all, then you are familiar with the ingredients and equipment that you will need. Are you ready to make tocino and longganisa? Read on to find out how.



Let's Try This

Do you know the things you should and should not do when making tocino and longganisa?

If you do, write them below.

_____

_____

_____

_____

_____

Compare your answers with those in the *Answer Key* on page 48. If you were not able to write anything, don't worry. Just read on to learn what you need to know.

Let's Read

How to Make Tocino

Suppose that one day at the market, your favorite meat shop owner was making some tocino when you dropped by to buy something. You proceeded to observe how she went about doing it. This was what you saw.

Ingredients:

1 kilo pork meat

2 tbsps. brown sugar

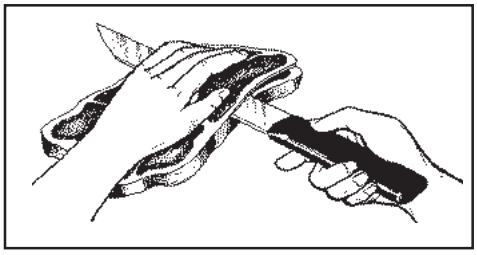
2 tbsps. salt

1 tsp. saltpeter (*salitre* or potassium nitrate)

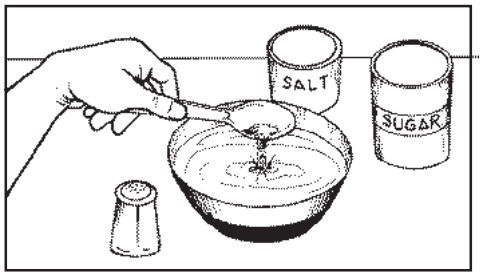
4 tbsps. warm water

Procedure:

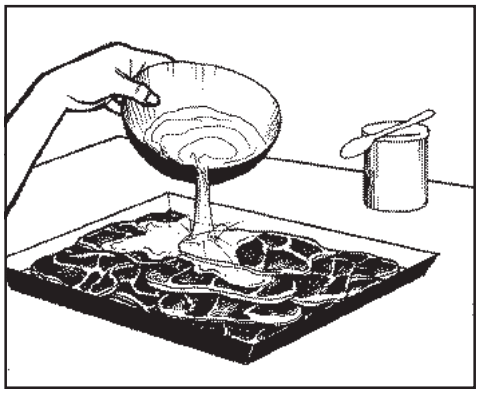
Step 1. Cut the meat into ¼-inch slices.



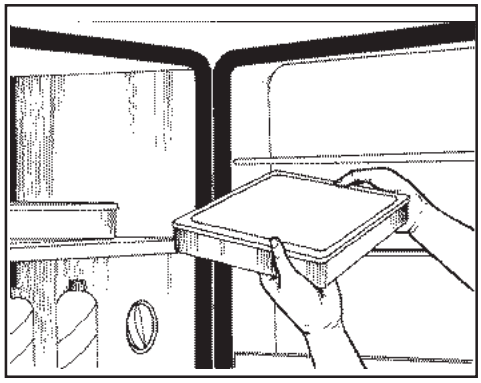
Step 2. Prepare a curing solution. Mix 2 tbsp. salt, 2 tbsp. sugar and 1 tsp. saltpeter. Dissolve these in 4 stbsp. of warm water.



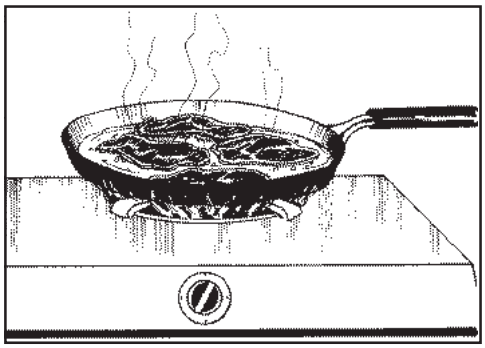
Step 3. Pour the curing solution over the meat, making sure that it is evenly applied to all slices.



Step 4. Place the meat inside a plastic container and store it in the refrigerator for 2 to 3 days before cooking.



Step 5. Cook the meat until it is slightly brown.



The preparation and cooking should take about 15–20 minutes.

Do you think you will be able to follow the steps in making `tocino`?

Let's Review

Answer the following questions.

1. List down the ingredients needed for making tocino.

   _____

   _____

   _____

2. Explain the method of making a curing solution.

   _____

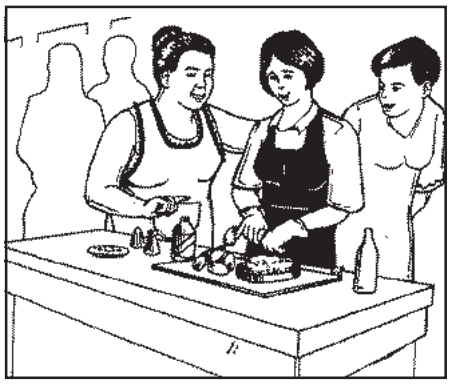
   _____

   _____

Compare your answers with those in the *Answer Key* on pages 48–49.

Let's Learn

How to Make Longganisa



Let us say that while you were talking with your favorite meat shop owner, you saw the lady from the neighboring stall making longganisa (Filipino-style sausage). You wanted to learn more about what she was doing so you asked to be introduced. You also asked for the recipe, and she gave you this:

Ingredients:

1 kilo ground pork

2 tbsps. salt

2 tbsps. sugar

1 ½ tbsps. soy sauce

2 tbsps. vinegar

2 tbsps. wine

1 tsp. saltpeter (*salitre* or potassium nitrate)

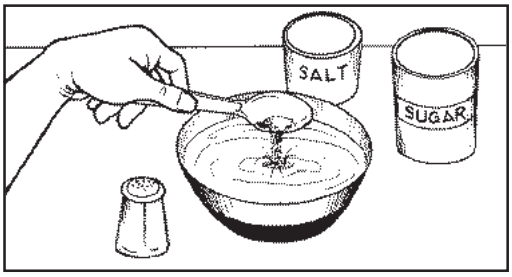
1 tsp. ground pepper

2 tsps. chopped garlic

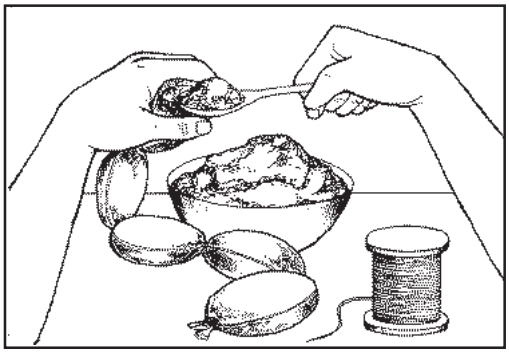
12 sausage **casings** (skinlike coverings for processed meat such as longganisa; usually made of the cleaned intestines of cows, pigs or sheep)

Procedure:

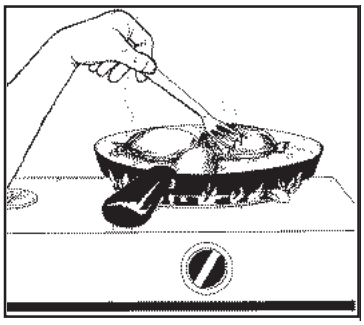
Step 1. To prepare the curing solution, combine 2 tbsps. salt, 2 tbsps. sugar and 1 tsp. saltpeter. Dissolve these in 4 tbsps. warm water.



Step 2. Mix the curing solution with the ground pork. Add the rest of the ingredients and stuff the mixture into the casings. Place them inside the refrigerator and let stand for 5 to 6 days.



Step 3. To cook, place a small amount of water in a frying pan. Add the longganisa and boil for about 10 minutes. With a fork, pierce the casings. The longganisa is ready when juices flow out and turn to a dark caramel color.



Happy with what you have learned, you went home with the ingredients you purchased for making tocino and longganisa.

You tried making your own tocino and longganisa immediately, because you didn't want to forget the new things you have just learned.

Well, how did your tocino and longganisa taste? Were they delicious? Now, here are some tips to improve your products.

Tips on preparing tocino and longganisa:

- The most important ingredient in the curing solution is salt.
- Saltpeter (*salitre*) is the ingredient used to improve the color of a meat product.
- Loin is the pork cut that yields juicy and delicious tocino and longganisa. However, any pork cut may be used for making tocino.
- The meat used for making longganisa is a mixture of fat and lean meat.
- Make sure that the color of the meat is just right, that it has no smell, and that the grains are tightly packed.
- The steps followed in making tocino are the same steps followed in making ham or bacon, except that the manner of slicing the meat is different for tocino.
- It is not recommended that you use pork belly because it is too fatty.
- You may use other spices or even vinegar to help prevent food spoilage. In Lesson 1, you learned that vinegar prevents the multiplication of harmful microorganisms and can be used as a curing method. Two tablespoons of vinegar is an appropriate amount to add. The acid in vinegar and the natural chemicals in spices help keep microorganisms from increasing.
- If you want to prepare twice as much tocino or longganisa, you just have to double the recipe.

Tips on cooking `tocino` and `longganisa`:

- Wash the preserved product before cooking to remove the grease of the saltpeter.
- If the preserved meat is frozen, the cooking time should be longer.
- Avoid burning the `tocino` or `longganisa` when cooking. The chemicals of the saltpeter can be very unhealthy when burned.

Let's Review

Answer the following questions. Write your answers in the blanks provided.

1. What method of food preservation is used in preparing tocino and longganisa? Explain.

   _____
   _____
   _____
   _____
   _____

2. How do the recipes for preparing tocino and longganisa help in preserving the meat?

   _____
   _____
   _____
   _____
   _____

3. What are the advantages of preserved meats such as tocino and longganisa?

   _____
   _____
   _____
   _____
   _____

Compare your answers with those in the *Answer Key* on page 49.

Let's See What You Have Learned

A. Read the paragraph below, then fill in the blanks with the correct words or phrases found in the box.

How to Make Tocino

color	smell	tocino
saltpeter	salt	ham
slicing	any pork cut	loin
sugar	bacon	vinegar

The most important ingredient in the curing mixture for meat preservation is (1)_____. (2) _____ is the ingredient used to improve the color of a meat product. (3) _____ is also used to prevent the multiplication of microorganisms. (4) The pork cut that yields juicy and delicious `tocino` is _____. (5) However, _____ may also be used as long as the (6) _____ is just right, the meat has no (7)_____, and the grains are tightly packed. The steps followed in making `tocino` are the same steps followed in making (8) _____ or (9) _____, except that the manner of (10) _____ the meat is different for `tocino.`

B. Which step should come first? Number the following steps in making `tocino`, according to their proper order. (Write 1 for the first step, 2 for the second, and so on.)

___ Prepare the curing solution. Dissolve salt, sugar and saltpeter in warm water.

___ Cook until the meat is slightly golden. Serve.

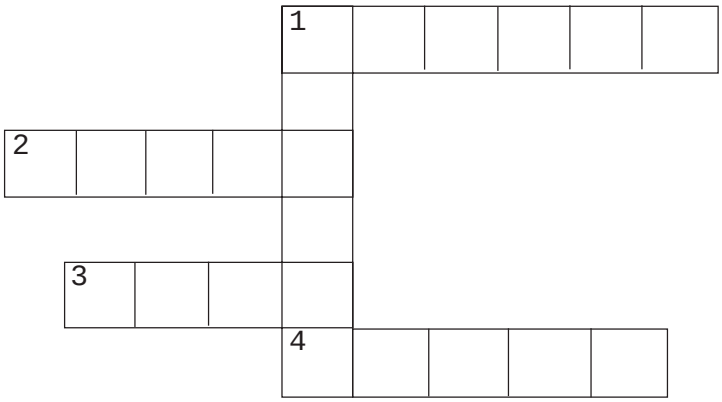
___ Measure the correct amounts of each ingredient.

___ Cut the meat into ¼-inch-thick slices.

___ Place the meat inside a plastic container and store in the refrigerator for 2 to 3 days before cooking.

___ Pour the curing solution over the meat, making sure it is evenly applied to all slices.

C. Try to complete this simple crossword puzzle. The clues to each word can be found in the statements below. Fill in the missing letters to find out what word you should place in the corresponding number of the puzzle.



Across

1. Longganisa is stuffed into a c_ _ _ _ _.
2. When cooking longganisa, first place a small amount of _ a _ _ _ in a frying pan.
3. Meat used for making longganisa is a mixture of fat and _ _ a _ meat.
4. G _ _ _ _ _ pork is used for making longganisa.

Down

1. The first step in making longganisa is mixing all the ingredients in the _ u _ _ _ _ solution.

D. Explain the method of food preservation used in making tocino and longganisa.

_____
_____
_____
_____
_____

Have you finished answering all the items? If so, you can compare your answers with those in the *Answer Key* on pages 49–50. If they are all correct, excellent! You may continue with the next lesson.

If some of your answers are wrong, don't feel bad. Just review this lesson. Then, answer the test questions again.

Let's Remember

- Tocino and longganisa are easy to prepare and cook.
- Remember the important tips in making tocino and longganisa such as the recommended type of meat, the use of salt, the length of cooking time, etc.
- The method used in preparing tocino and longganisa is curing. The meat is preserved with a curing mixture, made of salt, sugar and saltpeter. These curing ingredients absorb moisture from the meat, thus preventing or delaying microbial growth. Acid in vinegar and natural chemicals in spices help keep microorganisms from increasing in number. Refrigeration of the cured products will ensure that microorganisms won't spoil the product.

Preserving Fruits, Vegetables and Fish

Food preservation is not only for meat. The different methods used for preserving meat may also be used to preserve fresh fruits, vegetables and fish. Do you know some examples of preserved fruits, vegetables and fish? Do you see them in markets? Since there is a variety of them, you probably even have some of these products at home. Most people prefer to store these products because they are convenient and always ready for use.

After studying this lesson, you should be able to:

- explain how scientific methods are used in preserving fruits, vegetables and fish; and
- describe the advantages of preserving fruits, vegetables and fish.

Let's Read

Do you remember Cathy and Ate Rose? Let's go back to their story. While they were at the market, Ate Rose convinced Cathy to buy other types of food to store at home, besides meat.

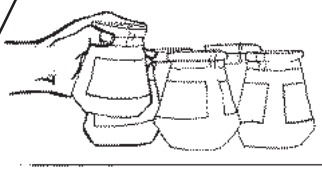
Well, you can buy other types of food that don't need a lot of cooking.

That's probably what I need.

Instead of fresh fish, you can buy *tinapa* and *daing*, dried and preserved. They only take a few minutes to cook. Better yet, I'll just tell you how to make *daing*. It's really good for breakfast.

I think that's a good idea.

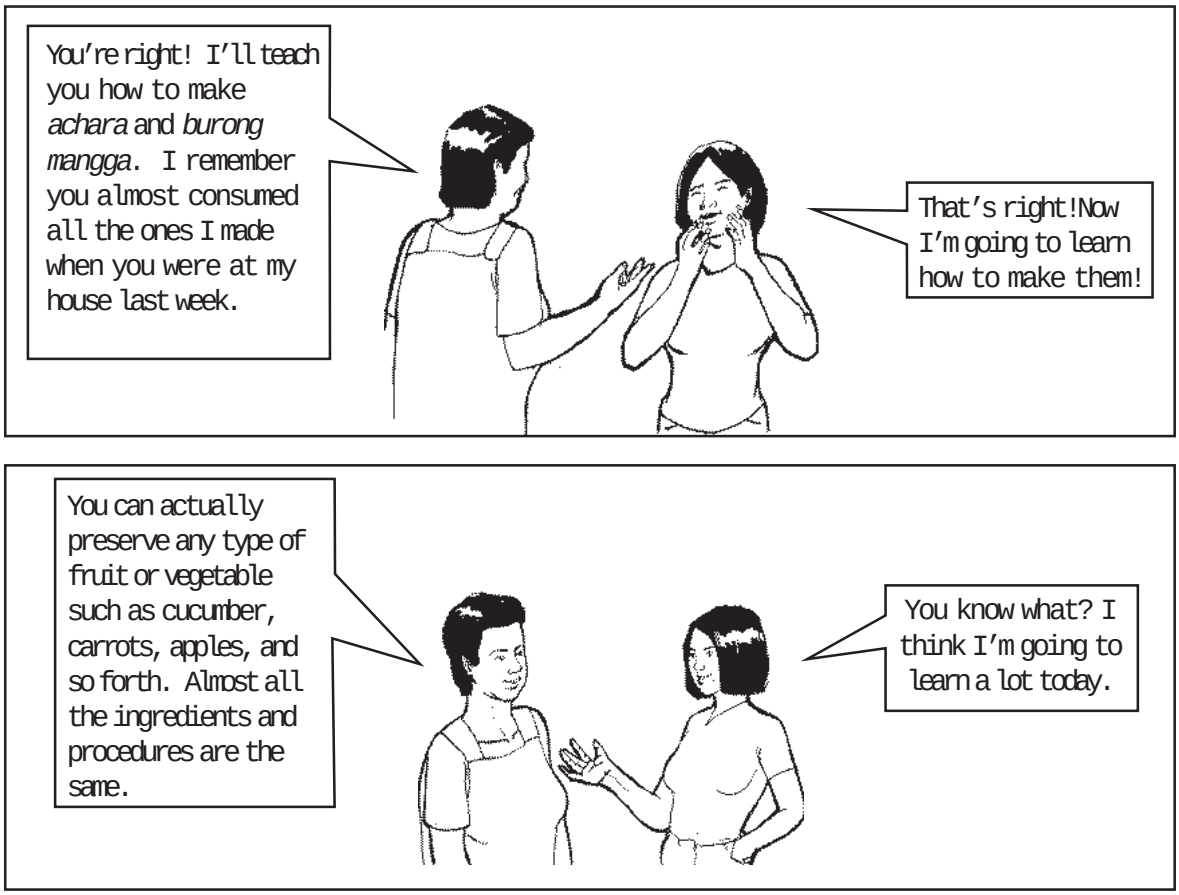
You may also buy jellies or jams depending on what kind of fruit you want. I think almost all fruit flavors are available.



My husband and I like grapes, so let's buy grape jelly.

Or if you like, you can also buy fresh fruits and vegetables. Don't worry about them spoiling. I'll teach you how to preserve them. They will last for months.

That's great! I won't have to worry about eating them right away! Usually, these fruits only last 3 to 5 days. Other vegetables only last a week or two.



Let's Talk About This

1. What are the examples of preserved fruits, vegetables and fish that Ate Rose mentioned?

   _____
   _____
   _____

2. Why do you think Ate Rose wants Cathy to learn how to make preserved fruits, vegetables and fish?

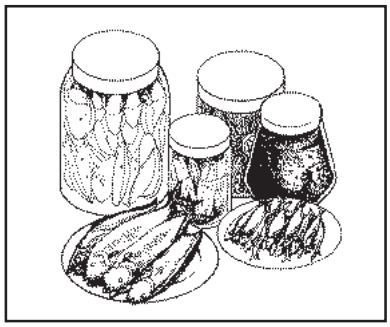
   _____
   _____
   _____

3. Have you or any of your family members tried preserving fruits, vegetables or fish? How did you or they do it?

   _____
   _____
   _____

Compare your answers with those in the *Answer Key* on pages 50–51.

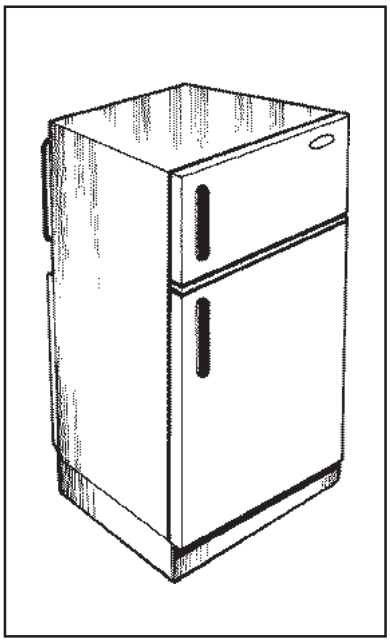
Let's Learn



Most green vegetables and fruits may be preserved by **pickling** in either a brine (water and salt) or a vinegar solution (sugar and vinegar). These methods do not only make the preserved foods last longer but may also make them more nutritious and better tasting.

Besides pickling, there are other ways of preserving these types of food.

Refrigeration is a common method of preventing the spoilage of fruits and vegetables and keeping them fresh. However, due to differences among some fruits and vegetables, there is actually no definite rule to be followed in storing them in a refrigerator. But here are some general guidelines that you can follow in storing some fruits and vegetables in refrigerators.



1. Papayas that are firm and full can be stored in the refrigerator at a temperature of 9 to 19 °C. Papaya can remain fresh for up to about a week in a refrigerator.
2. Avocados may be stored at a temperature of 7 to 10 °C. They will last for about one week.
3. Cabbage can be stored at a temperature of 0°C. Storage can be maintained for about two to three weeks.
4. Pechay, as well as mushroom can be stored at a temperature of 0°C. However, storage life is much shorter: 10 to 15 days for pechay, and five days for mushroom.

These methods can be used when you have a refrigerator at home. But what if you don't have one? Fortunately, you can resort to other methods of preserving fruits and vegetables.

Apart from pickling and refrigeration, another method is **canning.** You have probably noticed that many companies can and bottle products such as fruits, vegetables, fish and meat. Canning allows you to store foods for longer periods of time.

Let's Review

1. What is the advantage of using the pickling method in preserving fruits and vegetables?

   _____
   _____
   _____

2. Do you think having a refrigerator is important in preserving fruits and vegetables? Why or why not?

   _____
   _____
   _____

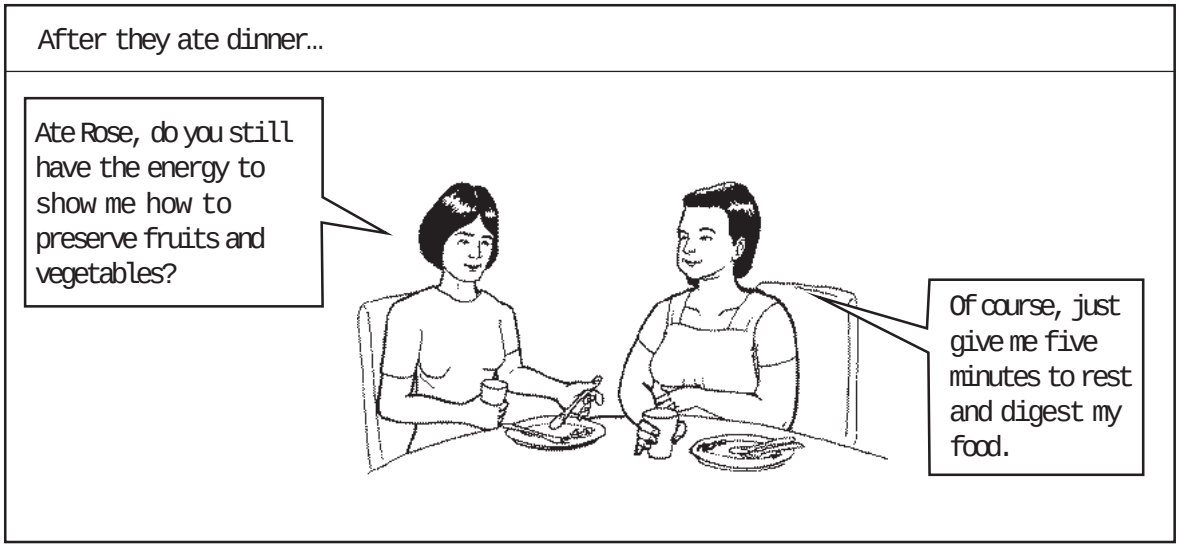
3. Besides pickling and refrigeration, what other method is used to preserve fruits, vegetables and fish? How does it preserve the food?

   _____
   _____
   _____

Compare your answers with those in the *Answer Key* on page 51.

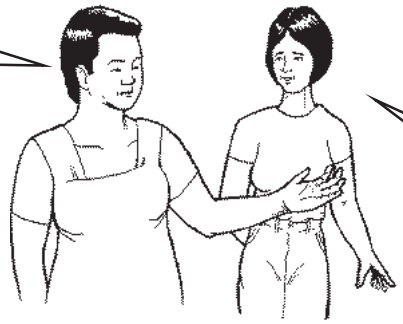
Let's Read

Let's go back to Cathy and Ate Rose to find out how the pickling process is done. Ate Rose is going to teach Cathy how to preserve fresh fruits and vegetables. She will also teach Cathy how to preserve fresh fish.



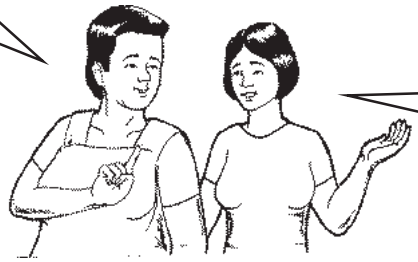
After 5 minutes…

Okay, now let's go to the kitchen. Since most fresh fruits and vegetables soften and rot after 24 hours, you must think of a way of making them last longer.



Especially because they cost so much.

You're right. Now, just like I told you about preserving meat, you can also use salt and vinegar in preserving fruits or vegetables. They play an important role in preventing the growth of harmful microorganisms. An example is in making *achara* or pickled papaya.



I understand now. So, how do you make *achara*?

You can make *achara* using these vegetables: 3 cups grated green papaya, 2 sweet red peppers, 1 carrot, 1 small cucumber and 1 red hot pepper. Write this down. You might want to use this recipe again in the future.

The first thing to do is to grate the flesh of a green, unripe papaya. Soak it overnight in a strong salt solution (brine), which is one cup of salt dissolved in four cups of water. Next, slice the cucumber and carrots, unpeeled. The peel adds color and crunch to your pickle. Just be sure to wash your vegetables well before slicing. Remove the cucumber seeds. Soak the carrots and cucumber overnight in the salt solution with a pinch of alum vinegar for a crispier taste.

Boil a solution of 4 cups of vinegar and 1 cup of sugar. Let it cool while you sterilize the glass jars. Sterilizing the jars is important to make sure that the *achara* containers are germ-free. Immerse the jars and lids in a pot of water. Boil them for 20 minutes. Then remove them with a clean tong. Place them upside down on a clean surface. If they are not to be used immediately, screw the lids on the jars when they're not too hot to hold. You don't want germs to contaminate your jars. Remember the vegetables you soaked overnight? You have to drain off the liquid. Pack the vegetables in the sterilized jars. Use a clean spoon or tong. Pour your cooled vinegar solution in the packed jars until it covers all the vegetables. Then seal the jars tightly.

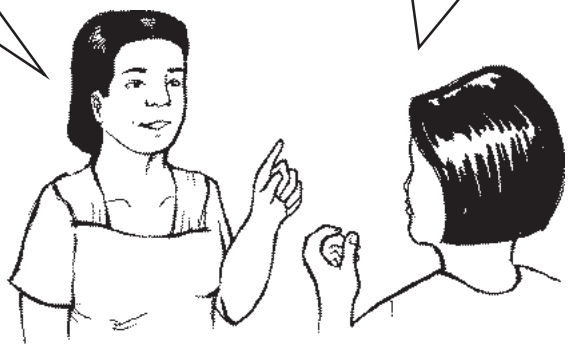
Can't I just place the *achara* in a bowl and store it in the refrigerator?

The preserved fruits have to be sealed in a jar for protection against harmful microorganisms. This way, the fruit will last longer. And yes, you can store it in the refrigerator.

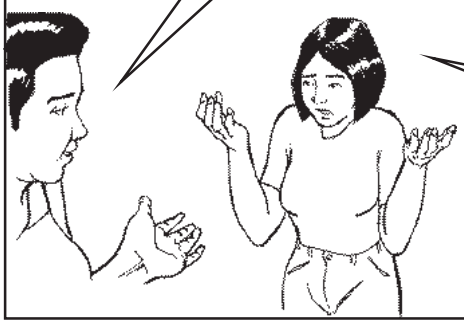
Ate Rose, why don't you tell me how to make *burong mangga*? I'll just do it some other time. I don't want to take so much of your time.

That's all right. Making *burong mangga* is much easier to do and it has fewer ingredients. First, you have to prepare the brine. Use the same amount you used for the grated papaya (1 cup salt and 4 cups water). Boil it to kill the microorganisms. Cool the brine. Place it in a sterilized jar. Next, peel and slice the green mango, but not too thinly. Place it in the brine. Leave it for two days to allow **fermentation.**

As easy as that, huh? But, what do you mean by "fermentation"?



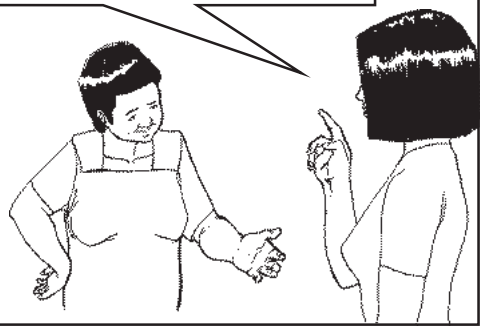
Fermentation is the process by which foods containing carbohydrates are changed by microorganisms that are present in the raw food. The food changes in color, odor and flavor due to the action of "good" microorganisms. The end product is supposed to be safe and delicious to eat. That is what happens in *burong mangga*.



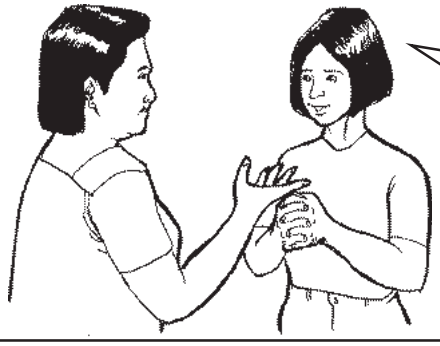
Why do we want fermentation to occur when preserving fruits or vegetables?

Fermentation prevents the growth of harmful microorganisms. We want the "good" bacteria present in the vegetables to ferment the food. The salt solution helps fermentation in two ways. First, it limits the action of harmful microorganisms. Second, it draws out water from the fresh mango, keeping microorganisms away from the food.

I see. So instead of fresh fruits lasting for only a few days, they can actually last for months when fermented.



Now, why don't I also teach you how to make *daing?*



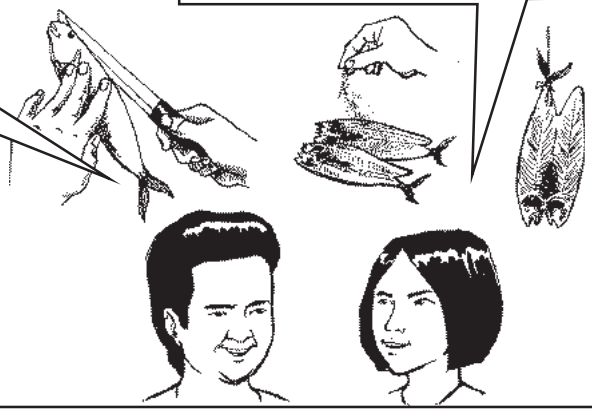
Wow! That's one of my husband's favorites! He'll be happy to know that I could make *daing* by myself.

Making *daing* takes about two days. You might want to do this some other time. But I'll tell you how to do it.

Thank you, Ate Rose. You are really teaching me a lot about preserving food today.

Make sure that the fish you use is fresh. You may use any type of fish. The most common is *galunggong*. Clean the fish, marinate it with salt, then place it in a net. Hang this under the sun for 1 to 2 days. This method is called **salting** and **drying**. If you don't have a net, just use anything that has holes on it, as long as it allows air to pass through. This will prevent the fish from being moist. Remember, microorganisms grow in moisture.

Thanks for reminding me. I won't forget. I'll probably try making *daing* this weekend.



I think that you've learned enough for today. It's getting late, so I better go home. Just call me if you have more questions.

Thanks again, Ate Rose. Bye!

Let's Remember

A lot of useful information has been given in the dialogue between Cathy and her Ate Rose. Below are some of the most important points.

- Pickling is a form of food preservation often used for vegetables. It involves the use of vinegar as acid, and sugar for absorbing water from the food being preserved. These two ingredients, when combined, help prevent the growth of harmful microorganisms.
- Fermenting is a form of food preservation which allows "good" microorganisms to transform the food. The end product has a different color, blend and flavor, but it is safe and delicious to eat.
- Refrigeration delays the growth of harmful microorganisms, since most microorganisms grow best at room temperature.
- Canning is another food preservation technique. It is used when foods have to be kept for longer periods of time.
- Drying and salting are two of the most popular food preservation techniques. Both methods involve reducing the moisture content in the food. Microbial growth is delayed in low-moisture conditions.
- Some examples of preserved fruits and vegetables are *achara* and *burong mangga*. *Daing* is an example of preserved fish.

+

Let's Review

Let's review how much you have learned about the methods of food preservation from the dialogue of Cathy and Ate Rose. Try to answer the following questions.

Encircle the letter of the best answer.

1. The method used in making *achara* is _____.

   a. pickling
   b. freezing
   c. boiling
   d. drying

2. The use of salt and vinegar in preserving fresh fruits and vegetables helps _____.

   a. improve the color
   b. slow down the growth of harmful microorganisms
   c. slow down the fermentation process
   d. improve the taste

3. Ate Rose mentioned fermentation. What does this mean?

   a. The conversion of carbohydrates into acid
   b. The process of drying fruit and vegetables in order to preserve them
   c. A food preservation technique which involves the use of a net
   d. The process of canning fruits, vegetables and fish

4. What is the purpose of sealing preserved fruits or vegetables in a sterilized jar?

   a. to protect them against harmful microorganisms
   b. to improve the taste
   c. to improve the color
   d. to keep the preserved product moist

5. Fermented and pickled food products can be expected to last for _____.

   a. only a few days
   b. several months
   c. 24 hours
   d. one month

6. Which method is used in making *daing*?

   a. drying

   b. pickling

   c. curing

   d. refrigeration

7. Why is it necessary for fish to be placed in a net when drying?

   a. fish will dry faster

   b. fish will not stay moist

   c. fish will be cooked

   d. fish will become moist

Compare your answers with those in the *Answer Key* on pages 51–52.

Let's Learn

Our country has an abundant variety of fruits. Give three kinds of fruits that are now in season:_____

How long do you think fruits will stay fresh after they have been picked or harvested? The storage life of fresh fruits is short—5 days to 2 weeks at most. Fruits in season are in abundant supply. Have you seen what happens to an oversupply of fresh fruits in the market? Naturally, they spoil or rot. It would be a waste not to preserve them for future use. Have you seen any "preserved" fruit in the market or grocery?

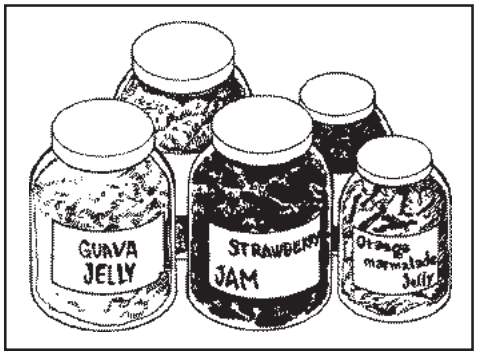
If you answered yes, can you name three of these "preserved" products that you have seen?

_____

_____

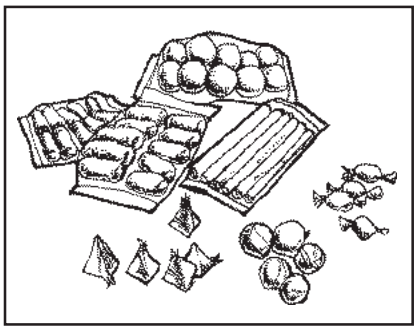
_____

Among the very popular "fruit preserve" products are jams and jellies.



Jelly is a fruit product prepared by extracting the juice from fruits, boiling this with sugar and cooking the mixture to attain a gelatin-like product. Jelly may be made only from fruits rich in pectin and acid. Pectin is also called "vegetable jelly." You can test if pectin is present in your fruit.

Get a tablespoon of juice from any fruit. Add a tablespoon of ethyl alcohol (**not** the one from rubbing alcohol.) If the mixture "gels," it means your fruit is rich in pectin. You can make good jelly with that fruit.



Jam is similar to jelly, but in jam, the whole fruit is used including the pulp, rather than the fruit juice only.

Making **candy** out of fruits is done when the syrup penetrates slowly through the fruit. The sugar concentration in the fruit has to be high enough to prevent spoilage. This is usually done through repeated boiling and storage in syrups. The syrup is made of sugar and water. The fruit is soaked in syrup for a week, heating the syrup for 5 minutes every day. When the syrup is thick, the syrup-soaked fruit is drained and dried under the sun. After that, it is wrapped in cellophane.

Let's See What You Have Learned

Read each statement carefully. Encircle the letter of the best answer for each statement.

1. *Achara* ingredients include _____.
   a. sweet papaya
   b. red pepper
   c. small potato
   d. none of the above
2. The most important ingredient in pickling vegetables is _____.
   a. brine solution
   b. vinegar solution
   c. vegetables
   d. all of the above
3. The most important step in sterilizing jars to be used in food preservation is boiling them for at least _____.
   a. 10 minutes
   b. 20 minutes
   c. 30 minutes
   d. none of the above
4. A brine solution is made from _____.
   a. vinegar and sugar
   b. a pickling solution
   c. a salt solution
   d. all of the above

5. In fermenting *burong mangga*, you use a _____.

   a. salt solution
   b. pickling solution
   c. vinegar solution
   d. all of the above

6. After fermentation, food changes in color, odor and flavor due to the action of _____.

   a. salt
   b. sterilization
   c. harmful microorganisms
   d. "good" microorganisms

7. *Daing* is preserved fish made by lessening the amount of _____ present in the fish.

   a. air
   b. water
   c. nutrients
   d. all of the above

Compare your answers with those in the *Answer Key* on page 52.

Let's Remember

- To avoid the spoilage of excess fruits and vegetables or to prolong their use, certain preservation methods like **pickling** may be used.
- Examples of preserved fruits and vegetables include *achara, burong mangga*, vegetable pickles, jams, jellies, candies and more.
- Fresh fish is preserved through drying and salting, such as in making *daing* and *tinapa*.
- Jelly is made by extracting the juice from fruits by boiling it with sugar and then cooking them. Jam is similar to jelly, but instead of just the juice, the whole fruit is used.

Well, this is almost the end of the module. Congratulations for reaching this far. You have been a patient and diligent learner. Did you like the module? Did you learn something useful from it? A summary of its main points is given on the next page to help you remember them better.

Let's Sum Up

In this module you learned about different methods of preserving food. The key points of the module are as follows:

- Foods that are not properly stored or preserved will spoil easily. Microorganisms such as bacteria, molds and yeast are common causes of spoilage.
- Spoiled food changes in color, odor and flavor. The changes are often unpleasant and the food is harmful if eaten by humans.
- Meat is one food which easily spoils. It contains nutrients and moisture, which invite microbial growth. Contaminated meat has a strong odor (like ammonia) and looks dark or greenish.
- Scientific methods are important in food preservation. This assures that harmful microorganisms will be killed or at least prevented from spoiling the food.
- Meat can be preserved by freezing it at a temperature of 0°C or lower. Other methods of meat preservation are: drying, smoking, salting, curing and canning. Preserved meat not only lasts longer; its flavor, color and texture may also improve when cooked.
- Biotechnology is the application of modern scientific knowledge in the fields of agriculture, industry, medicine and food manufacturing. Food preservation is improved by modern biotechnology.
- Salt, vinegar, spices and saltpeter (potassium nitrate or *salitre*) are important ingredients in curing meat. The addition of these curing ingredients prevents or delays harmful microorganisms from growing in the meat.
- Fish can be preserved through the following methods: freezing, canning, salting (*daing*), drying (*tuyo*), smoking (*tinapa*), and the addition of vinegar and spices.
- Vegetables and fruits can be preserved by pickling and fermentation techniques. Aside from these, fruits can also be preserved by the addition of sugar. Popular examples of fruit preserves are jams, jellies and candies.

What Have You Learned?

You can find out how much you have learned from the module by taking this test.

A. Read each statement carefully. Encircle the letter of the best answer.

1. Common causes of food spoilage are _____.
   a. bacteria, molds, yeasts
   b. molds, insects, viruses
   c. bacteria, viruses, insects
   d. molds, viruses, insects
2. The ideal freezing temperature is _____.
   a. 4°C or lower
   b. 2°C or lower
   c. 0°C or lower
   d. all of the above
3. Spoiled meat is usually _____.
   a. odorless
   b. reddish-pink in color
   c. covered with greenish-blue to brownish-black spots
   d. firm
4. The process of meat contamination starts during _____.
   a. slaughtering
   b. slicing
   c. selling
   d. storing
5. Meat is an ideal place for microorganisms to grow because _____.
   a. it is exposed to air
   b. it has lots of nutrients and moisture content
   c. it is clean
   d. it is not cooked well
6. Exposing food to the sun is a form of food preservation called _____.
   a. drying
   b. heating
   c. lighting
   d. smoking

7. Smoking helps preserve the food because of _____.

   a. pectin
   b. natural smoke
   c. alum
   d. pyroligneous acid

8. It is one of the earliest ingredients used in food preservation. Almost all foods can be preserved using _____.

   a. vinegar
   b. spices
   c. salt
   d. sugar

9. _____ absorbs water from food, thereby preventing harmful microorganisms from growing.

   a. Vinegar
   b. Spices
   c. Salt
   d. All of the above

10. _____ it is a preservative ingredient that delays microbial growth due to its acid content.

    a. Vinegar
    b. Spices
    c. Salt
    d. Sugar

11. Which of the following ingredients is used to add flavor and aroma to the food as well as natural chemicals that delay microbial growth?

    a. vinegar
    b. spices
    c. salt
    d. sugar

12. Which of the following is **not** a form of biotechnology?

    a. the use of machines to make alcohol and yogurt
    b. the selective breeding of animals
    c. the use of natural pest control in agriculture
    d. the use of microorganisms to produce vaccines

13. The standard curing ingredients for meat are _____.
    a. salt, sugar and saltpeter
    b. *vetsin*, salt and sugar
    c. saltpeter, salitre and potassium nitrate
    d. salt, pepper and vinegar
14. When pickling vegetables, the most important ingredient is _____.
    a. the brine solution
    b. the vinegar solution
    c. alum
    d. all of the above
15. Fermentation happens when microorganisms transform foods containing _____. The end product changes color, odor, and flavor, but is safe and delicious to eat.
    a. water
    b. protein
    c. carbohydrates
    d. salt
16. "Vegetable jelly" or pectin is the main ingredient in _____.
    a. jams
    b. jellies
    c. candies
    d. fruit preserves

B. Briefly explain in your own words the importance of food preservation and how it may improve your quality of life (4 points).

_____
_____
_____
_____
_____

Compare your answers with those in the *Answer Key* on pages 52–54 .

How many items did you get right? If you got a score of:

16–20 Excellent! You have learned many new things from this module. You may now move on to the next one.

11–15 Good! You only need to review to the items that you did not get right.

6–10 Review the sections that you did not understand.

0–5 You have to carefully study the entire module again.

Answer Key

A. Let's See What You Already Know *(page 2)*

1. (**T**)
2. (**T**)
3. (**T**)
4. (**F**) Salt is widely used as a food preservative. It does not only dry the food, but also destroys harmful microorganisms.
5. (**T**)
6. (**T**)
7. (**F**) Loin is the preferred pork cut for longganisa. Pork belly is not recommended because it is too fatty.
8. (**T**)
9. (**T**)
10. (**F**) Jelly falls under the category of fruit preserves. It is prepared by extracting the juice from boiled fruit.

B. Lesson 1

Let's Study and Analyze (pages 4–5)

1. Aling Tinay was worried because she knew that meat spoils easily and they did not own a refrigerator. She also did not know anything about food preservation. So she was worried that the meat she wasn't able to sell might become spoiled, in which case she would lose a lot of money.
2. Below are sample answers. You may have other answers.

   Yes. The meat spoiled because I was not able to put it in the refrigerator. After a few days, it began to smell bad.

   No. I never had meat that spoiled. We always consume all the food we cook right away.
3. It generally appears dry, with molds that are commonly white, green or black in color. Food spoilage caused by bacteria appears red, yellow, and blue. Greenish-blue to brownish-black spots are found on stored beef. Spoiled meat smells like ammonia (peppery odor). If any fly lands on the meat, it becomes infested with maggots, making it smell even worse.

4. Refrigeration is the most widely used method of meat preservation. Since meat is high in moisture, which microorganisms thrive in, it has to be stored at 0 °C or lower to prevent the growth of microorganisms and food spoilage. Meat kept in a freezer can remain edible for several months. However, if the meat is just kept in the refrigerator (not in the freezer), it will last longer than when it is out in the open, but it will eventually begin to spoil.

Let's Try This (page 9)

1. **(b)** Ate Rose noticed that the meat Cathy stored in the refrigerator seemed rotten. Choices (a), (c) and (d) are the opposite of what Ate Rose noticed about the meat.

2. **(c)** Cathy stored the meat in the freezer at a temperature of 4°C. To avoid spoilage, meat has to be stored at a temperature of 0°C or below. Choices (a), (b) and (d) are all incorrect if one reads the story again.

3. **(a)** Besides freezing, meat can also be preserved by adding salt and vinegar to it. They help slow down the growth of microorganisms. Choices (b) and (d) do not protect the meat from microbial growth. Choice (c) still uses the refrigerator for food preservation.

4. **(d)** Eating rotten meat may cause diarrhea, nausea, vomiting and even food poisoning.

5. **(a)** Bacteria, molds and yeast are harmful microorganisms that are capable of spoiling meat. Choices (b), (c) and (d) all include insects and viruses. Insects are not microorganisms, although they may also help spoil the meat. Viruses are microorganisms but they infect only living cells.

Let's Review (page 11)

1. Because it is high in moisture and rich in nutrients and minerals, and usually has some carbohydrates, it attracts and invites the growth of harmful microorganisms. These harmful microorganisms include bacteria, molds and yeast, which are all capable of spoiling meat.

2. To prevent food spoilage by preventing the growth of harmful microorganisms.

3. There are many ways to prevent food from spoiling. It has to be stored below 0°C or preserved properly.

4. Here is a sample answer. Your answer may be a little different.

   Food preservation is important in my everyday life because my health, family, and income depend on it. If I don't know how to preserve food properly, I will waste food and money. I might also end up eating rotten or spoiled food without knowing it, and suffer from food poisoning or diarrhea.

   You can discuss your answers with your Instructional Manager or Facilitator for additional feedback.

Let's See What You Have Learned (page 16)

1. freezing
2. Smoking
3. curing
4. Harmful microorganisms
5. 75
6. biotechnology

C. Lesson 2

Let's Try This (page 19)

1. Buy the correct ingredients (pork meat for `tocino`, ground pork for longganisa, brown sugar, salt, saltpeter, `vetsin`, soy sauce, vinegar, wine, ground pepper, garlic and sausage casings).
2. Measure and mix the correct amount of each ingredient.
3. Make sure the meat is stored and preserved properly before cooking.
4. Tocino has to be stored in the refrigerator for 2 to 3 days to allow the curing ingredients to penetrate the meat thoroughly.
5. Longganisa has to be stored in the refrigerator for 5 to 6 days to allow the curing process to penetrate the meat thoroughly.
6. Do not use pork belly in making longganisa because it is too fatty.
7. Do not use too much salt when preserving the meat because it will become tough, dry and unsavory.
8. Do not set your freezer above 0°C — this will cause the meat to spoil.

Let's Review (page 21)

1. The ingredients for tocino are: 1 kilo pork meat, 2 tbsps. brown sugar, 2 tbsps. salt and 1 tsp. saltpeter (salitre or potassium nitrate).

2. The method is: mix 2 tbsps. salt, 2 tbsps. sugar and 1 tsp. saltpeter. Dissolve these in 4 tbsps. warm water.

Let's Review (page 24)

1. Refrigeration and curing methods are used in making tocino and longganisa. Curing is used to provide flavor and color to the meat. The ingredients used are 2 tbsps. salt, 2 tbsps. sugar and 1 tsp. saltpeter. The curing solution is applied over the meat before it is stored in the refrigerator. The prepared tocino is stored in the refrigerator for 2 to 3 days and 5 to 6 days for longganisa to allow the curing ingredients to penetrate through the meat.
2. The recipe for tocino and longganisa includes salt, vinegar, saltpeter, sugar, etc. These ingredients are used for curing, which provides flavor to the meat and ensures the retention of meat color during cooking. Salt dries the meat and destroys microorganisms that are capable of spoiling it. Vinegar also helps in slowing down the growth of harmful microorganisms. Saltpeter improves the color of the meat. Sugar and the rest of the ingredients help enhance the taste.
3. They are tasty and delicious, easy to prepare and cook, convenient to stock at home, long lasting, and hygienic when prepared in your own home. They are preserved to prevent the multiplication of harmful microorganisms that spoil food.

Let's See What You Have Learned (pages 25–26)

A. 1. salt
   2. Saltpeter
   3. Vinegar
   4. loin
   5. any pork cut
   6. color
   7. smell
   8. ham
   9. bacon
   10. slicing

B. The correct sequence of steps for making tocino is as follows:
   1. Cut the meat into ¼-inch-thick slices.
   2. Measure the correct amounts of each ingredient.

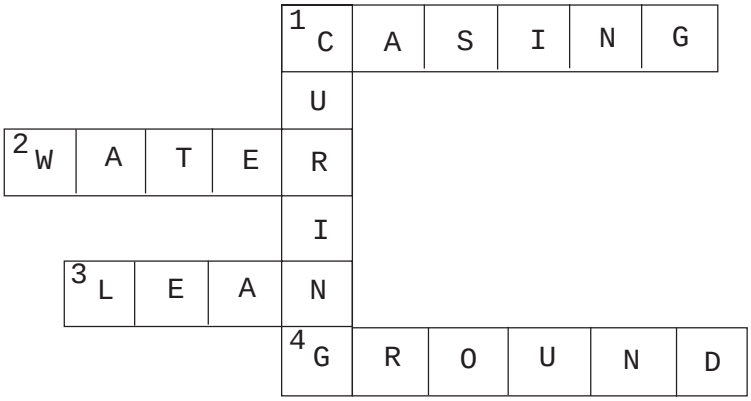
3. Prepare the curing solution. Dissolve salt, sugar and saltpeter in warm water.

4. Pour the curing solution over the meat, making sure it is evenly applied to all slices.

5. Place the meat inside a plastic container and store in the refrigerator for 2 to 3 days before cooking.

6. Cook until the meat is slightly golden. Serve.

C. Answers to the puzzle.



D. The preparation of `tocino` and `longganisa` involves curing to preserve the meat. The curing solution, which is a mixture of salt, sugar and saltpeter, is applied to the meat to provide flavor to the meat and to ensure the retention of the meat color during cooking. The use of vinegar also helps prevent the growth of microorganisms.

D. Lesson 3

Let's Talk About This (page 30)

1. Tinapa, daing, jellies, jams, achara, burong mangga are the examples of preserved fruits, vegetables and fish mentioned by Ate Rose.

2. Since most fruits, vegetables and fish spoil easily, preserving them would make them last longer, be more nutritious and taste better. Also, Cathy is still learning to cook and only has a little knowledge about food preservation. Cathy is worried that the fruits and vegetables she's going to buy will spoil after a short period of time.

3. If you answered *yes*, here is a sample answer for you to compare with yours: "My mother made cucumber pickles. She soaked the cucumbers overnight in cold water. Then, she made a syrup from vinegar, sugar, water, mustard seed and mixed spices. She boiled the syrup and added the cucumbers, then boiled these again for another 3 minutes until the cucumber lost their green color. She packed the pickles into jars, added salt and onion, covered the jar with boiling syrup and sealed them at once."

If you answered *no*, the reason might be something like this: "None of us knows how to preserve fruits, vegetables or fish." You also may have other reasons for answering no.

You can discuss your answers with your Instructional Manager or Facilitator for additional feedback.

Let's Review (page 32)

1. The pickling method does not only make foods last longer but also prevents spoilage and makes the food more nutritious and better tasting.
2. Here is a sample answer. Your answer may be a little different.

   Refrigeration is important because it prevents spoilage and keeps the fruits and vegetables fresh. However, if you don't own a refrigerator at home, you can resort to other methods of preserving fruits and vegetables, such as pickling and canning.
3. Apart from pickling and refrigeration, another method is canning. This method is used for longer storage periods that demand more complete protection against spoilage.

Let's Review (pages 38–39)

1. **(a)** The pickling method is usually used in preserving green vegetables and fruits such as achara or papaya pickle. (b) is incorrect because achara is not a frozen product. (c) and (d) are also incorrect.
2. **(b)** Salt and vinegar help slow down the growth of harmful microorganisms. They are not used to improve the color (a), slow down the fermentation process (c), or improve the taste (d). Taste is not a good measure of whether a food is preserved or not.
3. **(a)** Fermentation is a chemical change in which the carbohydrate is turned into acid. The color of the vegetable or fruit changes from bright green to olive or yellow green. It also improves flavor, aroma and quality. (b) is incorrect because fermentation is not a drying method. (c) is incorrect because fermentation may not involve the use of a net. (d) is incorrect because fermentation is not a process of canning.
4. **(a)** A preserved fruit or vegetable has to be sealed tightly in a jar to protect against harmful microorganisms. The sterilized jar is not used to improve the taste and color of the preserved product and does not make it moist. Therefore, (b), (c) and (d) are all incorrect.
5. **(b)** Fresh fruits and vegetables usually soften after 24 hours and eventually rot after 3 to 5 days or about a week. They are preserved through fermentation and pickling to avoid spoilage and to make the food last for several months.

6. **(a)** Fresh fish may be preserved by salting and drying. The fish is hung in a net under the sun for 1 to 2 days. Drying reduces the moisture of the fish, making it more difficult for harmful microorganisms to grow.

7. **(b)** When drying fish, it has to be hung in a net or placed in anything with holes on it. This will reduce to moisture in the fish.

Let's See What You Have Learned (pages 40–41)

1. **(b)** Red pepper is one of the vegetables listed in the ingredients for achara. (a) is wrong because only green, unripe papayas should be used. Sweet papayas and potatoes are never used for achara.

2. **(d)** If any of the ingredients in (a), (b) and (c) are missed, the pickling process will not succeed.

3. **(b)** Most harmful microorganisms are killed when a container is boiled for at least 20 minutes. Sterilization may still continue if the containers are boiled for 30 minutes.

4. **(c)** Brine is a salt solution. It does not contain any other ingredients such as sugar or vinegar.

5. **(a)** The fermentation of *burong mangga* calls for brine or a salt solution. This solution draws the water out from the mango. A pickling solution or vinegar plus sugar may be added as a last step. However, this is optional.

6. **(d)** Fermentation is the transformation of carbohydrates into acids due to the action of "good" microorganisms. (a) is incorrect because salt helps promote this reaction. (b) is incorrect because sterilization is performed on the container, not the product.

7. **(b)** *Daing* is a dried food product. Drying means reducing the moisture (water) content in the food. (a) and (c) are incorrect because air may hasten the drying effect while the nutrients present in the fish usually remain.

E. What Have You Learned? *(pages 43–45)*

A. 1. **(a)** is the correct answer. Bacteria, molds and yeasts are harmful microorganisms that are capable of spoiling meat. Choices (b), (c) and (d) all include insects and viruses. Insects are not microorganisms, although they may also spoil the meat. Viruses are microorganisms but they infect only living cells.

2. **(c)** is the best answer. At a temperature of 0°C or lower, microorganisms do not multiply. The rate of growth is very, very slow. Options (a) and (b) are higher temperatures than 0°C. Microbial growth is very possible at these temperatures, and may result in food spoilage due to contamination.

3. **(c)** is the best answer. (a), (b) and (d) are incorrect because they describe characteristics of unspoiled meat.

4. **(a)** is the best answer. During slaughter, the animal's natural defense systems are no longer active. The meat is already exposed to bacterial contamination from the surroundings. Options (b), (c) and (d) are all processes done to the meat after the animal has been slaughtered.

5. The best answer is option **(b)**. Meat is high in moisture and rich in nutrients and minerals. These conditions are ideal for the growth of microorganisms. Whether or not the meat is exposed to air, is clean or not, or whether it is cooked or uncooked, microorganisms may still grow.

6. **(a)** is the best answer. (b), (c) and (d) are all methods of preservation that do not involve placing the food under the sun.

7. **(d)** is the best answer. Smoking involves burning wood and leaves to dry the food. Natural chemicals from the smoke, such as pyroligneous acid, penetrate the food and act as a preservative. They also give special flavor and odor to the food.

8. The best answer is **(c)**. Salt is a natural compound that has been used for generations to preseve food. It has been used to flavor and preserve food, whether meat, fish, fruits or vegetables.

9. The best answer is **(c)**. Salt is a water-absorbing ingredient. (a) is incorrect because vinegar is a liquid ingredient, which delays microbial growth through its acidic content, not by absorbing water. (b) is wrong because spices do not absorb as much moisture as salt does.

10. **(a)** is the correct answer. Vinegar is the only acid ingredient among the three choices.

11. The best answer is **(b)**. Spices add delicious odors and flavors to the food. The natural chemicals in spices also help to keep microorganisms from increasing in number. (a) is incorrect because vinegar contains acid, which helps delay microbial growth, but is not used to add flavor or aroma. (c) is wrong because although salt is also used as a preservative and also adds flavor, it does not give aroma. (d) is wrong because sugar is only used to enhance the taste of food.

12. The correct answer is **(a)**. (b), (c) and (d) are all examples of biotechnology.

13. The best answer is **(a)**. These three ingredients are standard curing ingredients. (b) and (d) are incorrect as they do not include all the ingredients for adding flavor to the cured product. (c) is incorrect as the items listed are just different terms of the same curing ingredient.

14. **(d)** is the best answer. All of the ingredients listed should be present in the pickling process. All of these ingredients will result in a high-quality pickled product.

15. The correct answer is **(c)**. Fermentation is the action of good microorganisms on carbohydrates only.

16. **(b)** is the best answer. Jellies would not be produced without pectin. Pectin is also present in (a) jams but in a lesser amount. The same is true with (c) candied fruit. (d) "fruit preserves" is just a general term for (a), (b) and (c).

B. Here is a sample answer for you to compare your answer with:

Food is one of the basic needs of humans. Without the scientific methods of food preservation, the food that we buy will easily spoil after a short period of time. Food preservation methods can prevent food from being wasted and can make food last longer and taste better. Food preservation methods can improve our quality of life by helping us save money, time and effort. Eating spoiled food can lead to diarrhea, nausea, vomiting and even food poisoning. Therefore, food preservation techniques also prevent us from getting sick from eating spoiled food.

Your answer might be different. You can discuss it with your Instructional Manager or Facilitator for additional feedback.

Glossary

Contamination A process of infection through contact
(*Example*: We must preserve food to avoid further contamination and spoilage.)

Diarrhea Frequent excretion of watery feces/stools

Economic Financial; has to do with money
(*Example*: One of the skills that can come in handy during difficult economic times is food preservation.)

Extracting Taking; collecting; gathering
(*Example*: Jelly is prepared by extracting the juice from boiled fruit.)

Food poisoning Acute illness caused by food contaminated with certain bacteria

Formaldehyde Acid used as a disinfectant and preservative

Humidity Degree of moisture in the air

Inhibiting Preventing
(*Example*: Refrigeration/Freezing has been proven highly effective because of its inhibiting effect on microorganisms.)

Microorganisms germs; microscopic animals or plants

Moisture Water or other liquids scattered in small quantity

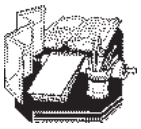
Pectin Soluble gelatinous carbohydrate acting as a setting agent in jams and jellies; also called "vegetable jelly"

Pyroligneous acid Acid which comes from burning wood and leaves which helps preserve food

Scientific Based on science or on proven knowledge; systematic; accurate; efficient; effective
(*Example*: Some examples of scientific methods of meat preservation are freezing, drying and curing. They are called scientific because these methods have been tested and found to be effective.)

Slaughtering Killing of animals, usually for human consumption

Sterile Clean; sanitary; uncontaminated; hygienic



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