



Food Science & Technology CDE

Purpose

The Food Science and Technology Career Development Event is designed to stimulate learning activities in science and technology related to the food industry. Through participation in this event members develop technical competence and understanding in areas of safety and sanitation, food and nutrition labeling and food processing. In addition, participants will distinguish products and aromas used in the food science industry.

Sponsor

The Corn Growers Association of North Carolina sponsors this event.

Superintendent

State agricultural education staff will designate the superintendent for this event.

Comments and questions may also be directed to Dr. Jason Davis, State FFA Coordinator, Department of Agricultural and Extension Education, NCSU, Box 7654, Raleigh, NC 27695-7654. Phone: 919.515.0216 Fax: 919.513.3201
Email: jason_davis@ncsu.edu

Eligibility and General Guidelines

This event will be held during the North Carolina State FFA Convention and is open to all FFA chapters and FFA members in good standing. FFA Members may not participate in a Career Development Event that leads to a state level event after July 1, following their high school graduation. Members winning a previous state event in this area or that have participated in a previous national event in this area are ineligible.

Teams shall consist of three or four members. Four scores will count towards the team total (A three-member team will earn a zero for the 4th score). No alternates are allowed in state events. Any alternate found participating in a state event will result in team disqualification.

FFA members in good standing may also participate as individuals in this event. A chapter may have up to two members participating as individuals as long as the chapter does not have a team participating in the event. Their scores will only count toward individual recognition and will not be tallied as a team score.

The use or possession of cellular phones or any other mobile electronic communication device is prohibited during any state-level career development event. Any violation of this rule by any team member will result in total team disqualification.

FFA members participating in career development events that require the use of calculators may only use non-programmable/graphing calculators that do not have the ability to communicate with other calculators. Calculators will be screened prior to the start of a CDE for acceptability. Students caught using data stored on a calculator or communicating with other calculators will result in a total team disqualification for the event.

Any member found cheating in any state-level career development event will result in total team disqualification for that event.

The North Carolina FFA Association, in keeping with the FFA mission and purposes, does not permit the use of tobacco products, e-cigarettes, vapes, or Juuls at any FFA facility or at any FFA activity.

At the North Carolina FFA State Convention, members may participate in only one career development event with the exceptions of Creed and Parliamentary Procedure or Prepared Public Speaking and Parliamentary Procedure.



Dress Code

Participants are required to follow the North Carolina FFA Career Development Event Dress Code.

The North Carolina FFA Association strives to promote a positive image at all Official FFA Events. The dress code policy was established to address the issue of appropriate attire at all Official FFA Events. Members should adhere to this policy for all events. A ten percent reduction will be applied to all individual scores from a chapter if a participant from that chapter violates the dress code during that career event.

Procedures for Administering the Event

Part 1: Multiple-Choice (100 points)

The written test will be comprised of a total of twenty-five (25) multiple-choice items designed to determine each team members understanding of the food science industry. Test materials will come from the text Food Science: The Biochemistry of Food and Nutrition, the latest available edition, Mehas & Rogers, Glencoe using the following rotation of chapters:

- 2019 Chapters 1,2,19 20,21,22, 3,24
- 2020 Chapters 1,2,25,26,27,28
- 2021 Chapters 1,2,7,8,9,10,11

Part 2: Aroma (100 points)

Each participant will be asked to identify the ten (10) aromas from numbered vials and record the answer on the Sensory Evaluation - Aromas scorecard.

Part 3: Triangle Test (45 points)

Each participant will conduct three triangle tests valued at 15 points each. Participants will circle the letter for the odd or different sample for each triangle test. Differences may be based on smell, taste, texture or color.

Part 4: Nutrition Facts Panel(s) and Nutrition Problem (50 points)

Each participant will be given a sample nutrition facts panel or panels for a given product or products. The participant will review the Nutrition Facts Panel(s) and answer 10 questions on the information provided by the panel(s). Each question answered correctly will be worth 5 points. Sample questions are those related to computing %Daily Values when some information is missing from the Nutrition Facts Panel(s) or questions pertaining to the panel(s). Each participant will turn in one answer sheet.

Part 5: Team Activity: Food Safety (60 points)

Each team will examine 6 photos to determine if violations exist from an Official List of Potential Food Processing Sanitation and/or Safety Problems. If a violation exists, the team will list the number for the item found to be in violation on the scorecard. In the event there are multiple violations in the photo, the team is required to identify only one correctly. If a team list more than one violation, only the first one listed on the left side of the answer blank will be considered for grading. Each correctly reviewed photo will be worth ten points whether a violation exists or not.

Scoring

Written Test	100
Aroma Identification	100
Triangle Test	45
Nutrition Facts Panel (S) Problem	50
Team Activity –Food Safety	60

Procedure for Determining the State Event Winner When Scores are Tied

In the event a tie score exists, apply the following methods in sequential order until the tie is broken:

1. Compare the total team scores for the written test and the higher scoring team is the winner.
2. Compare the total team scores for the aroma test and the higher scoring team is the winner.
3. Compare the total team scores for food safety and the higher scoring team is the winner.
4. If these methods fail to break the tie, co-winners will be declared and a run-off event will be held to determine which team will represent North Carolina



at the National FFA Convention. The run-off event will follow the same rules as the state event.

Procedure for Determining the State Event High Scorer When Scores are Tied for individual participants

In the event a tie score exists, apply the following methods in sequential order until the tie is broken.

1. Compare the individual scores on the written test and the high scoring individual is the winner.
2. Compare the individual scores on aroma test and the high scoring individual is the winner.
3. Compare the individual scores on food safety and the high scoring individual is the winner.
4. If a tie still exists for individuals, co-high scorers will be declared and all tied individuals will be recognized.

State Awards

The awards for the state event will be presented annually at the state FFA convention to include a team 1st, 2nd and 3rd place plaque and a travel monetary award. The high scoring individual will receive a plaque.

National Career Development Event Participation
State winning teams advancing to the national career development event will be automatically registered for the national event. It is the responsibility of the FFA Chapter Advisor to complete all necessary national certification and waiver forms and return them to the state FFA Coordinator by the assigned due date.

State winning CDE Teams that choose not to participate at the national level should contact the state office by Sept 1 prior to national convention. Teams that fail to inform the state office prior to Sept 1 will be ineligible to participate in that same CDE for the next year (chapters may appeal to the State FFA Board of Directors). Teams that do not compete at the National Convention will be required to pay back the travel award.

Reference

Food Science: The Biochemistry of Food and Nutrition, Latest Available edition, Mehas & Rogers, Glencoe Secondary Catalog: Family & Consumer Sciences. This material includes a student text, student lab manual, teacher's annotated lab manual, and teacher's resource binder.



**NORTH CAROLINA FFA ASSOCIATION
FOOD SCIENCE CAREER DEVELOPMENT EVENT
Maximum Points = 100**

Sensory Evaluation – Aromas

Name: _____
Chapter Name: _____
Contestant Number: _____

Score: Aromas Identified ___ x 10 = ___

Instructions: Identify the aromas from the ten samples provided. Write the sample number beside the appropriate aroma type.

- _____ Apple
- _____ Banana
- _____ Basil
- _____ Butter
- _____ Cherry
- _____ Chocolate
- _____ Cinnamon
- _____ Clove
- _____ Coconut
- _____ Coffee
- _____ Garlic
- _____ Ginger
- _____ Grape
- _____ Lemon
- _____ Licorice (anise)
- _____ Lime
- _____ Maple
- _____ Molasses
- _____ Nutmeg
- _____ Onion
- _____ Orange
- _____ Oregano
- _____ Peach
- _____ Peppermint
- _____ Raspberry
- _____ Sage
- _____ Smoke (liquid)
- _____ Strawberry
- _____ Vanilla
- _____ Watermelon
- _____ Wintergreen

**NORTH CAROLINA FFA ASSOCIATION
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Maximum Points = 45**

**SENSORY EVALUATION
Triangle Testing**

Name: _____

Chapter: _____

Contestant Number: _____

Instructions: Conduct a triangle test on the given samples. Select the odd or different sample from each based on smell, taste, texture, or color. Circle the letter that represents the odd or different sample for each triangle test.

- 1. A B C (15)
- 2. A B C (15)
- 3. A B C (15)

Participant's Score =

Number Right ___ x 15 = _____



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FOOD SCIENCE CAREER DEVELOPMENT EVENT**

Sample Nutrition Facts Panels and Questions

The next several pages include sample Nutrition Facts Panels from three different products. One or more Nutrition Facts Panels will be used for the team activity and may come from any food source. These sample panels may or may not represent the food source that will be used for the event. In addition, there are ten sample questions from the three panels. These are only sample questions. Any questions pertaining to the information found on a Nutrition Facts Panel may be used. These are guidelines and questions will for the most part be very similar to the ones found in these samples.

The calorie information included in this box is basic to food science standards and may be useful in solving any or the problems encountered in this segment of the event.

Basic Calories per Unit

- 4 calories per gram of protein
- 4 calories per gram of carbohydrates
- 9 calories per gram of fat

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium	Less than	3,500mg	3,500mg
Total Carbohydrate	Less than	300g	375g
Dietary Fiber	Less than	25g	30g
Protein	Less than	50g	65g



North Carolina FFA Association
FOOD SCIENCE CAREER DEVELOPMENT EVENT

QUESTION SET #1 – Egnog Nutrition Facts Panel with Sample Questions



1. How many grams of fat are in one serving of egg nog?

2. What percent of a day's allowance of Saturated Fat is a person receiving from one serving of egg nog in a normal 2,000 calorie

3. How many grams of carbohydrate is in a serving of egg nog in a normal 2,000 calorie diet?

4. What percent of a day's allowance of Sodium is a person receiving from one serving of egg

5. What percent of a day's allowance of Protein is a person receiving from one serving of egg nog in a normal 2,000 calorie diet?

Special Thanks to April Hix Morrison, Academic Advisor, North Carolina State University, Dept. of Food, Bioprocessing & Nutrition Sciences and the Food Science Department in developing this component.



NORTH CAROLINA FFA ASSOCIATION
FOOD SCIENCE CAREER DEVELOPMENT EVENT

Set 1 Solution for Sample Questions from Egnog Nutrition Facts Panel

- 1. How many grams of fat are in one serving of egg nog?**
 - Calories from Fat are given in the Calories line as 70
 - To get the number of fat grams, divide 70 calories by 9 cal/g of fat ($70 \text{ cal} / 9 \text{ cal/g} = 7.77778 \text{ g}$)
 - Rounded up is 8 grams of fat per serving

- 2. What percent of a day's allowance of Saturated Fat is a person receiving from one serving of egg nog?**
 - In a 2,000 calorie diet, a person is to get no more than 20g of saturated fat.
 - The amount of Saturated fat in one serving of egg nog is 5g.
 - To get the percentage of Saturated fat, divide 5g by 20g = 0.25
 - Multiply answer by 100
 - 25% of a the person daily limit for Saturated Fat is supplied by one serving of egg nog

- 3. How many grams of carbohydrate is in a serving of egg nog in a 2,000 calorie diet?**
 - The Nutrition Facts Panel shows that 8% of a person's daily allowance for carbohydrates is supplied by one serving of egg nog.
 - In a 2,000 calorie diet, 300 g is the recommended amount of carbohydrates for an average person to consume.
 - To get the number of grams of carbohydrate, multiply 0.08 by 300g = 24g
 - The answer is 23 or 24 grams of carbohydrate depending on the calculator and rounding of the answer.

- 4. What percent of a day's allowance of Sodium is a person receiving from one serving of egg nog?**
 - The Nutrition Facts panel shows that there is 105mg of sodium per serving of egg nog.
 - The recommended daily allowance for sodium is 2,400mg in both a 2,000 and 2,500 calorie diet.
 - To get the sodium percentage in one serving, divide 105mg by 2,400mg = 0.04375
 - Multiply answer by 100
 - 4% (under 5%) of a person's daily allowance of sodium comes from one serving of egg nog.

- 5. What percent of a day's allowance of Protein is a person receiving from one serving of egg nog in a normal 2,000 calorie diet?**
 - The Nutrition Facts Panel shows that there is 4g of Protein per serving of egg nog.
 - The recommended daily allowance for Protein in a 2,000 calorie diet is 50g.
 - To get the percent daily allowance for Protein in one serving, divide 4g by 50g = 0.08
 - Multiply answer by 100
 - 8% of a person's daily allowance of protein comes from one serving of egg nog



NORTH CAROLINA FFA ASSOCIATION
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Set 2 Sample Questions from Cookie Nutrition Facts Panel

Nutrition Facts			
Serving Size 1 cookie (52g)			
Servings Per Container 24			
Amount Per Serving			
Calories 220	Calories from Fat 80		
% Daily Values			
Total Fat 9g	14%		
Saturated Fat 5g	25%		
Trans Fat 0.5g	--%		
Polyunsaturated Fat 0.5g	--%		
Monounsaturated Fat 2.5g	--%		
Cholesterol 35mg	12%		
Potassium 70mg	2%		
Sodium 160mg	7%		
Total Carbohydrates 32g	11%		
Dietary Fiber 1g	4%		
Sugars 17g	--		
Protein 3g	6%		
Vitamin A 6%	• Calcium 2%		
Iron 4%	• Vitamin D 2%		
Vitamin E 2%	• Vitamin K 2%		
Thiamin 4%	• Riboflavin 2%		
Niacin 2%	• Vitamin B6 2%		
Folate 2%	• Pantothenic Acid 6%		
Phosphorus 6%	• Iodine 4%		
Magnesium 4%	• Zinc 4%		
Selenium 10%	• Copper 4%		
Manganese 4%	•		
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily values may be higher or lower depending on your calorie needs.			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrates	Less than	300g	375g
Dietary Fiber	Less than	25g	30g

Sample Questions

1. Approximately how much protein is in one cookie based on a 2,000 calorie diet?
2. Approximately how much total fat is in one cookie?
3. What percentage of a person's daily allowance of fiber is in one cookie based on a 2,000 calorie diet?



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Set 2 Solution for Sample Questions from Cookie Nutrition Facts Panel

1. Approximately how much Protein is in 1 cookie based on a 2,000 calorie diet?
 - The percentage of a person's daily protein allowance is listed on the Nutrition Facts Panel as 6%.
 - For a 2,000 calorie diet, 50g of protein is the recommended daily allowance.
 - To get the grams of protein, multiply 0.06 by 50g = 3g
 - 3g of protein is in 1 cookie.

2. Approximately how much Total Fat is in 1 cookie based on a 2,000 calorie diet?
 - In a 2,000 calorie diet, a person is to get no more than 65g of fat daily.
 - The percentage a person recommended daily intake of fat in 1 cookie is listed as 14%.
 - To get the grams of fat, multiply 0.14 by 65g = 9.1g
 - Round to the nearest whole number
 - 9g of fat is in 1 cookie

3. What percentage of a person's daily allowance of fiber is in 1 cookie based on a 2,000 calorie diet?
 - The Nutrition Facts Panel shows that 1g of fiber is provided by 1 cookie.
 - In a 2,000 calorie diet, it is recommended that a person should get at least 25g of fiber per day.
 - To get the percent daily allowance, divide 1g by 25g = 0.04
 - Multiply answer by 100
 - 4% (and up to 6%) of a person's daily allowance of fiber comes from 1 cookie.

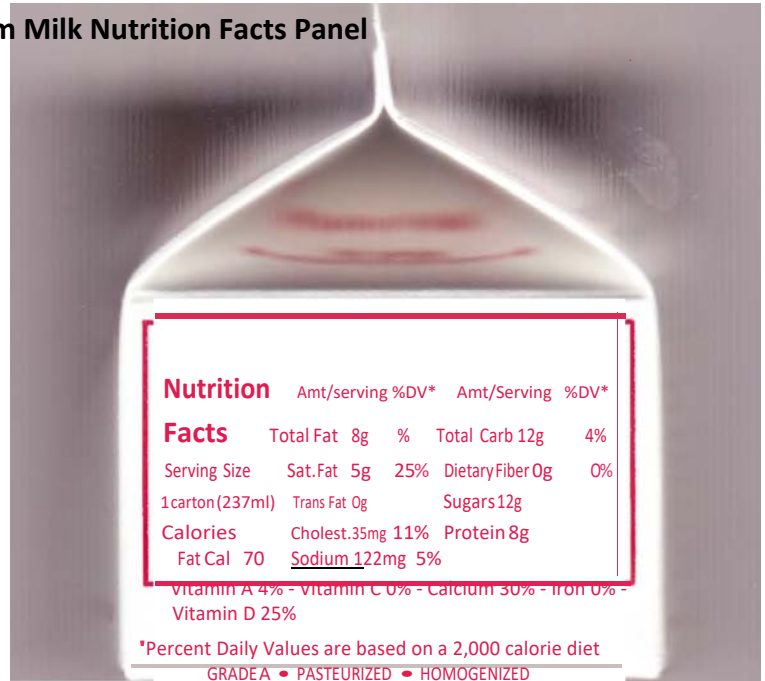


**NORTH CAROLINA FFA ASSOCIATION
FOOD SCIENCE CAREER DEVELOPMENT EVENT**

Set 3 Sample Questions from Milk Nutrition Facts Panel

Sample Questions

1. Given that there are 9 calories per gram of fat, 4 calories per gram of carbohydrate, and 4 calories per gram of protein, calculate the number of calories in this serving of milk.
2. What percentage of a person's daily allowance of fat is supplied by one serving of milk based on a 2,000 calorie diet as well as a 2,500 calorie diet?



		Calorie 2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium	Less than	3,500mg	3,500mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g
Protein		50g	65g



NORTH CAROLINA FFA ASSOCIATION
FOOD SCIENCE CAREER DEVELOPMENT EVENT

Set 3 Solutions for Sample Questions from Milk Nutrition Facts Panel

1. Given that there are 9 calories per gram of fat, 4 calories per gram of carbohydrate, and 4 calories per gram of protein, calculate the number of calories in this serving of milk.
 - Multiply 8g of fat by 9 Calories = 72 Calories
 - Multiply 12g of carbohydrates by 4 Calories = 48 Calories
 - Multiply 8g of protein by 4 Calories = 32 Calories
 - Add $72 + 48 + 32 = 152$ calories
 - Round to the nearest 10 = 150 Calories

2. What percentage of a person's daily allowance of fat is supplied by one serving of milk based on a 2,000 calorie diet as well as a 2,500 calorie diet?
 - The Nutrition Facts Panel shows that 8g of fat is provided by one serving of milk.
 - In a 2,000 calorie diet, it is recommended that a person eat no more than 65g of fat per day.
 - In a 2,500 calorie diet, it is recommended that a person eat no more than 80g of fat per day
 - To get the percent daily allowance, divide 8g by 65g for the 2,000 calorie diet = 0.123077
 - Multiply answer by 100 = 12%
 - To get the percent daily allowance, divide 8g by 80g for the 2,500 calorie diet = 0.100000
 - Multiply answer by 100 = 10%
 - The answers are 12% for a 2,000 calorie diet and 10% for a 2,500 calorie diet



**NORTH CAROLINA FFA ASSOCIATION
FOOD SCIENCE CAREER DEVELOPMENT EVENT
FOOD SAFETY AND SANITATION PROBLEM
TEAM ACTIVITY
Maximum Points = 60**

Name: _____ Chapter: _____ Participant ID Number: _____

Instructions: Your team is now Official NCDA Food Safety Inspectors. Use the given list of POTENTIAL FOOD PROCESSING SANITATION AND SAFETY PROBLEMS to determine if problems are depicted in each of the six photos provided. Write the number from the given list for any problem you find for each photo. Teams will not receive credit for identifying multiple problems. The first number listed on the left will be the only number considered for grading. If you do NOT find any problems in the photo you will place a check by No Problem found.

Photo Number 1:

_____ number for the problem found in this photo

_____ no problem was found in this photo

Photo Number 2:

_____ number for the problem found in this photo

_____ no problem was found in this photo

Photo Number 3:

_____ number for the problem found in this photo

_____ no problem was found in this photo

Photo Number 4:

_____ number for the problem found in this photo

_____ no problem was found in this photo

Photo Number 5:

_____ number for the problem found in this photo

_____ no problem was found in this photo

Photo Number 6:

_____ number for the problem found in this photo

_____ no problem was found in this photo



North Carolina FFA Association
Food Science Career Development Event
Potential Food Processing Operations
Sanitation of Food Safety Problems

3. Facilities, ingredients and packaging supplies and processed foods shall be free of:
 - a. insects (such as flies, cockroaches, worms, etc.); insect parts (in excess of allowable limits), and insect eggs;
 - b. rodents (such as rats and mice);
 - c. birds;
 - d. domestic animals (such as cats and dogs);
 - e. fecal droppings or urinary discharges from any of the above.
4. Holes in walls or window screens are not permitted (as they may allow entry of insects or rodents).
5. Cracks or spacing under doors or windows are not permitted.
6. Open outside doors or windows without screens or air curtains are not permitted.
7. Rodent control programs are required (including traps or baits).
8. Open top trash containers (inside or outside) are required to be covered.
9. Rust, rough solder and seams on processing equipment contacting foods are not allowed.
10. Proper temperature control of processes throughout the facility is required, such as:
 - f. cooler storage temperatures;
 - g. freezer storage temperatures;
 - h. frozen ingredients may be thawed prior to use, but containers cannot be dripping moisture or other liquids prior to usage.
11. Food supplies shall not be stored directly on floor - skids, pallets, or racks are required.
12. Equipment, facilities, walls, floors and overhead utilities must be free of dirt, dust, mold, or otherwise contamination-free.
13. Equipment or utilities above the processing line shall not drop anything into the food line either on equipment or food (such as grease, water, dust, or dirt).
14. All parts of a disassembled processing equipment line shall be cleaned immediately after usage and stored on clean racks (off the floor) when not in use. (Any contact with floor shall be considered re-contamination).
15. All food contact surfaces shall be constructed of heavy stainless steel or of food grade quality sanitary plastic or rubber.
16. All overhead lights shall be shielded to avoid glass breakage and contamination of foods.
17. All processing cooking vessels shall be covered whenever possible to prevent contamination and control temperatures.
18. All processing room walls shall be constructed of washable, waterproof materials.
19. All raw ingredients shall be sound and wholesome.
20. Food-handling employees must wear hairnets and/or beard nets.
21. Food-handling employees must not touch ready-to-eat foods with their bare hands.
22. Food-handling employees must wash their hands prior to starting work, after picking up anything from the floor, after every visit to the toilet or at any other time whereby their hands have become contaminated.
23. Food-handling employees shall wear clean, impact-resistant, sanitary gloves made of impermeable plastic or rubber whenever in direct contact with foods, ingredients, or containers for these foods and supplies.
24. All hand wash sinks in food operation and toilet areas shall be clean and sanitary, with cold and hot water and proper temperature controls and mixing valves accessible at all times.
25. Hand wash sinks and equipment wash sinks shall not be used to store soiled or clean equipment, supplies, or packaging containers.
26. Adequate covered trash containers must be available in food operation, toilet, and hand-wash sink areas.



27. Processed foods shall not contain any foreign materials (such as glass, metal, wood, insects or parts of insects, or toxic substances).
28. Only government approved and properly labeled chemicals may be used for cleaning the processing equipment and plant work areas.
29. Only government-approved chemicals may be used for maintaining the food plant and storage areas from contamination by insects, rodents, birds, etc, and shall be applied by a certified pest control operator.
30. Workers with open cuts, bruises, or wounds shall not handle foods or raw ingredients.
31. Ingredients and workers shall be free of any disease that can be communicable through food or equipment.
32. Uncooked foods and cooked foods shall be stored in separate areas with proper identification.
33. All processed food products offered for public sale and consumption shall be sound and wholesome and free of adulterants.
34. Food plant buildings shall not have any walls with peeling paint or other toxic substances that could be exposed to any food ingredients or processing equipment.
35. All walls, ceilings, floors and equipment exposed to foods in the processing or storage areas shall be rust free.
36. All packaging materials, equipment, storage, and delivery supplies must be free of dust, dirt, rust, or other possible contaminants.
37. All food ingredients to be added to food and/or processed for human consumption must be clean and free from any contact with contaminated surfaces prior to usage.

Sources of "Good Sanitation" Operations Information

U.S. Food & Drug Administration Web Addresses:

- <http://www.cfsan.fda.gov> – FDA Home page
- <http://www.cfsan.fda.gov/list.html> - FDA Center for Food Safety and Applied Nutrition
- <http://www.cfsan.fda.gov/~dms/guidance.html> - Food Guidance Documents
- <http://www.cfsan.fda.gov/~dms/gmp-toc.html> - Good Manufacturing Practices and Regulations
- <http://www.cfsan.fda.gov/~dms/fc05-toc.html> - The 2005 Food Code (retail and food service operations)
- <http://www.cfsan.fda.gov/~dms/dalbook.html> - The Defect Action Levels – (allowable non-hazardous, unavoidable filth in foods)
- <http://www.cfsan.fda.gov/~dms/insp-toc.html>
- <http://www.cfsan.fda.gov/~dms/insp-toc.html> – Ensuring shipments are clean, sanitary, and safe
- <http://www.cfsan.fda.gov/~lrd/part110t.html> - (legal food processing - Manufacturing regulations)
- <http://www.cfsan.fda.gov/~dms/selfinsp.html> - (self inspection of food processing facility)
- <http://www.cfsan.fda.gov/~dms/foodcode.html> - (The Food Code - retail and food service operations)

Retail Store Sanitation Book:

"Food Store Sanitation," by R. B. Gravani & D. Roshoi (1998)
(to purchase contact R. B. Gravani, Cornell University, Stocking Hall, Ithaca, NY 14853 or email rbg2@cornell.edu)