

Farm • Chapter 8

A Variety of Very Safe Veggies

Class periods required: two 30-min. class periods

Supplement section: Farm PA PAS for FCS: 9.3.3 A, 9.3.3 B, 9.3.6 B, 9.3.9 B.

National Education Standards: FCS 8.2.1, 8.2.3, 8.2.5, 8.2.6, 9.2.1, 9.2.3, 9.2.5, 9.2.6; LA 2, 3, 035, 132, 278; SC 5.

LESSON SUMMARY

Students will learn about bacteria and viruses that can contaminate vegetables, what farmers do to keep vegetables safe, and how vegetables can be preserved.

Objectives

The students will:

- State that vegetables can contain spoilage and pathogenic organisms.
- Describe the farmer's role in ensuring safe vegetables.
- Summarize how vegetables can be preserved by pickling.

Materials Provided

Overheads:

1. Hepatitis-contaminated Strawberries News Release
2. Fruit and Vegetable Production
3. Pathogens on Fruits and Vegetables
4. Role of the Farmer
5. Harvesting
6. Packing
7. Preservation of Fruits and Vegetables

Handout:

- Pickle recipe (pick one from "Pickling Vegetables" resource)

Teacher Information Sheets:

1. Pickling vegetables (<http://www.ces.ncsu.edu/depts/foodscie/agentinfo/veg/conspub.html#6>)
2. Evaluation of pickling lab
3. Evaluation of NIE activity

Suggested Presentation Aids

- Pickle-making ingredients (vegetables, salt, vinegar, and flavorings)
- Canning jars
- Canner or large container with lid for processing
- Samples of tap and pond water (or other dirty water)
- Slides
- Light microscope

LESSON PLAN

Introduction

- Read the newspaper article entitled “Hepatitis-contaminated strawberries spark scare” (Overhead 1).
- Lead a class discussion about the article. Ask the students the following questions:
 1. Who was at fault for causing the outbreak of Hepatitis A?
 2. How did the outbreak affect sales of strawberries?
 3. What do you think could have been done to avoid this outbreak?

Lesson sequence

- **Fruit and vegetable production** (Overhead 2). Fresh fruits and vegetables are important to the health and well-being of the American consumer. Advances in farming practices, processing, preservation, packaging, shipping, and marketing technologies on a global scale have enabled the fresh fruit and vegetable industry to supply customers with a wide range of high-quality produce year-round. Current dietary guidelines recommend eating five or more servings of fruits and vegetables daily.
- **Pathogens on fruits and vegetables** (Overhead 3). In the past ten years, outbreaks of foodborne illness associated with raw vegetables and fruits (or unpasteurized products from them) have increased. Bacteria such as *Listeria monocytogenes* and *Clostridium botulinum* live in soil, so their presence on fresh produce is not rare. *Vibrio cholerae*, *Cyclospora cayetanensis*, and *Cryptosporidium parvum* can be spread by unclean water. *Salmonella*, *E. coli*, and other parasites and viruses, such as Hepatitis A, can contaminate fruits and vegetables if they come in contact with raw manure.
- **Role of the farmer** (Overhead 4). Providing consumers with safe, wholesome fruits and vegetables is the first priority of farmers. Farm workers follow strict guidelines when harvesting and packing to be sure that fruits and vegetables are clean.
- Many bacteria naturally live in soil, so farmers have to make sure that they clean fruits and vegetables to remove the bacteria before they are sold. They also should sell only produce that was picked directly off of plants and avoid fruits and vegetables that have fallen to the ground.
- Water can be the carrier of many microorganisms, so farmers have to be sure that they use fresh water to irrigate their fields and wash fruits and vegetables before packing or transporting them. Farmers can ensure the safety of their water by performing periodic microbial testing, cleaning and sanitizing water-contact surfaces such as tanks, water coolers, etc., and routinely inspecting and maintaining equipment designed to help maintain water quality.
- Manure makes an effective and cheap fertilizer, but it can contain several pathogens that can make people sick. The manure must be treated to kill the pathogens before growers use it, or it can contaminate the surface of fruits and vegetables. Treatments used to make manure safe for fertilization include pasteurization, composting, heat drying, or combinations of these.
- **Harvesting** (Overhead 5). Microorganisms contaminating fruits and vegetables during harvesting can come from workers, and harvesting equipment. The key to keeping produce pathogen-free is cleaning. The farmer’s role in harvesting safe fruits and vegetables is to make sure the people handling the produce are clean, the storage buildings are cleaned prior to use, containers or bins are cleaned before transporting produce, harvesting equipment is kept clean, and as much dirt and mud as possible is removed from produce before it is brought in from the field. The harvesting equipment should be designed so that the produce remains intact and unbruised during picking. Breaks in the

skin or bruising of fruits and vegetables can provide weak points that let in spoilage and pathogenic bacteria.

- **Packing** (Overhead 6). Sanitation during packing is critical, since it is the last processing step that fresh fruits and vegetables undergo before they are sold to consumers. To keep the produce from becoming contaminated, packers must remove as much dirt as possible outside of packing areas, keep packing buildings clean, keep machinery and equipment that comes in contact with fresh produce as clean as possible, and make sure that the storage areas are free of mice, rodents, and bugs.
- **Preservation of vegetables** (Overhead 7). Vegetables and fruit can be eaten fresh or preserved for later use. If produce is kept in the refrigerator, it can last one to two days (berries and cherries) to one month (apples). Fruits and vegetables can be stored for longer periods of time if they are jellied, canned, dried, or pickled.

Closure

- Pickling activity (Teacher information sheet 1 and Handouts/Pickle recipes). Have students prepare pickles, using one of the recipes given in this lesson plan. Depending on time constraints, the students can prepare either brined pickles (must ferment for three to five weeks) or quick pickles (ready immediately after preservation). Pickle preparation should take one class period. Processing may have to be performed by the teacher.

Suggested Learning Activities

- Let the students look at slides containing samples of pond and tap water under a microscope. For information on obtaining and preparing slides, see Reference section. Explain to them that all of the microorganisms they see in the pond water have the potential for contaminating fruits and vegetables if farmers use it to irrigate their fields.

- Find newspaper articles on safe canning procedures or how-to's on pickling, and write a one-page paper summarizing the main points, hints and tips, new procedures, safety issues, etc. Report to class.

Evaluation

- Evaluation of Pickling Lab (Teacher information sheet 2)
- NIE newspaper activity (Teacher information sheet 3)
- Quiz #8
- Examination #2 at the end of the Farm unit

References

- Pond water can be obtained from any pond or drainage ditch, and city water can be taken directly from the tap. One drop of each sample of water should be added to a glass microscope slide and covered with a cover slip. A basic slide-making kit can be ordered from
 Carolina Biological Supply Company
 2700 York Road, Burlington, NC 27215
 1-800-334-5551
 Catalog number: D8-31-9734
 Cost: \$9.30/36 slides, 50 cover slips, labels, and mountant.
- More information about vegetable safety can be found at the following Web sites:
 Emerging Infectious diseases: Produce handling and processing practices at <http://www.cdc.gov/ncidod/eid/vol3no4/beuchat.htm>
 Center for Disease Control and Prevention. Guide to minimize microbial food safety hazards for fresh fruits and vegetables at <http://www.foodsafety.gov/~fsg/fsgadvic.html>. Look for produce in listing.

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Overhead 1

Hepatitis-contaminated Strawberries News Release April 1997

Los Angeles (AP) - Word that more than 1 million pounds of frozen strawberries shipped to school lunch programs and the commercial market might contain hepatitis A started a scramble to inoculate children and sent parents into a panic Wednesday. Hepatitis A causes liver infection and is easily spread through uncooked food.

According to the Los Angeles Times, the frozen fruit was served March 25-28 in 13 elementary schools, 2 middle schools, and 3 high schools. The Los Angeles School District has yet to report any cases of Hepatitis A, but the strawberries caused 153 cases in Michigan and berries from the same source were shipped to Arizona, Florida, Tennessee, Iowa and Illinois as part of a USDA-sponsored school lunch program. The strawberries were grown and frozen in Mexico in April and May 1996.

The USDA has launched an investigation because the department is only allowed to buy commodities grown in the US. for the school lunch program. Health officials are trying to determine the source of the contamination. They said that it could have been the grower in Mexico, the packer in San Diego (Anderson and Williamson), or the processing plant in Clovis, California (Wawona Food Services).

Mexican agriculture officials quickly jumped to their own defense, by saying that they thought that it was more likely that the berries were contaminated "during processing and packing rather than during cultivation." In response to the outbreak, Fred L. Williamson, the president of the company that packed the strawberries resigned, apparently because he had inaccurately described the berries as domestic, rather than Mexican grown, which was against the law.

Strawberry growers in the U.S. complained of canceled orders at a peak time in their growing season. One grower said he lost \$12,700 in canceled orders. The outbreaks left both parents and children with doubts about the safety of school lunches. "The school should at least scrutinize the food a little bit more carefully and then none of this would happen," said Belinda Hernandez, a parent interviewed outside Los Angeles' Garfield High School.

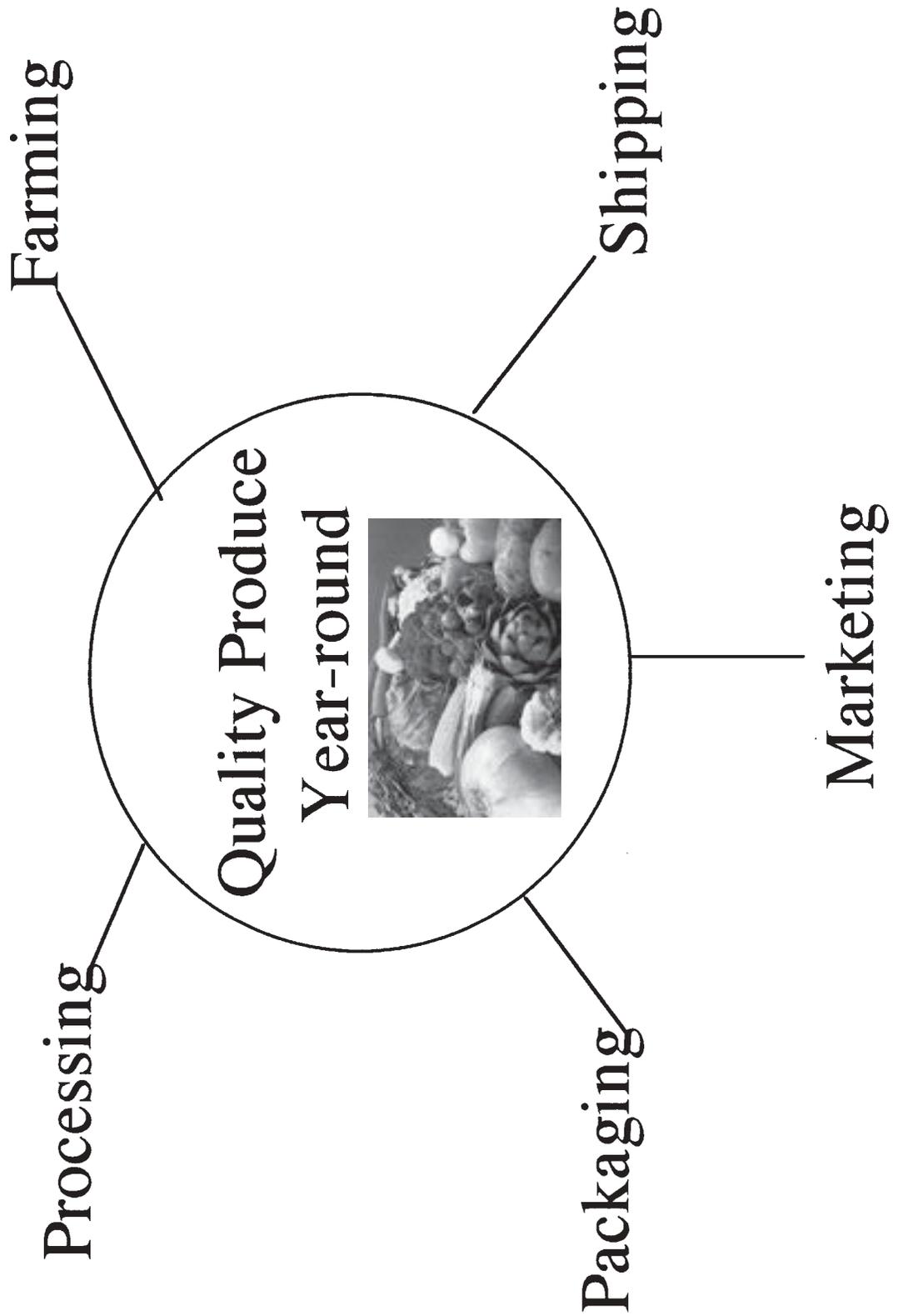
Sources:

HepNet - Hepatitis A "L.A. Reaction to Threat" at <http://www.hepnet.com/hepa/hepala.html>

Lubbock Avalanche-Journal 1997 "Hepatitis-contaminated strawberries spark scare" at <http://www.lubbockonline.com/news/040397/hepatiti.htm>

Overhead 2

Fruit and Vegetable Production



Pathogens on Fruits and Vegetables

Soil

- *Listeria monocytogenes*
- *Clostridium botulinum*

Water

- *Vibrio cholerae*
- *Cyclospora cayetanensis*
- *Cryptosporidium parvum*

Manure

- *Salmonella*
- *E. coli*



Overhead 4

Role of the Farmer

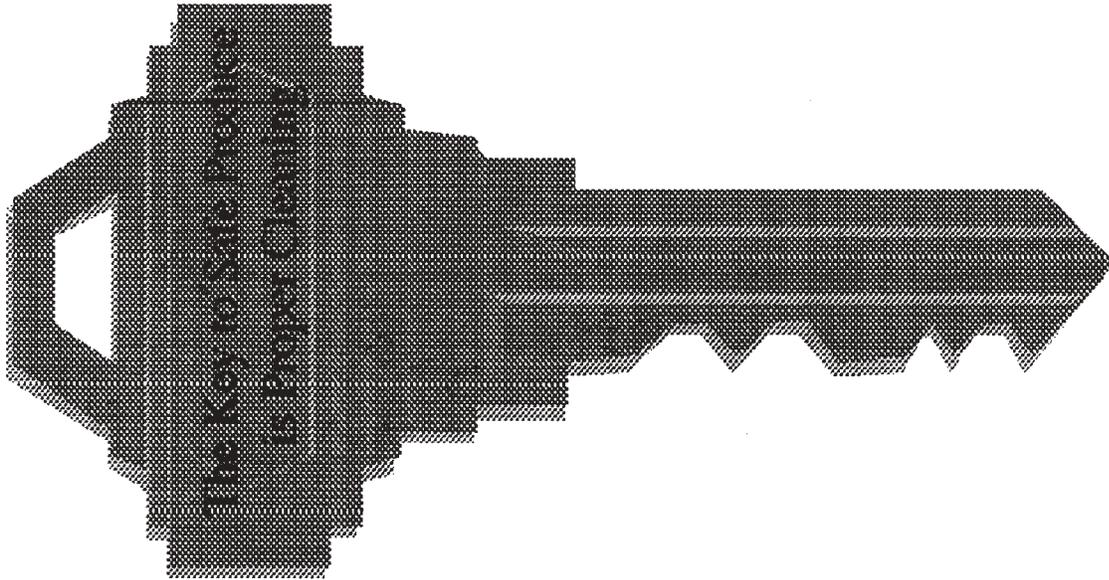
- Make sure produce is clean before it is sold.
- Use only fresh water to clean and irrigate fruits and vegetables.
- Make sure that fertilizers have been treated so that they are bacteria free.



Overhead 5

Safe Harvesting

- Clean workers
- Clean storage buildings
- Clean storage bins
- Clean harvesting equipment
- Clean vegetables



Overhead 6

Packing

- Remove dirt before packing
- Keep packing building clean
- Keep packing equipment clean
- Keep bugs and rodents away from stored produce

Overhead 7

Preservation of Fruits and Vegetables



•Jellying

•Canning

•Drying

•Pickling

Teacher Information Sheet 1

Pickling Vegetables

See: <http://extension.oregonstate.edu/fcd/foodsafety/foodpres.php>

Go to publication PNW355



Teacher Information Sheet 2

Name _____

Class/Period _____

Date _____

Evaluation for Pickling Lab

Evaluate each step of the pickling lab using the following rating scale. One is lowest and ten is the highest score. If an evaluation step is not used in your recipe, leave it blank.

Procedure	Score									
Proper storage temperature for perishable ingredients	1	2	3	4	5	6	7	8	9	10
Clean storage area for ingredients	1	2	3	4	5	6	7	8	9	10
Wash hands and personal hygiene	1	2	3	4	5	6	7	8	9	10
Clean and sanitize work area, ovens, and equipment	1	2	3	4	5	6	7	8	9	10
Organize work area	1	2	3	4	5	6	7	8	9	10
Follow pickling directions completely	1	2	3	4	5	6	7	8	9	10
Measure ingredients accurately	1	2	3	4	5	6	7	8	9	10
Wash vegetables before cutting	1	2	3	4	5	6	7	8	9	10
Follow individual recipes for adding spices, vinegar, water, and other ingredients	1	2	3	4	5	6	7	8	9	10
Heat vegetables to required temperature	1	2	3	4	5	6	7	8	9	10
Pack vegetables in canning jars, pour liquid over top, and screw on lids and rings	1	2	3	4	5	6	7	8	9	10
Process jars according to recipe	1	2	3	4	5	6	7	8	9	10
Test seal of jars	1	2	3	4	5	6	7	8	9	10
Clean up: wash all equipment with hot, soapy water	1	2	3	4	5	6	7	8	9	10
Clean up any spills on the floor	1	2	3	4	5	6	7	8	9	10
Use a commercial cleaner on preparation surfaces to sanitize	1	2	3	4	5	6	7	8	9	10

Teacher Information Sheet 3

Name _____

Class/Period _____

Date _____

Evaluation of NIE Newspaper Activity

Grade the NIE activity on the following criteria using the 0-4 rating scale. Four is the highest rate and zero is the lowest rate. Write comments in the boxes under the rating for each criterion.

Criteria	4	3	2	1	0
Content: Information is correct, complete, and useful.					
Neatness: Clean, organized, and not sloppy.					
Spelling: All words spelled correctly.					
Handed in on time: Handed in on due date. A point is deducted for each day late.					
Time Management: Time used wisely and working on project at allotted time.					

Quiz 8 Key

Unit: Farm

Lesson: A Variety of Very Safe Veggies

Short answer: Write short answers or fill in the blank for the following questions and statements. Use complete sentences when answering questions.

1. How can bacteria in the soil and water affect vegetables?

*Bacteria such as *Listeria monocytogenes* and *Clostridium botulinum* live in the soil, so their presence on fresh produce is common. *Vibrio cholerae*, *Cyclospora cayetanensis*, and *Cryptosporidium parvum* can be spread by unclean water. Plants need water, sunlight, and clean soil to grow. Bacteria in the water and soil can infect fresh produce.*

2. Hepatitis A is a foodborne disease caused by the hepatitis virus.

3. List three ways that farmers can increase the safety of vegetables.

1. Use pasteurized fertilizers
2. Use clean water for irrigation
3. Harvest and store vegetables carefully to avoid damage

4. How can harvesting vegetables reduce contamination by pathogens?

Microorganisms contaminating fruits and vegetables can come from workers and harvesting equipment. Make sure the people handling the produce are clean, the storage buildings are cleaned prior to use, containers or bins are cleaned before transporting produce, harvesting equipment is kept clean, and as much dirt and mud as possible is removed from produce before it is brought in from the field. Care needs to be taken when handling the produce to reduce bruising and breaks in the skin because weak points let in spoilage and pathogenic bacteria.

5. Name one pathogen that can contaminate vegetables.

Listeria monocytogenes
Clostridium botulinum
Cyclospora cayetanensis
Cryptosporidium parvum
Vibrio cholerae
Hepatitis A

6. List the different ingredients needed for making pickles. What ingredient is most important in keeping the pickles fresh?

1. Vegetables
2. Salt
3. Vinegar (most important in keeping pickles fresh)
4. Flavorings
5. Water
6. Firming ingredients

7. How do packers insure consumers and processors receive safe produce?

Packers must remove as much dirt as possible outside of packing areas, keep packing buildings clean, keep machinery and equipment that comes in contact with fresh produce as clean as possible, and make sure that the storage areas are free of mice, rodents, and bugs.

-
6. List three ways that farmers can increase the safety of vegetables.
 - a.

 - b.

 - c.

 7. List the different ingredients needed for making pickles. What ingredient is most important in keeping the pickles fresh?
 - a.

 - b.

 - c.

 - d.

 - e.

 - f.

Examination 2 Key

Unit: Farm

Matching: Match the vocabulary terms in column A with the definitions in column B. Write the letter of the definition in column B in the space next to the terms in column A.

A	B
<u>G</u> 1. Standard plate count	A. A mineral in milk that contributes to healthy bones.
<u>C</u> 2. Lactose	B. A holding area for hog manure.
<u>A</u> 3. Calcium	C. A milk sugar that gives people energy.
<u>H</u> 4. Lysozyme	D. A foodborne disease caused by the hepatitis virus.
<u>J</u> 5. <i>Salmonella</i>	E. Watering of fields.
<u>I</u> 6. <i>Trichinella spiralis</i>	F. The preservation of vegetables by adding vinegar and salt.
<u>B</u> 7. Hog lagoon	G. A universal quality test for milk.
<u>E</u> 8. Irrigation	H. An enzyme in egg white that can kill bacteria.
<u>D</u> 9. Hepatitis A	I. A parasite found in pork that causes trichinosis.
<u>F</u> 10. Pickling	J. A pathogen found in eggs and meat.

Short answer and fill in the blank: Write short answers or fill in the blank for the following questions and statements. Use complete sentences when answering questions.

- List the major components of milk and describe how each benefits our bodies.

Lactose, or milk sugar, gives you energy. Fat makes your hair shine, gives you energy, and contains vitamins. Milk protein builds and repairs muscles and other body tissues. Calcium, a mineral in milk, makes your bones strong and healthy.

- What bacteria can live in milk? What can dairy farmers do to keep these bacteria from growing?

Listeria monocytogenes, Staphylococcus aureus, Salmonella, and Escherichia coli live in milk. Farmers can keep the milk cold (below 40 °F) to keep bacteria from growing.

- What are the four principles of proper cleaning? Why is each one important?

- Time: Sanitizers must be left on surfaces for the proper amount of time to be effective.*
- Temperature: Hot liquids will dissolve fats, removing them from surfaces.*
- Concentration: Cleaners must be used at the proper concentration to remove dirt and kill bacteria.*
- Physical action: Scrubbing will remove bacteria that are attached to surfaces.*

4. Draw a diagram of an egg. How does each part protect against bacteria?
See diagram in Eggstra Safe Eggs lesson plan. The outer waxy shell membrane, a shell, and an inner shell membrane provide a barrier to bacteria. Lysozyme in the egg white kills bacteria.
5. What actions can farmers take to insure the food safety of pork products?
 - a. *Work closely with the veterinarian*
 - b. *Inspect new hogs as they come into the farm*
 - c. *Keep buildings and facilities clean*
 - d. *Separate piglets from full-grown pigs*
6. List three ways that farmers can increase the safety of vegetables.
 - a. *Use pasteurized fertilizers*
 - b. *Use clean water for irrigation*
 - c. *Harvest and store vegetables carefully to avoid damage*
7. List the different ingredients needed for making pickles. What ingredient is most important in keeping the pickles fresh?
 - a. *Vegetables*
 - b. *Salt*
 - c. *Vinegar (most important in keeping pickles fresh)*
 - c. *Flavorings*
 - e. *Water*
 - f. *Firming ingredients*

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