

Further Processing and Labeling

Inspection Course

Student Handout

USDA



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01 - Introduction to the Further Processing and Labeling Course

This module provides the big picture of what will be covered in this course. It will provide the basis and general overview touching on statutory authority, definitions, regulatory references and a discussion of the inspection verification tasks.

The mission of the Food Safety and Inspection Service (FSIS) is to assure that meat, meat food, poultry, poultry food, and egg products distributed in interstate commerce are wholesome, not adulterated, and properly marked, labeled, and packaged (not misbranded). FSIS enforces the Federal Meat Inspection Act (FMIA), the Poultry Products Inspection Act (PPIA), Egg Products Inspection Act (EPIA) and the regulations implementing these laws. FSIS Directives and FSIS Notices provide inspection program personnel (IPP) with specific instructions to help them enforce the laws and regulations.

The highest priority in FSIS is protecting public health and food safety. The Agency directs IPP to focus on food safety and food security (when specific heightened security threat condition is declared). Nevertheless, FSIS must continue to verify that establishments that produce meat, poultry and egg products comply with the statutory and regulatory requirements that do not address food safety. These statutory and regulatory requirements are referred to as Non-Food Safety Consumer Protection (NFSCP) or Other Consumer Protection (OCP) requirements. NFSCP regulatory requirements ensure that meat, poultry and egg products distributed to consumers are wholesome and not economically adulterated or misbranded.

Statutory Authority

Economic Adulteration

The term “adulterated” is defined in 21 U.S.C. 601(m) of the FMIA. 601(m) identifies nine circumstances (m 1-9) in which a carcass, carcass part, meat or meat food product is adulterated.

Misbranded

The second requirement is that carcasses, carcass parts, meat, and meat food products distributed to consumers must be properly marked, labeled and packaged. When a carcass, carcass part, meat, or meat food product is not properly marked, labeled and packaged, it is misbranded. The term “misbranded” is defined in 21 U.S.C. 601(n) of the FMIA. 601(n) identifies twelve circumstances (n 1-12) in which a carcass, carcass part, meat or meat food product is misbranded.

Label/Labeling

The term “label” means a display of written, printed, or graphic matter upon the immediate container of any article. The term “labeling” means all labels and other written, printed, or graphic matter upon any article or accompanying the article. These terms can be found in 21 U.S.C. 601(o) and (p).

Regulations and Policies

The regulations that provide non-food safety protection to consumers are extensive and detailed. However, the same statutory provisions for adulteration and misbranding, as well as the definition of a label and labeling can be found in 9 CFR 301.2 and 9 CFR 381.1.

Regulations and policies also outline the approved ingredients which can be used in or on food products. These documents may dictate the amount of ingredients allowed in or on a product, and the purpose for which the ingredient can be used. Food and Drug Administration (FDA) regulations, 21 CFR Subchapter B, identify all approved food for human consumption. 21 CFR Subchapter B Parts 172-184 address direct and indirect food additives, and Parts 73, 74, 81, 82 address color additives. These regulations are incorporated into FSIS regulations by reference in 9 CFR 424.21(b)(2). FSIS determines the suitability of ingredients to be added to meat and poultry products, specifically, and they are listed in 9 CFR 424.21 and updated quarterly in FSIS Directive 7120.1. While FSIS no longer issues official policy through Policy Memos, and many have been cancelled or rescinded, there are Policy Memos that remain active and relevant. These have been incorporated into the Food Standards and Labeling Policy Book.

Some products have standards of identity. These regulatory standards in 9 CFR 319 and 381 Subpart P, dictate the ingredients, preparation and/or processing of the product in order for it to bear that name on its label. Product standards are also set by the Food Standards and Labeling Policy Book.

In the regulations, 9 CFR 442.1 prescribes the procedures to be followed for determining net weight compliance and prescribes the reasonable variations from the declared net weight on the labels of immediate containers of products in accordance with 9 CFR 317.2(c)(4), 317.2(h) and 381.121. FSIS uses the NIST Handbook 44 and the NIST Handbook 133 standards as the basis for verifying net weights and these documents have been incorporated into regulation by reference.

Non-Food Safety Consumer Protection Tasks

When performing the **General Labeling Task**, IPP are to verify compliance with the labeling regulations, ensuring that the required label

- Is affixed to the immediate container and contains all the required information (mandatory features)
- Has an accurate ingredients statement
- Identifies any proteinaceous substances such as allergens
- Meets requirements for restricted ingredients

Restricted ingredients (RIs) are non-meat ingredients, such as curing agents or antioxidants. They are direct food additives that have a regulatory limit established in 9 CFR 424.21. This regulation continues in Directive 7120.1 “Safe and Suitable Ingredients used in the Production of Meat, Poultry, and Egg Products,” which is updated quarterly. The establishment MAY add the ingredient to the product’s formula in any amount up to its regulatory limit.

When performing the **Labeling Product Standards Task**, IPP are to verify compliance with the regulations and standards for products that have a standard of identity. Standards of identity are established in FSIS regulations and in the Food Standards and Labeling Policy Book for many meat and poultry products. For example, standards of identity for meat products can be found in 9 CFR 319 and in 9 CFR 381 Subpart P for poultry products.

As part of their standard of identity, some products (such as some cured products) have established limits for increased weight after processing expressed as gain or yield. Some products must decrease in weight after processing, with a minimum shrink requirement (such as ham or bacon). These required percentages are verified by calculations when performing the **Percent Yield/Shrink Task**.

When performing the **X Percent Solution Task**, IPP are verifying the label truthfulness pertaining to the percentage of added solution which has been declared on the label. IPP calculate the percentage added by formulation and comparing the result to the amount on the label.

The **Net Weights Task** is performed to ensure establishments are properly representing on the label the amount of product in the container. Net Weight calculations allow for some variation, but IPP perform this task to verify regulatory compliance.

Inspection Responsibilities

As with other inspection tasks, IPP are to schedule the tasks on the dates most appropriate and verify the regulatory requirement using the GAD Thought Process – Gather information, Assess the information and Determine compliance. FSIS Directive 7000.1 provides guidance for verifying NFSCP regulations. The Public Health Information System (PHIS) assigns NFSCP tasks to the establishment's task lists based on the product information recorded in the establishment profile. NFSCP tasks are performed to verify that meat, poultry, and egg products distributed to consumers are not economically adulterated or misbranded.

IPP are not to perform directed NFSCP tasks unless they observe conditions or activities while performing a food safety verification task that gives them a reason to suspect that product has not met NFSCP regulatory requirements. Laboratory testing is used when it is the only means available to determine regulatory compliance.

Compliance with the NFSCP regulations is on per lot basis and the establishment's control of the process being assessed such as, applying accurate labeling to product, applying added solutions to product, applying an accurate net weight statement and/or formulating products to meet their standard of identities. Notify establishment management orally and then in writing with an NR when there is noncompliance. When uncertain, discuss the situation with your supervisor.

While performing NFSCP tasks, IPP may uncover concerns related to an establishment's food safety system, such as the Sanitation SOP or the HACCP plan. When this occurs, IPP should perform the appropriate food safety inspection task as a directed task following the instructions in FSIS Directive 5000.1. For example, if an IPP is performing the general labeling verification task and discovers that the establishment has formulated a product with an allergen or other ingredient of public health concern without properly declaring the ingredient on the label, the IPP should pursue the food safety aspects of this finding by scheduling and performing the appropriate directed HACCP Verification Task.

02 - Labeling

Objectives

After completing this module, the student will be able to:

1. Define the following terms:
 - Immediate container
 - Label
 - Principal display panel
 - Generic labeling
 - Sketch labeling
 - Shipping container
2. Identify the eight mandatory features of an immediate container label.
3. Identify the mandatory features that must be shown on shipping containers.
4. Identify the two types of labeling approvals granted by the Labeling and Program Delivery Staff (LPDS).
5. Identify the product name labeling requirements for raw meat and poultry products that contain added solutions.
6. Identify the product name and cooking instruction labeling requirements for mechanically tenderized raw beef products.
7. Describe how to perform the General Labeling inspection task.

Labeling Regulatory Requirements

Labeling regulatory requirements for **meat** products appear in Part 317—Labeling, Marking Devices, and Containers. Labeling regulatory requirements for **poultry** products appear in Part 381—Poultry Products Inspection Regulations, Subpart N—Labeling and Containers. This segment of the module will specifically address the requirements in Subpart A of Part 317 of the regulations. The section of the poultry inspection regulations that references the same or similar requirements is identified in brackets at the end of pertinent paragraphs.

§317.1—Labels required; supervision by program employee.

§301.2 identifies an *immediate container* as the receptacle or other covering in which any product is directly contained or wholly or partially enclosed.

§301.2 identifies a **shipping container** as the outside container (box, bag barrel, crate or other receptacle) containing or wholly or partly enclosing any product packed in one or more immediate containers. In some cases the shipping container becomes the immediate container (e.g., when product units are bulk packed and not individually wrapped and labeled) and must then bear a label with all the required features.

*§317.1(a)—When, in an official establishment, any inspected and passed product is placed in any receptacle or covering constituting an **immediate container**, there shall be affixed to such container a **label** as described in §317.2 [§381.115]*

§317.1(c)—No covering or other container which bears or is to bear a label shall be filled, in whole or in part, except with product which has been inspected and passed in compliance with the regulations in this subchapter, which is not adulterated and which is strictly in accordance with the statements on the label. No such container shall be filled, in whole or in part, and no label shall be affixed thereto, except under supervision of a Program employee. [§381.136]

Only inspected and passed product that meets all regulatory requirements, is unadulterated, and has an accurate label may be packaged. Packaging and labeling operations can only be performed under the supervision of an IPP. Under the supervision of the IPP only means that he or she is on duty. The IPP **does not** need to **continually oversee** the filling and labeling of packages or containers.

§317.2—Labels: definition; required features.

Label Definition

*§317.2(a)—A **label** within the meaning of this part shall mean a display of any printing, lithographing, embossing, stickers, seals, or other written, printed, or graphic matter upon the **immediate container** (not including package liners) of any product.*

Placement of Mandatory Label Information

§317.2(b)—Any word, statement, or other information required by this part to appear on the label must be prominently placed thereon with such conspicuousness (as compared with other words, statements, designs, or devices in the labeling) and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use. [§381.116(a)]

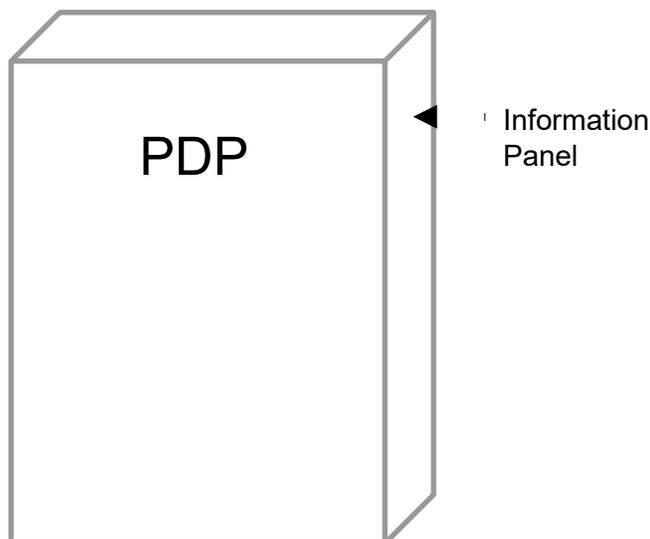
All mandatory information must appear on the label's **principal display panel**, except as otherwise permitted in 9 CFR 317.2 and 9 CFR 381.116. Except for products exported to foreign countries or distributed solely to Puerto Rico, the required information **must be** printed in the **English** language.

*§317.2(d)—The **principal display panel** shall be the part of the label that is most likely to be displayed, presented, shown, or examined under customary conditions of display for sale...The principal display shall be large enough to accommodate all of the **mandatory label information** required to be placed thereon...with clarity and conspicuousness and without obscuring of such information by designs or vignettes or crowding. [§381.116(b)]*

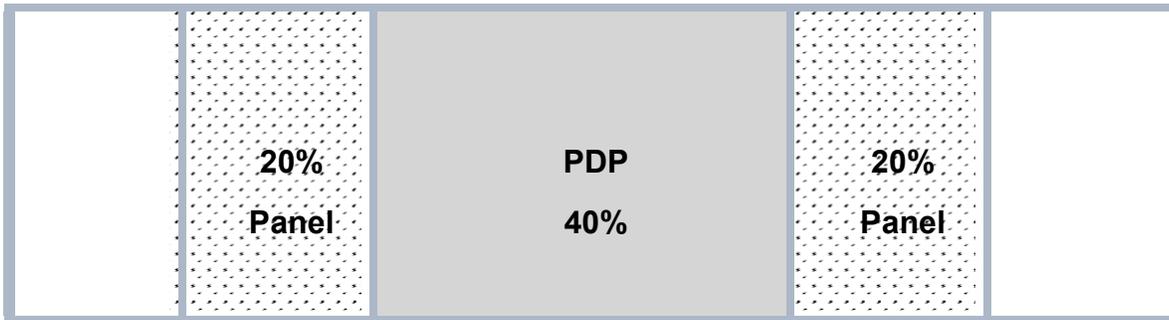
Principal display panels have specific size requirements to accommodate the mandatory information (features). The size requirements for the principal display panel for the various shapes of containers or packages are identified in §317.2(d)(1) through (3) and 381.116(b)(1) through (3).

Additional panels where certain mandatory label information may be shown in lieu of showing it on the principal display panel are identified in 9 CFR 317.2 and 9 CFR 381.116. For example, the ingredients statement, signature line, and/or nutritional facts may be placed together to form the information panel. Certain mandatory features may also be displayed on the front riser panel of a frozen food cartons and the 20% panel of a cylindrical container.

Information Panel

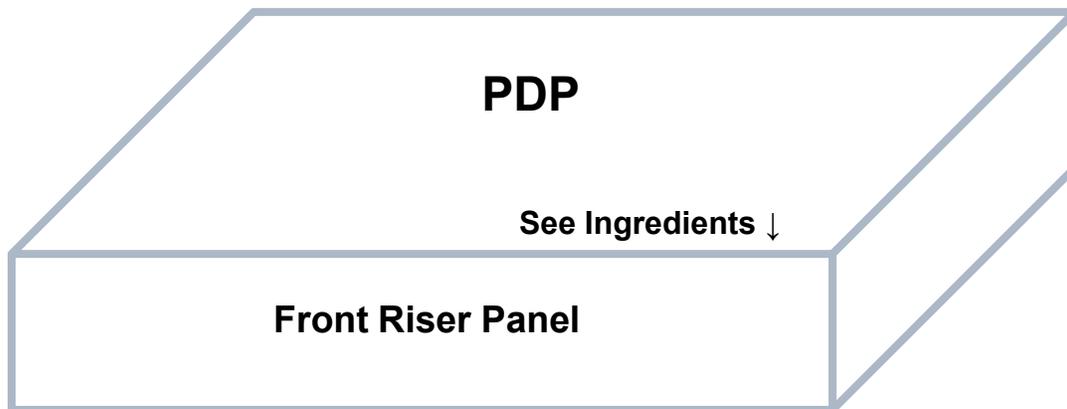


20% Panel on a Cylindrical Container



Either to the left or right of the PDP

Front Riser Panel



Mandatory Features of a Label

Up to eight features may be required on an **immediate container** label. The eight mandatory features are identified in the table in Attachment 1.

- **Name of the Product**

§317.2(c)(1)—The name of the product, which in the case of a product which purports to be or is represented as a product which a definition and standard of identity or composition is prescribed in part 319...shall be the name of the food specified in the standard, and in the case of any other product shall be the common or usual name of the food, if any there be, and if there is none, a truthful descriptive designation as prescribe in paragraph (e) of this section... [§381.117(a)]

Fresh pork sausage (§319.141), Italian sausage (§319.145) and frankfurters (319.180(a)) are examples of products that have standards of identity we have covered in this course. Ground beef is another meat product that has a standard of identity (§319.15(a)). Pork Shoulder and Beef Rib Eye Steak are common and usual names. "Sloppy Joe" is a fanciful name and must be qualified with the descriptive name "barbecue sauce with (species)".

Product names must be prominently shown on the principal display panel.

Raw Meat and Poultry Products Containing Added Solutions Descriptive Designations (if applicable)

§317.2(e)(2)–The product name for a raw meat product that contains added solution and does not meet a standard of identity in 9 CFR part 319 must contain a descriptive designation that includes:

(i) The percentage of added solution (total weight of the solution ingredients divided by the weight of the raw meat without solution or any other added ingredients multiplied by 100). The percentage of added solution must appear as a number (such as, 15, 20, 30) and the percent symbol (%). The percentage of added solution may be declared by the words "containing" or "contains" (such as, "contains 15% added solution of water and salt," or "containing 15% added solution of water and teriyaki sauce").

The word "contain" or "contains" is not required. Other words that may be used in the descriptive designation include "added," "with," or "up to", "injected," or "flavored." The word "solution" is not required in the descriptive designation as long as the added ingredients are included. The words "marinated" and "basted" may be used in the descriptive designation without restriction to the level of solution. **All ingredients that make up the solution, including water if that is the liquid used in the formula, must be declared in the descriptive designation.**

(ii) The common or usual name of all individual ingredients or multi-ingredient components in the solution listed in descending order of predominance by weight.

(iii) When the descriptive designation includes all ingredients in the solution, a separate ingredients statement is not required on the label. When the descriptive designation includes multi-ingredient components and the ingredients of the component are not declared in the descriptive designation, all ingredients in the product must be declared in a separate ingredients statement on the label as required in Sec. 317.2(c)(2) and (f).

A multi-ingredient component is an ingredient added to the formula that itself is made up of two or more ingredients, for example, seasoning (salt and spices) or soy sauce (water, soybeans, wheat).

(iv) The product name and the descriptive designation must be printed in a single easy-to-read type style and color and must appear on a single-color contrasting background. The print may appear in upper and lower case letters, with the lower case letters not smaller than one-third ($\frac{1}{3}$) the size of the largest letter.

(v) The word "enhanced" cannot be used in the product name. [381.117(h)]

This rule applies to:

- raw meat or poultry products where added solution increases the raw weight of the meat or poultry by any amount, for example, chicken with 2% solution of water and potassium lactate
- products where solution has been incorporated into raw meat or poultry through any method, for example, marinating, basting, injection, vacuum tumbling, and
- raw products with added solution going to Food Service, HRI, and retail.

The regulation does not apply to cooked product or products with a standard of identity where added liquid ingredients comply with the standard.

The product name and descriptive designation may appear on more than one line provided there is no intervening text or graphics. The font sizes may be different provided they meet the 1/3rd size requirement.

Based on the compliance level for pumped product in FSIS Directive 7620.3, Processing Inspectors' Calculations Handbook, the compliance level is 20% of the amount of solution stated on the label. Therefore, if the product is labeled "containing up to 7% of a solution", the label would be out of compliance if the actual amount solution added was more than 8.4% (7% plus 1.4%). IPP should retain the product until the establishment addresses the labeling noncompliance. In cases where the added solution is within the 20% allowance but the process consistently adds more solution than declared on the product's label, the establishment should correct the label to reflect the actual amount of solution retained.

Mechanically Tenderized Beef Product Name and Cooking Instructions (if applicable)

§317.2(e)(3) —Product name and required validated cooking instructions for needle- or blade-tenderized beef products.

(i) Unless the product is destined to be fully cooked or to receive another full lethality treatment at an official establishment, the product name for a raw or partially cooked beef product that has been mechanically tenderized, whether by needle or by blade, must contain the term “mechanically tenderized,” “needle tenderized,” or “blade tenderized,” as a descriptive designation and an accurate description of the beef component.

(ii) The product name must appear in a single easy-to-read type style and color and on a single-color contrasting background. The print may appear in upper and lower case letters, with the lower case letters not smaller than 1/3 the size of the largest letter.

(iii) The labels on raw or partially cooked needle- or blade-tenderized beef products destined for household consumers, hotels, restaurants, or similar institutions must contain validated cooking instructions, including the cooking method, that inform consumers that these products need to be cooked to a specified minimum internal temperature, whether the product needs to be held for a specified time at that temperature or higher before consumption to ensure that potential pathogens are destroyed throughout the product, and a statement that the internal temperature should be measured by a thermometer. These validated cooking instructions may appear anywhere on the label.

- Products covered: Needle- or blade-tenderized raw beef products destined for household consumers, hotels, restaurants, or similar institutions (HRI)
- Products not covered:
 - Non-intact beef products that are clearly non-intact (e.g., ground beef patties, hamburger patties, beef patties)
 - Beef products tenderized by other than needle/blade, such as pounding or cubing, which visibly changes the appearance of the product, e.g., cubed beef steak
 - Fully cooked beef products and those destined to another Federal establishment for a full lethality treatment
 - Raw or partially cooked products labeled as “Corned Beef” that have been mechanically tenderized (including through injection of a solution)
 - Raw mechanically tenderized beef products that are less than 1/8” thick, such as, beefbacon or carne asada, or raw mechanically tenderized beef products that are diced, such as stew meat

Labels must bear:

- The descriptive designation “mechanically tenderized,” “blade tenderized,” or “needle tenderized” and an accurate description of the beef component in the product name; and
- In close proximity; w/o intervening text or graphic
- All words in the descriptive designation be in the same style, color, and on a single-color contrasting background
- Upper and lower case allowed; however, the smallest letter must be at least 1/3 the size of the largest letter

- Validated cooking instructions for subject products destined for household consumers, hotels, restaurants, or similar institutions

Validated Cooking Instructions would address:

- A cooking method, (e.g., grill or bake)
- That these products need to be cooked to a specified minimum internal temperature,
- Whether these products need to be held for a specified time at that temperature or higher before consumption, i.e., dwell time or rest time, to ensure that potential pathogens are destroyed throughout the product, and
- A statement that the internal temperature should be measured by a thermometer.

Mechanically Tenderized Beef Labeling Workshop

You have scheduled a General Labeling task and selected the label for a raw mechanically tenderized beef flank steak destined for household consumers, hotels, restaurants, or similar institutions.

KEEP REFRIGERATED

Beef Flank Steak

Smoke Flavor Added

**Mechanically
Tenderized**

Containing Up to 15 percent of a Solution

Cooking Instructions:

To ensure adequate cooking, grill 5 minutes over medium heat. Then flip over and grill an additional 5 minutes.



Nutrition Facts	
Serving Size 1 Piece (142g)/5oz. Servings Per Container 4	
Amount Per Serving	
Calories 290	Calories from Fat 190
% Daily Value*	
Total Fat 16g	25%
Saturated Fat 8g	40%
Trans Fat 0g	
Cholesterol 75mg	25%
Sodium 440mg	18%
Total Carbohydrate 1g	0%
Dietary Fiber 0g	0%
Sugars 1g	
Protein 24g	
Vitamin A 0%	Vitamin C 8%
Calcium 2%	Iron 15%

*Percent Daily Values are based on a 2,000 calorie diet.

Ingredients: Beef flank steak, water, salt, spices, sodium phosphate

Meat Company 501 Main St,
Beltsville, MD 00000

NET WEIGHT: 20 OZ (1.25 LB)



1. What is your first name?
2. What is your last name?
3. Does the label comply with §317.2(e)(3) of the regulations?
 - a. Yes
 - b. No
4. Does the designation “Mechanically Tenderized” need to be part of the product name?
 - a. Yes
 - b. No
5. What is incorrect regarding the color of the background of the descriptive designation??
 - a. Nothing, there is no regulation regarding color of the background
 - b. The background is not a single color and contrasting
 - c. It should be white.
6. Does the label comply with the §317.2(e)(2) of the regulations?
 - a. Yes
 - b. No
7. What is incorrect with the ingredients listed in the descriptive designation?
 - a. The word “Ingredients” should be abbreviated
 - b. The ingredients are not listed in order of predominance.
 - c. Nothing
8. Is the product misbranded?
 - a. Yes
 - b. No

Ingredients Statement (if needed)

§317.2(c)(2)—*If a product is fabricated from two or more ingredients, the word "ingredients" followed by a list of ingredients as prescribed in paragraph (f) of this section...* [§381.118(a)]

The word “ingredients” must be spelled out, never abbreviated. The ingredients must be listed by their common and usual name in descending order of predominance according to the amounts used in the product’s preparation. There are a few exceptions.

Spices (e.g. mustard, pepper, etc.) and flavorings (e.g., oleoresin of black pepper, garlic oil, etc.) as defined in §317.2(f)(i) may be listed as “spice” or “flavoring” as appropriate in the ingredients statement. For instance, spices, spice extractives, essential oils, oleoresins, onion powder, garlic powder, celery powder, onion juice, and garlic juice may be listed as flavorings but flavorings (e.g., oleoresins, essential oils, etc.) cannot be listed as spices in the ingredients statement.

Ingredients present in individual amounts of 2% or less may be listed in other than descending order of predominance if:

- Such ingredients are listed by their common or usual name at the end of the ingredients statement; *and*
- Such ingredients are preceded by a quantifying statement such as "contains____percent of _____," or "less than____percent of_____." The blank before the word "percent" shall be filled with a threshold level of 2% (or less, as appropriate, e.g., 1.5%, 1%, or 0.5%). No ingredient subject to the quantifying statement may be present in an amount greater than the stated threshold. Such ingredients may be adjusted in the formulation without changing the label if the adjusted amount complies with §318.7(c)(4) or §381.147(f)(4) and does not exceed the stated threshold level.

The ingredient statement must be located on either the principal display panel, information panel, 20% panel of a cylindrical container, or the front riser panel of a frozen food carton.

Note: For some products an ingredients statement can be substituted with a “Cured with statement.” The label states “Cured with water, salt, sodium phosphate.....” The meat is left out and just includes all of the other ingredients. We see this with bacon, corned beef, ham, and other cured products.

- **Signature Line**

§317.2(c)(3)—The name and place of business of the manufacturer, packer, or distributor for whom the product is prepared, as prescribed in paragraph (g) of this section... [§381.122]

The name and place of business of the product's manufacturer, packer, or distributor is known as the signature line. The place of business shall be shown on the label by city, state, and zip code when the business is listed in a telephone or city directory; and if not listed in such a directory, the place of business shall also show the street address. **The signature line must be located on either the principal display panel, information panel, 20% panel of a cylindrical container, or the front riser panel of a frozen food carton.** When the product is prepared by one company and distributed by a different company, phrases like "prepared for..." or "distributed by" must precede the name and business address.

- **Net weight statement (if needed).**

§317.2(c)(4)—An accurate statement of the net quantity of contents as prescribed in paragraph (h) of this section...[§381.121(a)]

As stated in §317.2(h)(1) through (5), the net weight statement must:

- **Appear on the principal display panel** in a conspicuous and easily legible boldface print or type in distinct contrast to other material on the container.
- Not be false or misleading and shall express an accurate statement of the quantity of contents exclusive of wrappers and packing materials. The term "Net Weight" or "Net Wt." refers to contents in terms of weight. "Net Content" refers to fluid measure.
- Appear in the lower 30 percent portion of the principal display panel, unless otherwise exempt in the regulations. §317.2(h)(3)
- Be expressed in terms of Avoirdupois weight (US system) or liquid measure. Per§317.2(h)(4), a ¾ pound retail package would be labeled "Net Wt. 12 oz.". Retail packages containing one pound and less than four pounds are required to declare the net weight statement in *both* pounds and ounces (dual declaration), for example, "Net Wt. 24 oz (1 lb 8 oz)." per §317.2(h)(5).

Inspection Legend and Establishment Number

§317.2(c)(5)—An official inspection legend and...the number of the official establishment...[§381.123(a)(b)]

Labels on all products shall show an official inspection legend as illustrated in §312.2, §352.7, or §381.96 of the regulations. The inspection legend shall be in the exact form and arrangement as shown in the examples. It may be of any size, provided it is sufficient, and any color as long as it is conspicuous and readily legible. The proportions of letter size and boldness must be as illustrated in the regulations. **The legend must be located on the principal display panel or on the 20% panel of a cylindrical container.**

As stated in §317.2(i), the establishment number may be located inside or outside of the inspection legend. The establishment number may be located anywhere on the exterior of the container or its labeling.

Handling Statement (if needed)

§317.2(k)—Packaged products which require any special handling to maintain their wholesome condition shall have prominently displayed on the principal display panel of the label the statement: [§381.125(a)]

- Keep Refrigerated.
- Keep Frozen.
- Perishable, Keep Refrigerated.
- Previously handled frozen for your protection. Refreeze or Keep Refrigerated.

Safe handling instructions (if needed)

§317.2(l)—Safe handling instructions shall be provided for: all meat and meat products...that do not meet the requirements contained in §318.17, or that have not undergone other processing that would render them ready-to-eat; and all comminuted meat patties not heat processed in a manner that conforms to the time and temperature combinations in the Table for Permitted Heat-Processing Temperature/Time Combinations for Fully Cooked Patties in §318.23 [§381.125(b)].

Product that will be further processed at another official establishment is exempt from the safe handling requirements.

The safe handling instructions may be located anywhere on the outside of an immediate container.

- **Nutrition Facts Panel (unless an exemption applies)**

§317.300—(a) Nutrition labeling must be provided for all meat and meat food products intended for human consumption and offered for sale, except single-ingredient, raw meat products that are not ground or chopped meat products described in §317.301 and are not major cuts of single-ingredient, raw meat products identified in §317.344, unless the product is exempted under §317.400. Nutrition labeling must be provided for the major cuts of single-ingredient, raw meat products identified in §317.344, either in accordance with the provisions of §317.309 for nutrition labels, or in accordance with the provisions of §317.345 for point-of-purchase materials, except as exempted under §317.400. For all other products for which nutrition labeling is required, including ground or chopped meat products described in §317.301, nutrition labeling must be provided in accordance with the provisions of §317.309; except as exempted under §317.400.

FSIS requires nutrition labeling of the top 40 major cuts of single-ingredient, raw meat and poultry products (as defined in §317.344 and §381.444). This nutrition labeling must be on labels or at point-of-purchase, unless an exemption applies, however, the small business exemption specifically is not applicable to these cuts. FSIS also requires nutrition labels on all ground or chopped meat and poultry products as defined in §317.301 and §381.401 respectively, with or without added seasonings, unless an exemption applies. In addition, when a ground or chopped product does not meet the regulatory criteria to be labeled “low fat” (317.362(b)), a lean percentage statement may be included on the label or in labeling as long as a statement of the fat percentage that meets the specified criteria also is displayed on the label or in labeling when in compliance with §317.362(f) or §381.462(f).

Note: Ground and chopped product does not include products such as sausage, meatballs, beef patties. The “ground/chopped” products only includes products named “ground beef,” “hamburger,” “ground pork,” “ground chicken,” “ground turkey,” “chopped beef,” etc.

Nutrition labeling information may be shown on the principal display panel, on the information panel, or anywhere on the immediate container. There are exceptions for gift packs or when packaging doesn’t allow for sufficient space (§317.302 or §381.402).

Establishments may voluntarily provide nutrition labeling for single ingredient, raw meat and poultry products that are not one of the top 40 major cuts, and are encouraged to do so.

The regulations in §317.302 exempt products produced by small businesses, provided that the labels for these products bear no nutrition claims or nutrition information. There are two criteria for exemption, 1) less than 500 employees AND 2) less than 100,000 pounds of a specific product formula/nutrition profile per year. When calculating the total pounds of a formula, both retail and custom exempt with all pack sizes are included. For example, an establishment has a ground beef 70/30 formula. This formula is sold in bulk, as patties, in various retail sized packages, under various brand names, for HRI, some retail exempt, and some as custom exempt. All of this ground beef 70/30 is counted together for the total pounds per year. Each specific product formula/nutrition profile will need to be evaluated for the small business exemption and both criteria need to be met for that product labeling to be exempt from bearing the nutrition facts panel. It is possible for popular products manufactured in quantities larger than 100,000 pounds per year to be exempt but other products with production lower than 100,000 pounds per year to be exempt even though they are manufactured in the same establishment.

Mandatory Features for Shipping Containers

Shipping containers must bear the following mandatory features:

- Inspection legend [316.13(a)] and establishment number [317.2(i)]
- Handling statement (if needed) [317.2(k)]
- Net weight statement (if needed) [317.2(h)(9)(i)]

The establishment number may be located outside the inspection legend or elsewhere on the exterior of the container or its labeling if shown in a prominent and legible manner in a size sufficient to insure easy visibility and recognition and accompanied by the prefix "EST."

Note: The shipping container must bear a *net weight* statement per 381.121(a) and the following statements: "*Tare weight* of consumer package ____oz." (weighed to nearest 1/8 ounce or less), and the "Net wt." to be marked on consumer packages prior to display and sale" when **retail random weight poultry products** without the *net weight* statement are in the shipping container.

§412.1—Labeling approval.

§412.1(a)---No final label may be used on any product unless the label has been submitted for approval to the FSIS Labeling and Program Delivery Staff, accompanied by FSIS Form 7234–1, Application for Approval of Labels, Marking, and Devices, and approved by such staff, except for generically approved labels authorized for use in §412.2. The management of the official establishment or establishment certified under a foreign inspection system, in

accordance with parts 327 and 381, subpart T, must maintain a copy of all labels used, in accordance with parts 320 and 381, subpart Q, of this chapter. Such records must be made available to any duly authorized representative of the Secretary upon request.

No final labeling shall be used on any product unless the sketch labeling of such final labeling has been submitted for approval to FSIS except for generically approved labels authorized for use in 9 CFR 412.2. A sketch label is a printers proof or the equivalent which clearly shows all labeling features, including the size, and location.

FSIS requires the submission of labeling applications for the following four categories:

1. Labels for products produced under religious exemption (9 CFR 412.1(c)(1))
2. Labels for products for export with labeling deviations other than foreign language on the label or net weight in accordance with the usage of the country to which the product is exported (9 CFR 412.1(c)(2))
3. Labels with special statements and claims (9 CFR 412.1(c)(3))
4. Labels for temporary approval (9 CFR 412.1(c)(4)). Under certain conditions, LPDS may grant a temporary approval for the use of a final label that may be deficient in some particular for up to 180 calendar days

Any label that was previously approved as a sketch by FSIS qualifies to be used without any further approval.

The requirements for generically approved labels is covered in §412.2. IPP do not generically approve labels. Establishments do not generically approve labels. Generically approved labels are considered to be approved by FSIS provided that the label meets the criteria listed in §412.2(b). "Approved by FSIS" refers to compliance with the FSIS 9 CFR regulations, it does not mean that the labels have been submitted to Labeling and Program Delivery Staff (LPDS).

The responsibility of ensuring that generic labeling complies with regulatory requirements rests with the establishment. The establishment is responsible for creating the generic labeling record and is required to keep a copy of all generic labeling and related information in its files. A corporate headquarters may create and maintain the labeling files for their associated establishments. When labeling records are needed, the IPP may request the labeling records from the assigned establishment. The labeling records are required to be made available to the requesting IPP within 24 hours (FSIS Directive 7221.1).

There is no specific format for a generic labeling record, however, it is required to include all information in FSIS Form 7234-1 that would be provided to LPDS as if they were submitting for

sketch approval. Some establishments choose to use the FSIS 7234-1 form since they are familiar with the form and it is a reminder of what information is needed in the labeling record but they could provide all required information in another format. The labeling record should also include the final printed labeling that will be used on the finished packaged product and any supporting information that may be needed to verify that labeling is truthful and not misleading. Some companies choose to number their generic approvals as a way to track them internally, but there is no FSIS requirement to do so.

§317.8—False or misleading labeling or practices generally; specific prohibitions and requirements for labels and containers.

§317.8(a)—No product or any of its wrappers, packaging, or other containers shall bear any false or misleading marking, label, or other labeling and no statement, word, picture, design, or device which conveys any false impression or gives any false indication of origin or quality or is otherwise false or misleading shall appear in any marking or other labeling. No product shall be wholly or partly enclosed in any wrapper, packaging, or other container that is so made, formed, or filled as to be misleading. [§381.129(a)(b)]

The product or its packaging material may not bear any false or misleading label, marking or labeling. No written or graphic material on the product label or in its marking or labeling may convey a false impression or give a false indication of contents. A product's packaging material color, design or kind may not be misleading. Product that bears false or misleading marking or labeling is misbranded.

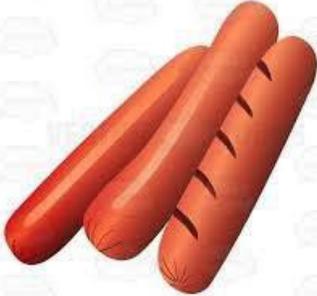
§317.8(b)(1)-(40) list requirements that product labels and containers must comply with to prevent them from having a false or misleading feature.

General Label Review Workshop

You are a CSI covering a very small “mom and pop” wiener processing establishment located in Cut and Shoot Texas. It employs two people and produces one product (New York Wieners in ½ lb packages) that conforms to the standard of identity in §319.180. The production volume has averaged 1,800 pounds per week over the past 2 years. Today, you have scheduled a General Labeling task and decide to verify whether the label (below) being applied to a lot of wieners complies with regulatory requirements.

Net Wt. ½ lb. Perishable, Store below Room Temperature

Wieners
New York *Brand*



INGRED: BEEF AND PORK, WATER, SALT, DEXTROSE, SUGAR, MUSTARD, PAPRIKA, SPICES, SPICE
EXTRACTIVES, MONOSODIUM GLUTAMATE, SODIUM ASCORBATE, SODIUM NITRITE.

WORTHLESS MEATERY
GIG 'EM, TX



Please select the best answer to the questions below.

1. What is your first name?
2. What is your last name?
3. What is incorrect with the Ingredient Statement?
 - a. Nothing
 - b. The word "Ingredients" needs to be spelled out
 - c. It is not listed in order of predominance
4. Is the Net Weight Statement Correct?
 - a. It should be in ounces
 - b. Nothing
 - c. The font is not correct
5. Is the Handling Statement correct?
 - a. Yes
 - b. No
6. What is missing from the Signature Line? (Select all that Apply)
 - a. The Zip Code
 - b. The name of the firm that produced the product
 - c. The state the product was produced in
 - d. Either "Prepared for" or "Distributed By"
 - e. Establishment Phone Number
7. Is the Inspection Legend correct?
 - a. Yes
 - b. No

§317.16—Labeling and containers of custom prepared products.

*Products that are custom prepared...must be **packaged immediately** after preparation and **must be labeled**...with the words “**Not For Sale**” in lettering not less than three-eighth inch in height.*

Custom prepared product must be properly labeled and have a prominent “Not for Sale” statement. The establishment may include additional labeling on custom prepared products or their containers provided it is not false or misleading.

NFSCP PHIS Task

Performing the General Labeling Task

Inspection program personnel perform this task to verify general labeling regulatory requirements and determine if the label accurately reflects the finished product.

- **General Labeling Requirements**

Verifying that the general labeling requirements involves:

- observing the application of the label or labeling,
- selecting labels and labeling for review, and
- reviewing the establishment’s labeling records

When IPP observe the packaging and labeling operations, they ensure that immediate containers of meat and poultry products have a label attached to them and that shipping containers bear the required information.

When IPP select and review the label/labeling applied to the container or package, they determine if:

- the label contains the mandatory features and other required information such as a qualifying statement or descriptive designation, and
- any printing or colors on the label and packaging material gives a false impression or does not meet specific formatting criteria

Product is misbranded if its label is missing a required feature, qualifying statement, or descriptive designation or is anyway false or misleading.

When IPP review the establishment's labeling file, they determine if the:

- label is on file and either met the generic approval requirements or was sketch approved by LPDS,
- label required sketch approval by LPDS and if so, the sketch is attached to the final label,
- label is being used beyond the expiration date if it has been granted a temporary approval by LPDS, and
- product's formulation (if applicable) and processing procedures are attached to or accompany the label/labeling.

If IPP find noncompliance, they issue an NR and take the appropriate action necessary to ensure misbranded product does not enter commerce.

Label Accurately Reflects the Product

Determining that the label accurately reflects the finished product involves reviewing the product's formulation record and observing its actual preparation and in some cases performing formula calculations.

When IPP perform this task, they should select one or more batches of product at formulation and verify ingredient amounts comply with the formula on file and that no undeclared ingredients are added or declared ingredients are omitted.

The verification may involve:

- observing pre-weighed ingredients for proper identification and weights, or
- observing establishment employees weighing ingredients or
- actually weighing pre-weighed ingredients to determine if the weight on the container is accurate.

An ingredient added at a different level than indicated in the product formula could affect the ingredient order of predominance on the label. The product is misbranded if a declared ingredient is omitted, an ingredient is added but not declared on the label, or the ingredient order of predominance is not accurate. Depending on the type of undeclared ingredient (e.g., an allergen) that is added to the product, it may be either adulterated or misbranded or both.

The regulations and many product standards of identity allow the establishment to add various ingredients to the formulae of certain meat and poultry products.

Some meat and poultry components used in the formulation may have regulatory limits. Some nonmeat ingredients have a specified maximum amount or percentage allowed in the product. These nonmeat ingredients are called **restricted** ingredients. The establishment **MAY** add the component or ingredient in any amount up to its permitted limit.

If the product is formulated with a meat or poultry component with a regulatory limit or with a restricted ingredient, the IPP should select one or more batches of product during formulation. They should determine the amount or percentage of the meat or poultry component and/or the amount one or more restricted ingredients used in the formula. The IPP verifies that the:

- percentage of meat or poultry component meets the regulatory limit,
- restricted ingredient is allowed in the product, and
- the amount of the restricted ingredient added to the product does not exceed the regulatory limit.

Verifying meat and poultry components or restricted ingredients are in compliance with regulatory limits usually requires the IPP to perform a formula calculation.

When meat or poultry components or restricted ingredients are added at levels in excess of their maximum regulatory limit, they become **economic adulterants**.

If IPP find noncompliance, they issue an NR and take the appropriate action necessary to ensure adulterated or misbranded product does not enter commerce.

Labeling Summary Workshop

Scenario

You are a CSI with a small raw ground beef product establishment on your assignment. The establishment produces ground beef, hamburger, and beef patties. The standards of identity for these products are provided at the end of the workshop.

The establishment has one HACCP plan under the Raw Product Non-Intact HACCP category. The company has 50 employees and produces about 50,000 lbs. of raw ground beef products a week. It operates two continuous production lines 8-hours a day, 5 days a week; the establishment has determined one day's production of a raw beef product is a lot.

The ground beef patties are 100% beef and produced using a two-step grinding method. The hamburger patties and beef patties have non-meat ingredients added at the blending step. The process of producing these patties involves a coarse grind, mixing and blending the meat and ingredients, and a final grind. Ingredients added to the hamburger patties include salt, seasonings and corn syrup. Ingredients added to the beef patties include salt, dried onions, flavorings, soy flour and water. The company does not rework broken or misshaped patties and it does not accept returned products. The patties are distributed in shelf ready 36-ounce trays or bulk packed in 20 lb. boxes.

The General Labeling task appears on your task schedule today.

You make your way to the production floor and ask the production supervisor what raw beef products are being produced. She states that tray packed beef patties are being produced on both lines. You review the labels, product formulation, and production procedures for the beef patties on file in the production supervisor's office.

You decide to verify product formulation. So, you observe the following ingredients added to the large blender on line 1 and line 2.

300.0 lb. 60/40 Beef Trimmings

85.0 lb. Water

60.0 lb. Soy Flour

25.0 lb. Flavorings

17.5 lb. Dried Onions

12.5 lb. Salt

You follow the product through the process. At the packaging step for **line one**, you observe the label/labeling being placed on the trays (immediate container) and the shipping container

markings.

The label below is being placed on the top of the tray and the safe handling instructions below are placed on the bottom of the tray. This is the only labeling applied to the trays.

Homestyle Beef Patties	Keep Frozen
Ingredients: Beef, Soy Flour, Water, Flavorings, Dried Onions and Salt.	UPC
	
Packed by: ABC Packing House Anytown NC, 12345	

The shipping container has the inspection legend on it in the upper right corner. This is the only printed information on the outside of the box.



At the packaging step for **line two**, you observe the following label/labeling being placed on the trays (immediate container) and the shipping container markings.

The label below is being placed on the top of the tray and the safe handling instructions illustrated above are placed on the bottom of the tray. This is the only labeling applied to the trays. The shipping container for these trays has the inspection legend on it in the upper right corner. This is the only printed information on the outside of the box.

Blue Ribbon Ground Beef Patties	Keep Frozen
<i>100% Beef</i>	
	
Packed by: ABC Packing House Anytown NC, 12345	Net Wt. 36 oz. (2.25 Lb.)

1. What is your first name?
2. What is your last name?

3. Based on the review of the product formulation and the labeling applied to the immediate containers and shipping containers, has the establishment produced misbranded product?
 - a. Yes
 - b. No

4. Based on the review of the product formulation and the labeling applied to the immediate containers and shipping containers, has the establishment produced adulterated product?
 - a. Yes
 - b. No

5. Is there a food safety hazard associated with the production of the product?
 - a. Yes
 - b. No

Workshop Reference Materials

Product Standards

FSIS regulations prescribe standards of identity, or composition, for many meat and poultry products. Standards of identity set specific requirements for a product's make-up. For instance, a product standard may identify:

- the kind and percentage of meat or poultry required in the product,
- the maximum percentage of a non-meat/non-poultry ingredient allowed in the product,
- the maximum percentage of a specific meat or poultry ingredient such as beef cheek meat or Mechanically Separated (Species)
- ingredients that are allowed or expected in the product, and
- any ingredient that **is not** allowed in the product.

Non-meat ingredients that have a maximum percentage allowed in the finished product are called **restricted ingredients**. The establishment MAY add the ingredient in any amount up to its **permitted limit**. When restricted ingredients are added at levels in excess of the regulatory limit, **they become adulterants**.

319.15 Miscellaneous beef products.

(a) *Chopped beef, ground beef.* “Chopped Beef” or “Ground Beef” shall consist of chopped fresh and/or frozen beef with or without seasoning and without the addition of beef fat as such, shall not contain more than 30 percent fat, and shall not contain added water, phosphates, binders, or extenders. When beef cheek meat (trimmed beef cheeks) is used in the preparation of chopped or ground beef, the amount of such cheek meat shall be limited to 25 percent; and if in excess of natural proportions, its presence shall be declared on the label, in the ingredient statement required by § 317.2 of this subchapter, if any, and otherwise contiguous to the name of the product.

(b) *Hamburger.* “Hamburger” shall consist of chopped fresh and/or frozen beef with or without the addition of beef fat as such and/or seasoning, shall not contain more than 30 percent fat, and shall not contain added water, phosphates, binders, or extenders. Beef cheek meat (trimmed beef cheeks) may be used in the preparation of hamburger only in accordance with the conditions prescribed in paragraph (a) of this section.

(c) *Beef patties.* “Beef Patties” shall consist of chopped fresh and/or frozen beef with or without the addition of beef fat as such and/or seasonings. Binders or extenders, mechanically Separated (Species) used in accordance with § 319.6, and/or partially defatted beef fatty tissue may be used without added water or with added water only in amounts such that the product characteristics are essentially that of a meat patty.

Attachment 1: FSIS Directive 7221.1 Table 1 Required Label Features

Feature	Reference	Location	Applies to
Product Name	9 CFR 317.2(c)(1) or 381.117	Principal display panel	All products
Inspection Legend and Establishment Number*	9 CFR 317.2(c)(5) or 381.123	Principal display panel, or 20% panel of a cylindrical container	All products
Handling Statement (e.g. "Keep Frozen")	9 CFR 317.2(k) or 381.125(a)	Principal display panel	Products requiring special handling to maintain wholesomeness
Net Weight Statement	9 CFR 317.2(h) or 381.121	Principal display panel	Product sold at retail, unless the net weight is applied at retail
Ingredients Statement**	9 CFR 317.2(f) or 381.118	Principal display panel, Information panel, 20% panel of a cylindrical container, or Front riser panel of a frozen food carton	Products with multiple ingredients
Name and Place of Business of the Manufacturer, Packer, or Distributor	9 CFR 317.2(g) or 381.122	Principal display panel, Information panel, 20% panel of a cylindrical container, or Front riser panel of a frozen food carton	All products
Nutrition Facts Panel	by 9 CFR 317.300 or 381.400	Principal display panel or Information panel	Products not exempted by 9 CFR 317.400 or 381.500
Safe Handling Instructions	9 CFR 317.2(l) or 381.125(b)	Anywhere on the immediate container	Products with a not-ready-to-eat meat or poultry component

***NOTE:** As stated in §317.2(i), the establishment number may be located inside or outside of the inspection legend. The establishment number may be located anywhere on the exterior of the container or its labeling; for example, it may be located on the end of a can if it is prominent, legible, and accompanied by the prefix “Est”. The establishment number may be located off the exterior of the container when there is a statement identifying the location of the number; for example, "Est. No. on clip" is printed on a bag containing product.

****NOTE:** All ingredients used in the product must be listed in the ingredients statement. Product is considered adulterated if an allergen is not listed in the ingredients statement. IPP are to contact their supervisor for guidance if at any time they have reason to believe that product failing to declare one of the “big 8” allergens [wheat, crustacean shellfish (e.g. crab, lobster, shrimp), eggs, fish, peanuts, milk, tree nuts (e.g. almonds, pecans, walnuts), and soybeans] or other ingredients of public health concern has entered commerce. FSIS ingredient and allergen compliance guidelines are available online.

03 - Net Weight

Objectives

After completing this module, the student will be able to:

1. Define the following terms:

Net Weight

Random Weight

Drained Weight

Inspection Lot

Tare Weight

Package Error

Labeled Weight

Total Package Error

Standard Weight

Maximum Allowable Variation (MAV)

2. Describe the steps for verifying net weight.
3. Describe the criteria for passing an inspection lot.
4. Determine whether an inspection lot passes or fails.

Introduction

Meat and poultry establishments must assure that the net weight statement on a label is not false or misleading and expresses an **accurate** statement of the quantity of contents. Since absolute accuracy is virtually impossible, FSIS net weight regulations allow “reasonable” variations from labeled weight.

Terminology

Net weight -The weight of the packaged product remaining after the deduction for **tare** weight. It is the weight of the nutritious content in the container suitable for food.

Drained weight -The weight of the solids in the container when packed in non-nutritious media.

Tare weight -The weight of the container, box, wrapper or other packaging material. It is always excluded from gross weight when determining the actual net weight.

Labeled weight - The net weight declared on the label.

Standard weight packages - Packages or containers that contain a predetermined amount of product and have identical net weight declarations, e.g., the full net weight statement is pre-printed on labeling, such as, Net Wt. 12 oz.

Random weight packages - Packages or containers that contain a varying amount of product and will not have identical net weight declarations, e.g., each package is weighed and the

specific net weight is written into a printed open net weight statement, such as, Net Wt. _____LBS, another example is when a scale generates an individual price/weight sticker to apply to the package.

Task Name	9 CFR References	FSIS Issuance References	Inspection Personnel Verification Activities
Labeling - Net Weights	9 CFR §442.1, §442.2, §442.3, §442.4, §442.5	<p><u>NIST Handbook 133</u> <u>NIST Handbook 44</u> * FSIS inspectors are to use these handbooks as the definitive references for determinations of net weight compliance. Sections identified in §442.2(b) of NIST HB133 should Not be used.</p>	<p><u>Select an appropriate retail-sized product and</u> 1. <u>Verify net weight regulatory requirements by reviewing establishment records and conducting net weight/drained weight, scale calibration, or tare weight checks.</u> 2. <u>Follow the QC program requirements after evaluating the program to ensure that following the program results in compliance with net weight regulatory requirements.</u></p>

Directive 7000.1, *Verification of Non-Food Safety Consumer Protection Regulatory Requirements*, identifies the regulations, references, and verification activities for performing the Net Weight task.

Net Weight Lot Inspection Verification Task

Prior to performing a net weight verification activity, IPP should review the requirements in *NIST Handbook 44* and then will verify net weight following the procedures in *NIST Handbook 133*. IPP must ensure the scales are of sufficient size, solidly supported, level and accurate. The scales are to be certified by the state’s or local government’s weights and measures

authority or from a registered or licensed individual at least once per calendar year. The valid certification is to be displayed on or near the scale.

Steps to Determine Net Weight

1. Determine the number of containers or packages in the inspection lot.

Inspection lot - A collection of identically labeled packages or containers from the same production shift available for inspection at one time. The IPP determines the inspection lot. The inspection lot passes or fails as a result of net weight testing.

IPP should define which packages are to be tested as well as determine the size of the inspection lot. An *inspection lot* is defined as a collection of identically labeled packages or containers from the same production shift available for inspection at one time. Enforcement action can only be taken on the packages contained in the lot that has been defined.

Lots may be made up of either standard or random weight packages. **“Standard packages”** are those with identical net content declarations such as containers of soda in 2 L bottles and 2.26 kg (5 lb) packages of flour. **“Random packages”** are those with differing or no fixed pattern of weight, such as packages of meat, poultry, fish, or cheese.

2. Refer to second column of Table 2-2 Sampling Plans for Category B from NIST Handbook 133.

Table 2-2. Sampling Plans for Category B (for Use in USDA-Inspected Meat and Poultry Plants Only)			
1	2	3	4
Inspection Lot Size	Sample Size	Initial Tare Sample Size	Number of Packages Allowed to Exceed the MAVs in Table 2-9
250 or Fewer	10	2	0
251 or More	30	5	0

IPP should use “Category B” sampling plans only to test meat and poultry products that are subject to USDA/FSIS regulatory requirements at the point-of-pack locations.

3. Record the inspection data.

All information collected should be recorded. There is no regulation or policy stating that there is a specific type of form that should be utilized to document the inspection data. It may be more practical to write the information in a notebook vs a form. See **Attachment 2**.

IPP must become familiar with the required information needed to officially determine if net weight is in compliance. There are minimum requirements for the information that should be collected to verify net weight compliance. Each state may alter the forms slightly as long as the minimum NIST criteria are met. The IPP should attach any additional notes, worksheets, etc. as needed.

4. Select the random sample.

Testing a “sample” of packages from a lot instead of every package in a shipment is efficient, but the test results have a “sampling variability” that must be corrected before determining if the lot passes or fails.

A randomly selected sample is necessary to ensure statistical validity and reliable data. This is accomplished by using random numbers to determine which packages are chosen for inspection. Improper collection of sample packages can lead to bias and unreliable results. Appendix B of NIST Handbook 133 provides Random Number Tables and describes various ways to use the tables to randomly select packages within the inspection lot.

5. Randomly collect a tare sample and determine the average tare weight.

- See Column 3 of NIST Handbook 133 Table 2-2 Sampling Plan for Category B to determine the Initial Tare Sample Size based on the Inspection Lot Size
 - If available, unused dry packaging may be used to determine the tare weight
 - When packages are opened to determine the tare weight, use the first 2 (or 5) randomly selected packages of the Inspection Lot in order that they were selected to determine the dry tare weight.
 - Weigh each set of packaging materials in the tare sample
 - Add the weights together
 - Divide the total tare weight by the sets of packaging material in the tare sample
- NOTE: When the average tare weight is exactly half of a scale division, round the value up to the next scale division (e.g. If the scale units are 1 gram and tare 1=19 g and tare 2=20 g, round the 19.5 g average up to 20g). Additional rounding examples are in **Attachment 1** at the end of the module.

6. Determine:

Nominal Gross Weight: Add the Average Tare Weight (as determined in step 5 above) to the labeled weight to determine the Nominal Gross Weight. Make sure you use the same units of measure for both values and that matches the units of measure of the scale being used.
 (average tare weight + labeled weight) = nominal gross weight

Package error: The difference between the gross weight (the weight of each individual sample package that includes the food product and the packaging weight) and the nominal gross weight.

(gross weight of the sample – nominal gross weight) = package error

-/+ Package error: When the nominal gross weight weighs more than the gross weight the sample package weighs more than what the label declares and is recorded as a positive (+) package error under the + column. When the nominal gross weight weighs less than the gross weight the sample package weighs more than what the label declares and is recorded as a negative (-) package error under the – column.

If desired, the package error may be expressed as “plus” or “minus” dimensionless unit by dividing the package error by the scale graduation. This method eliminates leading zeros and the units of measure and results in whole numbers.

Total Package Error: The sum of all of the individual package errors.

–	+
1.	38
2.	12
3.	8
4.	4
5. 3	
6. 2	
7.	12
8. 3	
9.	4
10. 1	
Total: 9	Total: 78
Total Package Error: +69	

Table 1: *Maximum Allowable Variation (MAV)*: The maximum amount the actual net weight of an individual package or container may be under its labeled weight. It represents the maximum underweight or short weight a package can be and still be considered “reasonable” under good manufacturing processes. The MAV is provided in NIST Handbook 133 Table 2-9.

Table 2-9. U.S. Department of Agriculture, Meat and Poultry Groups and Lower Limits for Individual Packages (Maximum Allowable Variations)

Definition of Group and Labeled Quantity		Lower Limit for Individual Weights (MAVs)
Homogenous Fluid When Filled (e.g., baby food or containers of lard)	All Other Products	
Less than 85 g or 3 oz		10% of labeled quantity
85 g or more to 453 g 3 oz or more to 16 oz		7.1 g 0.016 lb (0.25 oz)
More than 453 g More than 16 oz	85 g or more to 198 g 3 oz to 7 oz	14.2 g 0.031 lb (0.5 oz)
	More than 198 g to 1.36 kg 7 oz to 48 oz	28.3 g 0.062 lb (1 oz)
	More than 1.36 kg to 4.53 kg More than 48 oz to 160 oz	42.5 g 0.094 lb (1.5 oz)
	More than 4.53 kg More than 160 oz	1 % of labeled quantity

7. Apply the decision criteria to determine net weight compliance.

Decision criteria: The rules for determining whether the inspection lot complies with the net weight requirements. The net weight test results must meet **BOTH** criteria.

- The total package error (sum of the individual package errors) is equal to or greater than zero; **AND**
- No individual minus package error can exceed the MAV.

8. Take appropriate action based on net weight testing results.

9 CFR 442.5 specifies that a lot tested in an official establishment and found not to comply with net weight requirements **may** be reprocessed and **must** be reweighed and remarked. A lot tested outside an official establishment **must** be reweighed and remarked with a proper weight statement.

Attachment 1:

Tare Rounding Examples

Tare Weights	Scale Graduation	Average Tare Weight	Rounded Tare Value
0.14 & 0.17 lb	0.01 lb	0.155 lb	0.16 lb
5/32 & 8/32 oz	1/32 oz	6.5/32 oz	7/32 oz
0.20 & 0.25 lb	0.05 lb	0.225 lb	0.25 lb
5.06 & 5.15 g	0.01 g	5.105 g	5.11 g

ATTACHMENT 2:

NET WEIGHT WORKSHEET					
DATE	ESTABLISHMENT NO.	SCALE DIVISION	AVERAGE TARE WT.	GROUP NO.	MAV (Lower Limit)
LOT SIZE	SAMPLE SIZE	PRODUCT AND CONTAINER CODE:			LABELED WEIGHT

STANDARD WEIGHTS (10 or 30 sample size)		
UNIT	+	-
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL + 'S AND -'S (10 weights)		
TOTAL ERROR + 'S AND -'S (10 wts.)		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
TOTAL + 'S AND -'S (30 weights)		
TOTAL ERROR + 'S AND -'S (30 wts.)		

CATCH WEIGHTS (10 or 30 sample size)				
UNIT	LABEL WEIGHT	ACTUAL WEIGHT	+	-
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL + 'S AND -'S (10 weights)				
TOTAL ERROR + 'S AND -'S (10 weights)				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
TOTAL + 'S AND -'S (30 weights)				
TOTAL ERROR + 'S AND -'S (30 weights)				

PASS / FAIL DECISION CRITERIA

MAV CRITERIA: Is any single minus (-) unit greater than the MAV? <input type="checkbox"/> YES - Lot Fails <input type="checkbox"/> NO - Check Total Error	TOTAL ERROR CRITERIA: Is the total error equal to or greater than zero? <input type="checkbox"/> YES - Lot is Acceptable <input type="checkbox"/> NO - Lot Fails
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FSIS FORM 7240-1 (7/91)

REPLACES FSIS FORM 7240-1 (3/86), WHICH IS OBSOLETE.

Net Weight Workshop

Scenario 1: You are in an establishment producing raw, non-intact beef product producing packages of ground chuck. The current number of packages available for sampling is 237. The unit of measure for the certified scale being used is 0.001 lb.

Table 2-2. Sampling Plans for Category B (for Use in USDA-Inspected Meat and Poultry Plants Only)			
1	2	3	4
Inspection Lot Size	Sample Size	Initial Tare Sample Size	Number of Packages Allowed to Exceed the MAVs in Table 2-9
250 or Fewer	10	2	0
251 or More	30	5	0

3. What is the sample size of the packages that you should examine?
 - a. 30
 - b. 10
 - c. 2
 - d. 5
4. What is the initial tare sample size?
 - a. 30
 - b. 10
 - c. 2
 - d. 5

The sample tare weights were **0.020 lb** and **0.021 lb**

5. What is the Average Tare Weight?
 - a. .022
 - b. .21
 - c. 02
 - d. .021 lb

Table 2-9. U. S. Department of Agriculture, Meat and Poultry Groups and Lower Limits for Individual Packages (Maximum Allowable Variations)		
Definition of Group and Labeled Quantity		Lower Limit for Individual Weights (MAVs)
Homogenous Fluid When Filled (e.g., baby food or containers of lard)	All Other Products	
Less than 85 g or 3 oz		10% of labeled quantity
85 g or more to 453 g 3 oz or more to 16oz		7.1 g 0.016 lb (0.25 oz)
More than 453 g More than 16 oz	85g or more to 198 g 3 oz to 7 oz	14.2 g 0.031 lb (0.5 oz)
	More than 198 g to 1.36 kg 7 oz to 48 oz	28.3 g 0.062 lb (1 oz)
	More than 1.36 kg to 4.53 kg More than 48 oz to 160 oz	42.5 g 0.094 lb (1.5 oz)
	More than 4.53 kg More than 160 oz	1 % of labeled quantity

Scenario 2: You are in an establishment producing 8 oz. (226 g) individually packaged frozen beef burritos. There are 1600 packages currently available for sampling. The unit of measure for the certified scale in use is .1 grams. You weigh two complete sets of the packaging material. One set weighs 2.2 g and the other set weighs 2.3 g. You place the heavier set of packaging material back on the scale (2.3 g is the average tare weight) and press the “Tare” button to zero out the scale before weighing the product filled packages.

Gross Weight (g)	Labeled Net Weight (g)	Package Error
236.4	226	104
232.2	226	62
226.6	226	6
242.8	226	168
228.9	226	29
234.0	226	80
222.2	226	-38
230.5	226	45
236.3	226	103
218.2	226	-78
238.9	226	129
230.3	226	43
232.4	226	64
230.0	226	40
230.4	226	44
228.7	226	27
234.6	226	86
238.3	226	123
240.0	226	140
230.8	226	48
232.2	226	62
198.0	226	-280
240.7	226	147
236.6	226	106
242.0	226	160
232.9	226	60
196.2	226	-298
236.0	226	100
228.5	226	25
234.1	226	81

6. What is the sample size of the packages you should examine?

- a. 30
- b. 10
- c. 2
- d. 5

7. What was the total package error?

- a. - 1388
- b. + 1388
- c. - 1269
- d. + 1269

8. Did the lot meet the MAV criteria?

- a. Yes
- b. No

9. Did the lot pass?

- a. Yes
- b. No

Scenario 3: You are in an establishment producing 5 lb packages of raw, frozen chicken breasts. There are 243 packages currently available for sampling. The unit of measure for the certified scale being used is 0.001 lb.

10. What is the sample size of the packages that you should examine?

- a. 30
- b. 10
- c. 2
- d. 5

11. What is the initial tare sample size?

- a. 30
- b. 10
- c. 2
- d. 5

Tare weights sampled 0.072 and 0.073

12. What is the average tare weight

- a. .73
- b. .073
- c. .72
- d. .072

Gross weight (lb)	Labeled Net Weight (lb)	Nominal Gross Weight (lb)	Package Error
5.098	5.000	5.073	25
5.095	5.000	5.073	22
5.079	5.000	5.073	6
4.998	5.000	5.073	-75
5.088	5.000	5.073	15
5.083	5.000	5.073	10
5.071	5.000	5.073	-2
5.089	5.000	5.073	16
5.092	5.000	5.073	19
5.067	5.000	5.073	-6

13. What was the total package error?

- a. 30
- b. 10
- c. 2
- d. 5

14. Did the lot meet the MAV criteria?

- a. Yes
- b. No

15. Did the lot pass?

- a. Yes
- b. No

Example Using the Calculation Aid

Access the Calculation Aid as follows: Start Menu > FSIS Applications > Calculation Aid > Select Net Weights

Menu

Net Weights

Step 1: Calculate Average Tare Weight

tare 1: + tare 2:

2

scale graduation:

average tare: **0.025**

Calculate

Step 2: Calculate the MAV

lower limit:

scale graduation:

MAV: **-62**

Calculate



Net Weights

Step 3: Enter sample weights

Reset

sample gross weight	sample labeled weight	individual package error
1.063	1.000	38

Calculate
and Save



Total Samples Saved: 1



Net Weights

Step 4: Determine lot pass/fail

individual package errors

38
12
8
4
-3.001
-2.001
12
-3.001
4
-1.001

MAV

-62

Make Determination



total package error

68.996

Lot passed.

04 - Sausage Operations

Sausage (9 CFR Part 319, Subparts E, F, G, I, J, L; Part 381, Subpart N, P) is a coarse or finely **comminuted** (i.e., reduced in size by grinding and/or chopping) meat or poultry product made from raw or frozen meat, poultry, meat and poultry byproducts, and may contain mechanically separated meat or poultry. Sausages may be raw or cooked, contain various amounts of water, are typically seasoned, and are fresh (i.e., uncured) or cured.

9 CFR 319.140 addresses sausage in general and includes fresh sausage prepared from one or more kinds of meat or meat byproducts. **Meat** (§301.2) is the skeletal muscle of any cattle, sheep, swine, or goats, or which is found in the tongue, cheeks, diaphragm, beef heart cardiac muscle trimmed from the ventricular wall, or esophagus, with or without the normally accompanying and overlying fat. **Meat byproduct** (§301.2) is any part of cattle, sheep, swine, or goats, other than meat, which is capable of use as human food. Meat byproducts (“variety meats”) include pork stomachs or snouts; beef, veal, lamb, or goat tripe; whole beef, veal, lamb, goat, or pork hearts, tongues, fat, lips, weasands, and spleens; muscle tissue from ears; and partially defatted pork fatty tissue (PDPFT), or partially defatted beef fatty tissue (PDBFT).

Poultry (§381.118) is the deboned white and dark meat, including other edible parts such as skin and fat not to exceed natural proportions. For cooked sausages, **poultry meat** (§319.180(g)) is deboned chicken and/or turkey meat without skin or added fat and **poultry byproduct** (§381.2(c)) is any poultry skin, fat, gizzard, heart, or liver.

Mechanically separated species (MSS) is the mechanical separation and removal of the attached skeletal muscle of livestock carcasses and parts, excluding beef, from the bone (§319.5 - .6). **Mechanically separated kind of poultry** (MSK or MSKP) is the mechanical separation and removal of attached skeletal muscle and other tissue from most of the bone from poultry carcasses and parts (e.g., chicken, turkey), with or without skin with attached fat (§381.173 - .174). The result of mechanical separation is a finely comminuted product with paste-like form and consistency (“batter”). The **meat block** is the meat, poultry, and/or meat or poultry byproduct components in the product formulation.

Additives

A sausage **additive** is any safe ingredient, other than the meat, poultry, or meat and poultry byproducts. The industry supports and controls additive use while FSIS shares

responsibility with FDA for food additive safety. An additive, which may be limited or restricted in use, must be:

- (1) safe and suitable.
- (2) not detract from the product or promote deception.
- (3) serve a useful purpose or benefit the consumer.
- (4) lend itself to inspectional and/or analytical control.

Water is added to a sausage formulation to control temperature, aid in mixing other additives, facilitate stuffing, and improve texture and yield. Added water is limited to 3% of the total ingredients (excluding the weight of water or ice added to the formulation) in uncured (“fresh”) or cured raw meat sausages, uncooked smoked pork sausage, and any version of Italian sausage. Added water in cooked meat sausage products is limited to 10% of the finished product weight unless otherwise stated. Poultry sausages bearing the poultry mark of inspection have no added water limits.

Salt contributes to flavor, solubilizes and releases muscle fiber proteins, prevents fat separation during cooking, binds water to improve product yield, texture, and palatability, suppresses bacterial growth, and extends product shelf-life. Spices and flavorings impart unique taste characteristics in sausage.

Spice, whose primary function is seasoning rather than nutritional, means any aromatic vegetable substance in whole, broken, or ground form, other than onions, garlic, and celery (§317.2(f)(1)(i)(A) and §381.118(c)(1)). Paprika, which adds color and makes meat look brighter red, must be listed in the ingredient statement of the label as “paprika” or “spices and coloring” if permitted.

Flavoring, whose primary function is taste rather than nutritional, include essential oils, oleoresins, (a mixture of resin and essential or fatty oil), and other flavoring constituents derived from a spice, any other edible portion of a plant, meat, seafood, poultry, eggs, dairy products, or fermentation products. Sweeteners add flavor, counteract the harshness of salt, increase water retention, and improve casing peelability.

Sweeteners and **sugars** (e.g., sucrose, dextrose) are the primary food source for the lactic acid-producing bacteria starter cultures that drive the fermentation process and contribute to a characteristic tangy flavor in sausage. Malt syrup and sorbitol, which are not as sweet as sugar, are restricted in cured meat sausages and not permitted in

poultry products.

Restricted Ingredients

Restricted ingredients are approved for use in sausage products for the purposes indicated, within the stated limits, and under other conditions specified in 9 CFR Parts 318, 319, 381, and §424.21(c). Restricted ingredients, with the exception of flavorings designated in §381.118(c) and (2), must be declared in the ingredient statement by its common or usual name.

Antioxidants are chemicals that help stabilize product color and inhibit development of "off" odors and flavors by preventing oxidative rancidity. Antioxidants permitted in fresh sausage formulations are based on fat content and antioxidants allowed in dry sausages are based on total weight. The most common antioxidants used in sausages, which are limited to = 0.01% individually and 0.02% in combination, are BHA (butylated hydroxy anisole), BHT (butylated hydroxytoluene), and propyl gallate. Tocopherol may also be permitted but is limited to 0.03% and may not be used with other antioxidants.

Synergists are used to increase antioxidant effectiveness. Any meat sausage product that is permitted to contain antioxidants may contain citric acid as a synergist in amounts not to exceed 0.01% based on fat content. Fresh pork sausage products may contain no more than 0.02% monoglyceride citrate or monoisopropyl citrate as synergists.

Binders and extenders may be used individually or collectively in certain sausages to improve product sensory characteristics (e.g., texture, juiciness, flavor), sliceability, and yield. Most binders and extenders permitted in sausage are allowed at a maximum level of 3.5% of the finished product weight. However, isolated soy protein and sodium caseinate are limited to 2% due to a high protein content.

Phosphates, which are not permitted in raw sausage products, increase water retention (i.e., water binding capacity) and reduce shrinkage by controlling moisture loss in cooked sausages during further processing. Comminuted meat and poultry products may contain 0.5% phosphates in the total or final product.

Antimicrobial agents (e.g., sodium lactate/diacetate or other organic salts) may be added to sausage formulations as either flavoring agents or to inhibit microbial growth.

When these ingredients are added to sausage formulas, IPP need to determine their intended purpose.

Cure accelerators (e.g., sodium ascorbate, sodium erythorbate) increase the effectiveness of nitrite, help speed up color development, and stabilize cure color. Cure accelerators may only be used in association with approved curing agents.

Cures or curing agents are added to sausages (e.g., semi-dry and dry sausages, specific and nonspecific loaf) to develop flavor, color, and extend shelf life. Cures such as **sodium** or **potassium nitrite**, and less commonly **sodium** or **potassium nitrate**, have bacteriostatic properties that inhibit or suppress the growth of *Clostridia* spp. and other spoilage microorganisms in addition to antioxidant effects. The amount of cure permitted in sausage products is based on the meat block **green weight** (i.e., the weight of the meat and/or poultry components prior to processing). Do not include cured bacon in the sausage product meat block when calculating curing agent or cure accelerator ingredient regulatory limits.

Curing agents are typically added in very low concentrations to sausage products through a cure mix or curing compound that is pre-mixed with other ingredients such as salt, sugar, corn syrup solids, or monosodium glutamate. Curing agents combine with the muscle pigment *myoglobin*, an iron- and oxygen-binding protein, to form the characteristic pink-red color and develop the cured meat sausage flavor that cannot be reproduced with other ingredients. Nitrite is actually converted (“reduced”) by bacteria in the meat or poultry to form nitric oxide, which reacts with the myoglobin. If nitrate is used as source for nitrite, it must first be reduced to nitrite, which is then further reduced to nitric oxide. This nitrate reduction process is very difficult to control and slows the development of the cured color because the nitrate conversion rate and amount of nitrite formed is dependent on environmental factors (e.g., temperature, moisture content, salt content, pH) and the numbers of nitrate-reducing bacteria present in the sausage mixture.

The use of nitrites and nitrates must be carefully controlled because these ingredients can be toxic to humans at very high levels. Nitrites and mixtures containing them must be kept securely under the care of a responsible establishment employee. Containers containing a cure mix (e.g., Prague powder) must indicate the percentage of nitrite and/or nitrate in the mixture. Most curing compounds are tinted with FD&C Red #3 dye as an identification aid. Such compounds must be labeled to identify the dye, but no reference to the coloring is required on a sausage product label because the small amount used would not affect product color.

Many establishments now add naturally occurring sources of sodium nitrate and nitrite (e.g., celery powder, beet juice, sea salt) to cooked sausage formulations. Natural sources of nitrite and nitrate are not approved as curing agents but are sufficient to develop and maintain the pink coloring. Sausage products formulated with natural sources of nitrite instead of synthetic curing agents identified in §424.21(c) must be labeled as "uncured." In addition, the label must contain the statement "no nitrates or nitrites added" qualified by the statement "except for those naturally occurring in [name of natural source of nitrite such as celery powder]." Unless the pH is 4.6 or below or the water activity is .92 or less, these sausage products must also bear "Not Preserved— Keep Refrigerated Below 40°F At All Times" in easy to read lettering adjacent to and at least one-half the size of the product name.

FSIS has determined that **natural sources of nitrite** will likely control *C. botulinum* growth when used with a cure accelerator. To control the growth of *Clostridia* spp., establishments should add at least 100 ppm ingoing nitrite from the natural source along with at least 250 ppm of ingoing ascorbate at safe and suitable levels as outlined in §424.21(c) and FSIS Directive 7120.1. Additional information for natural sources of nitrite can be found by reviewing AskFSIS questions "Use of celery powder and other natural sources of nitrite as curing agents" and "Appendix B: Stabilization Option 3 for products containing celery powder and other natural sources of nitrite."

Food Ingredients Exercise

Answer the following questions using Module 4 Sausage Operations information in the student notebook.

1. *What is your first name? (online only)*
2. *What is your last name? (online only)*
3. What are the four criteria required for an additive to be allowed in a sausage product?
 - Safe and suitable
 - Does not detract from the product or promote deception
 - Cost effective
 - Serves a useful purpose or benefits the consumer
 - No regulatory limit
 - Lends itself to inspectional and/or analytical control
4. A spice may be listed in a label ingredients statement as spice, flavor, flavoring, or by common or usual name, and a flavoring may be listed in an ingredients statement as flavor or flavoring, by common and usual name, but cannot be listed as spice. True or False?
 - True
 - False
5. When an antioxidant is permitted in a sausage, the percentage allowed is based on the weight of the _____.
 - meat block
 - fat content
 - finished product
 - entire weight of the ingredients, excluding the weight of water or ice used
6. Water or ice may be used in the preparation of raw sausage products in an amount not to exceed what percentage of the total ingredients?
 - 1 %
 - 3 %
 - 10 %
 - 15 %
7. For most cooked sausages, added water may be no more than what percentage of the finished product?
 - 1 %
 - 3 %
 - 10 %
 - 15 %

Types of Sausages

Fresh sausage (§319.141-145) does not contain curing agents unless otherwise permitted (e.g., **Italian sausage**, §319.145). **Uncooked, smoked pork sausage** (§319.160) is also not cured and obtains distinct flavors and aromas from the smoking process. **Cooked sausages** such as frankfurters, franks, hotdogs, weiners, viennas, bologna, knockwurst, and similar products (§319.180-182) are cured, semisolid sausages prepared from one or more kinds of comminuted meat or poultry. Cooked sausages are permitted to contain phosphates and may gain distinct flavors from added nitrite curing agents and aromas if smoked. Cooked sausages are typically stuffed into a semi-permeable or impermeable casing or stainless-steel mold, then cooked in either a heating unit or hot water bath.

Semidry and dry sausages (§319.260-261) are fermented by lactic acid-producing bacteria or directly acidified. Semi-dry (e.g., summer, Genoa) and dry sausages (e.g., salami, pepperoni) may be uncooked, cooked, or smoked. All semidry and dry sausages undergo a controlled air drying process (“product stabilization”). Sausages with a standard of identity for which nitrate or nitrite is permitted may also be prepared without nitrate or nitrite. Such sausage products (§319.2) must be labeled with the term “uncured” as part of the product name.

Many establishments that produce cooked sausages also produce **specific loaf** (§319, Subpart K) and **nonspecific loaf** (§319, Subpart L), which are addressed in this training module. Specific and nonspecific loaf, which are not sausage products, are similarly processed comminuted, emulsified, semisolid products made from seasoned and cured raw or cooked meat or poultry.

Sausage Standard of Identity

Some sausage products are produced under a specified name or **standard of identity** identified in 9 CFR Part 319 and the Food Standards Labeling and Policy Book (FSLPB). Be aware when working with sausage products that the specific order of the product name is critical in determining which standard of identity may be applicable. For example, “uncooked smoked pork sausage” follows §319.160 but “uncooked pork smoked sausage” follows §319.140. Additional requirements for sausage product labeling are provided in §317.8.

Fresh pork sausage (§319.141) only contains fresh or frozen pork and no byproducts. Fresh pork sausage may contain mechanically separated pork up to 20% of the meat block, no more than 50% fat content in the finished product, and 3% or less added water. Antioxidants are allowed, but binders and extenders are not permitted.

The term “country style” may be used for **fresh country style pork sausage** when it is labeled in accordance with §317.8(b)(2). In addition, any sausage products labeled “country” or “farm” style must be prepared in the same way as in the country or farm and have the same characteristics. Only natural spices (i.e., no oleoresins, spice extractives, or essential oils) and sugar as the sweetening agent are allowed in sausages labeled “country” or “farm” style.

Fresh beef sausage (§319.142) may contain fresh or frozen beef with no byproducts, binders and extenders, no more than 30% fat content in finished product, and up to 3% added water. Mechanically separated species up to 20% of the meat block are permitted, as are antioxidants.

Breakfast sausage (§319.143) may contain fresh or frozen meat, fresh or frozen meat and meat byproducts, binders and extenders up to 3.5% or 2%, up to 50% fat content in finished product, and no more than 3% added water. Mechanically separated species up to 20% of the meat block and antioxidants are also permitted.

Whole hog sausage (§319.144) is prepared fresh and/or frozen meat from swine in proportions normal to a single carcass. Mechanically separated pork produced in natural proportions from a single hog is allowed. Whole hog sausage may not contain added water to exceed more than 3% of the total ingredients or more than 50% fat content in the finished product. Antioxidants are permitted, but binders and extenders are not.

Italian sausage (§319.145) may be cured or uncured and raw or cooked. Under the standard of identity, Italian sausage must contain at least 85% meat or meat and fat, no more than 35% fat in the finished, and 3% or less added water. Required ingredients that characterize Italian sausage include fennel and/or anise, salt, and any type of pepper. Although classified as a fresh sausage, Italian sausage may not be labeled as “fresh” when curing agents are added. Italian sausage is permitted to contain **paprika** as an ingredient under the standard of identity.

Bratwurst, chorizo, and linguica are other fresh sausages identified by a standard of identify in the FSLPB. These sausages are typically fresh sausages but may be cured. Cured Italian sausage and bratwurst must include the term “cured” on the product label (§319.145(a)(4), §319.140). Cured chorizo sausage does not require further product name qualification (FSLPB). Chorizo and linguica are permitted to contain **paprika** as an ingredient per the FSLPB and also §424.23(a)(2).

Fresh poultry sausage must be labeled to indicate the kind of poultry (e.g., “Chicken Sausage” or “Turkey Italian Sausage”) and meet other regulatory requirements in §319.140, except that added water and fat content limits are not applied to fresh poultry sausage. Products labeled “Italian Turkey Sausage” must meet all §319.145 requirements except for the fat and added water limits.

Cooked and/or smoked sausage products are produced under a standard of identity. These include **Polish sausage** and **cotto salami** (§319.140), **frankfurters, franks, furters, hotdogs, weiners, viennas, bologna, garlic bologna, salami, knockwurst,** and similar products (§319.180). **Cheesefurters** and similar products (§319.181) as well as **Braunschweiger** and **liverwurst** (§319.182) are also cooked and/or smoked sausages.

The cooked meat sausages listed in §319.180 may contain raw or cooked poultry meat and/or mechanically separated poultry without skin, kidneys, and sex glands up to 15% of the total ingredients, excluding water. These products are limited to no more than 30% fat, and may contain up to 40% fat in combination with added water. Comminuted, semisolid, seasoned, and cured sausages containing raw meat byproducts, or raw or cooked poultry products, must be labeled with the phrase “with byproducts” or “with variety meats” in the product name. Braunschweiger and liverwurst sausages are required to contain at least 30% fresh pork, beef, veal, sheep, and/or goat livers based on total batch weight. Braunschweiger may contain only pork, beef, and/or veal livers, and may be smoked, while liverwurst may contain liver from any amenable species and is not smoked.

Specific loaf (§319.260-261 and FSLPB) and **nonspecific loaf** (§319.280-281 and FSLPB) are formulated in a manner similar to sausage. These products are made with comminuted meat, meat and meat byproducts or poultry components (including MSKP), and nonmeat ingredients such as added water, various spices, and flavorings. Binders and extenders are permitted in specific and non-specific loaf unless otherwise indicated in §424.21(c) or the FSLPB. Specific and nonspecific loaf may contain ingredients such as pickles, olives, or pimentos, are stuffed into a casing or mold, then cooked. Specific

loaf has a standard of identity and must include the meat and poultry species in the product name (e.g., corned beef loaf, baked pork and chicken loaf, pork olive loaf, etc.). If poultry specific loaf contains more than 20% total livestock ingredients, the product name must be descriptively labeled to indicate the presence of the livestock ingredients (e.g., “Olive Loaf made with Chicken and Pork”). Nonspecific loaf has no standard of identity and may be labeled with either a descriptive name that identifies characterizing components and/or ingredients, or a fanciful or coined name accompanied by an ingredients statement contiguous to the product name. Examples of nonspecific loaf include “Olive Loaf” and “Pickle Loaf.”

General Sausage Preparation

Meat and poultry used in fresh sausage may be produced within the establishment during de-boning operations (e.g., whole hog pork sausage producers) or come from outside suppliers. Non-meat ingredients and packaging materials are almost always outsourced. Many processors rely on formal agreements with suppliers to ensure consistent product is received, including written purchase specifications that include quality aspects, such as the lean-to-fat ration in trimmings. For preblended or proprietary mixes, the establishment must provide an explicit breakdown of the ingredients and ensure that the ingredients are declared on the fresh sausage finished label.

Establishments are required under §320.1(b)(10) and §381.175(b)(6) to have on file any labeling records, product formulas, processing procedures, and additional documentation to support that products meet §412.1 labeling requirements. Establishments should **weigh and identify** individual ingredients according to the formula to create a consistent product batch and also ensure that the ingredients are accurately represented on the fresh sausage product finished label. Labels of spice or seasoning blends typically provide instructions for how much mixture to use for a specific amount of meat or poultry (e.g., one package seasoning mix per 100 lb. of meat). Restricted ingredients, some of which are allergenic, should be stored in separate containers for single batch formulas.

Meat and poultry components used in the formulation of raw and fresh sausages are comminuted through **chopping, grinding, flaking**, or a combination of methods. The comminuted meat and poultry is then mixed or blended with additives to achieve a uniform distribution of meat particles, fat, spices, flavorings, antioxidants, water, and other ingredients. The comminuted mixture may be stuffed into casings or chubs, shaped into skinless links, or formed into patties. The finished raw or cooked and/or smoked sausage products are packaged, labeled, and typically passed through metal detection before storage and distribution. Establishments must ensure that all ingredients, including those

in proprietary mixtures, are properly used and accurately declared on the finished product label by common or usual name.

Cooked Sausage Preparation

Cooked sausage products, which may or may not be cured, may combine meat and poultry components, mechanically separated species, water, and nonmeat ingredients to form a paste or **emulsion**. A mix of raw meat and/or poultry with appropriate water binding characteristics and nonmeat ingredients is essential to forming an emulsion. Emulsions may breakdown from too much added fat, over chopping of the meat and/or poultry mixture, increased mixture temperature, high acid content, low pH, or too rapid heating to a high temperature.

The emulsified sausage mixture may be stuffed into one of three types of **casings**. Natural, collagen, or artificial casings can be used to hold the semisolid meat and/or poultry sausage batter until the proteins can coagulate and harden during cooking to form the sausage. A natural casing is an animal casing derived from various sections of viscera. These must be inspected for condition and nodules, then thoroughly flushed and rinsed before use. Sausages encased in natural casings made from a different species than the encased meat or poultry must identify the casing type on the product label. Collagen casings are derived or “regenerated” from a natural constituent of hides that has been chemically processed and extruded to form an edible protein casing. Product labels must identify sausages encased in collagen casings. Fibrous, saran, and hydrocellulose artificial casings are strong, easy to handle, permeable to smoke and moisture, storable in a dry nonrefrigerated area, and are available in various sizes and shapes. Most artificial casings are typically inedible and must be removed prior to consumption. However, many establishments now use alginate film, which is applied as a liquid to the formed sausage batter. When placed in a calcium bath, the alginate forms a solid structure to produce a stable and edible artificial sausage casing.

Stuffed sausage product may be linked by pinching and twisting the casing, then placed on racks or trees and loaded into a smokehouse. **Smoking** sausage products with non-resinous hardwoods inhibits bacterial growth, enhances sausage flavor, and increases product shelf life. Smokehouse parameters that must be controlled to ensure microorganisms of concern are destroyed or inhibited in most sausage products include temperature and time. Humidity may also need to be controlled; however, since almost all semi-permeable or impermeable product casings will prevent or inhibit moisture loss, the heat resistance of pathogens is not affected when sausages are cooked in casings. Following cooking and/or smoking, the cooked sausage cooling process (i.e.,

stabilization) begins and rapidly continues until the sausage internal temperature is $\leq 40^{\circ}\text{F}$ to control outgrowth of spore-forming pathogens that may have survived the lethality process. (**NOTE:** refer to FSIS Appendix A for cooked product lethality guidelines and Appendix B for cooked product stabilization guidelines). The chilled cooked sausage product may be removed from casings in a machine called a peeler. After **peeling**, the cooked sausage product may be **sliced** and is typically packaged in labeled plastic wrapping for **distribution** to retail stores, hotels, and restaurants.

Rework is the re-routing of partially or fully processed product into a new batch or formulation with the same or similar ingredients. Product may be reworked due to emulsion residue, product breakage (“blow outs”), broken, irregular, or end slices, smoked meats, returns, etc. Rework must be wholesome, unadulterated, and not violate a standard of identity, change the order of predominance of ingredients, or perceptibly affect normal product characteristics. Rework may be used in cooked sausage and meat loaf without limitation, but establishments typically limit rework to 10% or less because it has no binding capabilities. Sausage products in edible collagen casings may be used in similar finely comminuted products without need for peeling. Finished cooked sausage in natural casings made from bungs, middles, beef rounds, bladders, or stomachs must be stripped of the casings before use. Also, natural casings of any type that break during stuffing operations should not be included in emulsions. The new product may have similar but different ingredients, but all ingredients in the rework must be declared in the new product’s ingredients statement. For the purpose of calculating restricted ingredients, IPP must not include the weight of the rework product since it has already met the requirements for restricted amounts at the time of its formulation and is only used as a filler product.

PHIS Verification Tasks

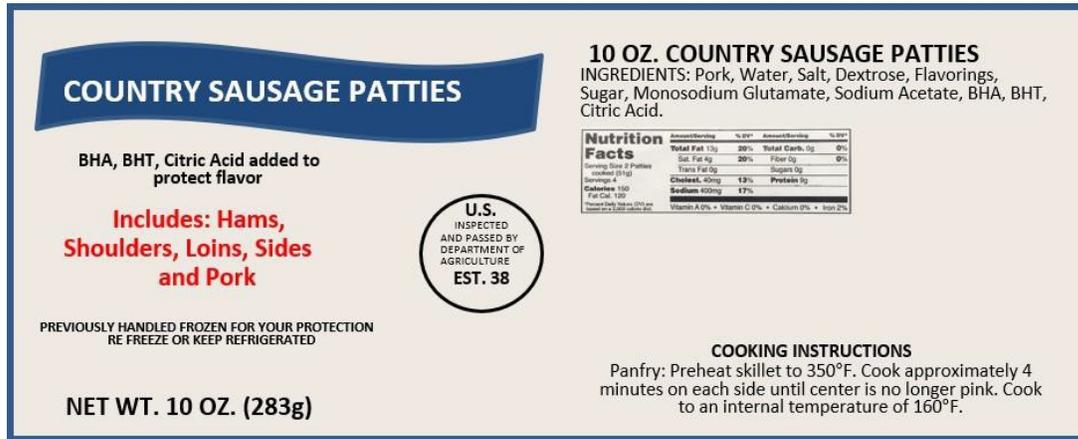
Inspection program personnel verify that the establishment meets regulatory requirements and labels accurately reflect the finished product. Product is considered misbranded if its label is missing a required feature, qualifying statement, or descriptive designation, is false or misleading, or contains special statements or claims without approval by If the product is misbranded, the IPP may withhold production (e.g., use of the label) until the suitability of the ingredient mixture and accuracy of the label can be determined. IPP perform labeling tasks as instructed in FSIS Directive 7000.1, “Verification of Non-Food Safety Consumer Protection Regulatory Requirements.” FSIS Directive 7620.3, “Processing Inspectors’ Calculations Handbook” and FSLPB are additional resources. The **General Labeling task** is performed in establishments that prepare meat or poultry products, including sausages that bear a label. The **Labeling-Products Standards task** is performed for sausage products with a standard of identity (i.e., sausage products required to have minimum amounts of meat or edible portion of

the animal (e.g., liver), or when specific ingredients are required.

IPP perform the labeling tasks to verify that label approvals are on file, product labels accurately reflect the finished product, all required information and graphics are represented, and labeling procedures are adequate. Verification activities include reviewing product formulation records and observing formulation preparations, then comparing that information to the approved label to verify that no declared ingredients were omitted or undeclared ingredients were added. IPP will also perform ingredient calculations to verify that the amounts of restricted ingredients in product formulations do not exceed regulatory limits.

Fresh Country Sausage Patties Example

An IPP has the General Labeling task on her schedule today. The establishment is making fresh sausage patties and tray packing them. She observes the label below being applied to the film wrapped trays.



She observes the following sausage patty formula posted near the blenders in the processing room. She also observes the pre-weighed ingredients for one batch. The ingredient weights and names agree with the posted formula.

Country Sausage Formula (\$319.140)

Regular pork trimmings (60% fat)	280.00 lb.
Pork hams, loins, shoulders, sides (30% fat)	160.00 lb.
Water	18.00 lb.
Hunts Fresh Sausage Flavoring Mix	10.00 lb.
Sugar	<u>2.00 lb.</u>
Total batch weight	470.00 lb.

In the production office, the IPP finds the same label and formula as above in the establishment's label file. The IPP also finds the following additional information attached to the formula:

Directions: Use one bag flavoring mix to each 470 pound batch of sausage patties.”

Salt	5 lb.
Dextrose	2 lb.
Black pepper	1 lb.
Sage	12 oz.
Nutmeg	9 oz.
MSG	7 oz.
Sodium Acetate	3 oz.
BHA, BHT, citric acid	1 oz. (<i>BHA - 30%, BHT - 10%, citric acid - 10%, salt - 50%</i>)
	10.0 lb.

NOTE: Hunts Fresh Sausage Flavoring Mix is formulated for a finished product fat limit of 40%.

There is a letter from the flavoring mix manufacturer stating that the BHA, BHT and citric acid are added to the flavoring mix as an antioxidant compound. It is made up of the following ingredients and their percentages: BHA (butylated hydroxyanisole) - 30%, BHT (butylated hydroxytoluene) - 10%, citric acid - 10%, and a salt carrier - 50%. When used according to directions, the flavoring mix complies with government requirement for antioxidants.

The IPP needs to verify the following requirements in this product formula:

1. Does the added water comply with the added water limit for this type of product?
2. Is the intended fat requirement met, based on calculated fat total?
3. Is the antioxidant in compliance with the regulatory limit in this type of product?

Determining Added Water Content

Given: Total amount of the ingredients is 470 pounds.

Step 1: Subtract the permitted percentage of water from 100% of the formula.

$$\begin{array}{r} 470 \text{ lb. [100\%]} \\ - 18 \text{ lb. [- 3\% water limitation]} \\ \hline 452 \text{ lb. [97\% batch weight, less added water]} \end{array}$$

Step 2: Divide the formula batch weight, minus the water weight (452 lb.) by the allowable percentage in the formula this ingredient represents (97%).

$$452 \div 0.97 = 465.97 \text{ lb. [total projected formula weight with the addition of 3\% water]}$$

Step 3: Subtract 452 lb. from 465.97 lb.

465.97 lb. [100% total batch weight with 3% water]
- 452.00 lb. [- 97% batch weight less added water]
13.97 lb. [3% total amount of water permitted]

OR

Multiply 465.97 lb. [100% total batch weight with 3% water] by 3% [regulatory water limit]

465.98 lb.
x.03
13.97 lb. of water permitted

The answer to the first question is **NO** because the added water exceeds the 3% permitted in raw sausage patties. The IPP should retain all of the sausage patties produced from the beginning of the shift and any other lots of sausage patties produced using the same formula that are still in the establishment.

Determining Fat Content for Subsequent Antioxidant Determination

IPP must be able to calculate the amount of fat in the product to verify compliance for a restricted ingredient with a regulatory limit based on the fat content of the product (e.g., an antioxidant). When antioxidants are added to sausage products, the finished product label must declare in prominent letters, in close proximity without intervening text or graphics to the product name, a statement identifying the antioxidant by its common and usual name or abbreviation (e.g., “BHA, BHT and citric acid added to help protect flavor”). Determine the total content of the antioxidant/synergist mixture and the percentage of each ingredient. (Information attached to the label in the establishment’s file states BHA = 30%, BHT = 10%, citric acid = 10%, salt carrier = 50%).

Limitations for antioxidants (e.g., BHA, BHT, and propyl gallate) and *synergist* (e.g., citric acid) in raw sausage:

- Individual antioxidants (0.01% of fat content), except tocopherols
- Tocopherols (0.03% of fat content) - not used in combination with other antioxidants
- Antioxidants in combination (0.02% of fat content)
- Synergist (0.01% of fat content)

Most antioxidants used are in a mix or compound containing a carrier, two or more individual antioxidants, and possibly a synergist. It will not be necessary to calculate for

each antioxidant or synergist. One calculation will be sufficient if the following rules are applied:

- If *no individual antioxidant or synergist is more than half of the total antioxidants* in the mix or compound: Use 0.02% to calculate for the total of all antioxidants in combination.
- If *one individual antioxidant or synergist is more than half the total antioxidants* in the mix or compound: Use 0.01% to calculate for that individual antioxidant or synergist.
- If *one individual antioxidant or synergist is exactly half (50%) of the total antioxidants* in the mix or compound: Use either 0.01% to calculate for that individual antioxidant or synergist, *or* 0.02% to calculate for the total of all antioxidants in combination. (The result will be the same.)

NOTE: An antioxidant (e.g., BHA, BHT, or TBHQ) can never be added to a product in an amount greater than its individual limit (0.01%, 0.003%, etc.), even in combination with other antioxidants (e.g., in a mixture). This is why the calculation for an antioxidant mixture is based on the 0.01% limit when an individual antioxidant makes up 50% or more of the total antioxidants.

Antioxidant Determination

Given fat content: 280 lb. regular pork trimmings = 60% fat
160 lb. pork hams, shoulders, loins, and sides = 30% fat

Step 1. Determine the amount of fat that is being added in the meat portion of the formula.

280 lb. pork trimmings
× 0.60 [60% fat content]
168 lb. fat added

160 lb. pork hams, shoulders, loins, sides
× 0.30 [30% fat content]
48 lb. fat added

Step 2: 168 lb. + 48 lb. = 216 lb. fat added

Given: The amount of antioxidant compound in the flavoring mix = 1.0 oz.

Step 3: Determine what percentage of the mixture is made up of antioxidants (i.e., total the percentages of antioxidants in the mix or compound):

30% BHA
+ 10% BHT
40% [total antioxidants] (30% BHA > half total antioxidants)

Step 4. If any one of the antioxidants or synergist makes up more than half of the antioxidant total, multiply the fat weight by 0.0001 (0.01%) to determine the amount of antioxidant permitted. If no single antioxidant or synergist is more than half (20%) of the antioxidant total, multiply the fat weight by 0.0002 (0.02%) to determine the amount of antioxidant permitted.

216 lb. [total fat added]
× 0.0001 [0.01%: BHA > half]
0.0216 lb. [maximum antioxidant permitted]

Step 5. To determine the amount of antioxidant compound that can be used, divide the amount of antioxidant permitted by the percent of the major antioxidant or synergist used. (If no individual antioxidant or synergist makes up more than half of the antioxidant total, divide the amount of antioxidant permitted by the percentage of total antioxidants to determine the amount of antioxidant compound that can be used.)

0.0216 lb. ÷ .30 [30% BHA] × 16 [oz. per lb.] = **1.15 oz. [maximum amount of antioxidant compound permitted]**

The answer to the third question is **YES**, the antioxidant compound in this batch is in compliance.

Fresh Breakfast Sausage Example

An IPP has the General Labeling task scheduled today. The establishment is making fresh breakfast sausage links and packaging them in trays with label below being applied to the trays.



Ingredients: Pork, mechanically separated pork, water, soy flour, salt natural flavorings, sugar, collagen casing **Contains Soy**

He observes the following breakfast sausage formula posted near the blenders in the processing room.

Breakfast Sausage Formula (\$319.143)

Pork (30% fat)	210.00 lb.	(Fat target = 50% fat)
Skinned pork jowls (88% fat)	187.00 lb.	
Mechanically separated pork (30% fat)	50.00 lb.	
Water and ice	20.00 lb.	
Soy flour	15.00 lb.	
Salt	8.00 lb.	
Sugar	5.00 lb.	
Natural Flavorings	5.00 lb.	
Total batch weight	500.00 lb.	

He wants to verify compliance for:

1. Water
2. Extenders and binders
3. Mechanically separated pork (MSS)

Water and Binder (Soy Flour) Determination

Added water is limited to 3% and binders and extenders are limited to 3.5% of total ingredients.

Step 1: Subtract the pounds of the water and binder from the batch weight.

$$\begin{array}{r} 500 \text{ lb. [100.0\% batch weight]} \\ - 20 \text{ lb. [- 3.0\% added water limit]} \\ - \underline{15 \text{ lb. [- 3.5\% binder limit]}} \\ 465 \text{ lb. [93.5\% formula less water and soy flour]} \end{array}$$

Step 2: Divide the remaining amount of the formula by the percentage it represents.

$$465 \text{ lb.} \div 0.935 \text{ [93.5\%]} = 497.3 \text{ lb. [total ingredients, max. amount water and soy flour added]}$$

Step 3: Multiply the total ingredients' weight by the regulatory limit for added water to determine the maximum amount permitted.

$$\begin{array}{r} 497.3 \text{ lb. [total weight with maximum amount of water included]} \\ \times \underline{0.03} \text{ [3\% water permitted]} \\ \hline \mathbf{14.9 \text{ lb. [water permitted in formula]}} \end{array}$$

Added water is not in compliance because the maximum amount of water permitted is 14.9 lb. and 20 lb. was added.

Step 4: Multiply the total ingredients' weight by the binder regulatory limit to determine the maximum amount permitted.

$$\begin{array}{r} 497.3 \text{ lb.} \\ \times \underline{0.035} \text{ [3.5\% binder and extenders permitted]} \\ \hline \mathbf{17.4 \text{ lb. [soy flour permitted in the formula]}} \end{array}$$

Soy flour is in compliance because 15 lb. was added.

Mechanically Separated Pork Determination

20% MSS is permitted based on the total meat and meat byproduct portion (meat block) of the formula.

Step 1: Determine the weight of the meat block in the formula.

Pork trimmings: 210 lb.

Pork jowls: 187 lb.

Total 397 lb. [without MSS = 80% of meat block of the formula]

Step 2: Divide the weight of the meat block by the percentage of the formula it represents (80%).

$397 \text{ lb.} \div 0.8 \text{ [80\% meat block without MSS]} = 496.25 \text{ lb. [100\% with 20\% MSS added]}$

Step 3: Multiply the amount of the formula (100%) with 20% MSS by the regulatory limit for MSS (20%) to determine the maximum amount of MSS permitted in the formula.

496.25 lb.

x 0.2 [20% MSS limitation]

99.25 lb. MSS permitted

Mechanically separated pork is in compliance because 50 lb. is added to the formula.

Fresh Sausage Workshop

Using the methods outlined in this handout, answer the questions related to the following fresh sausage formula and perform the required calculations. If you need help, contact your instructor.

You are a CSI assigned to an establishment that produces several types of pork sausage and Italian sausage. When you arrive at the establishment, you log-on to your computer and bring up the task calendar in PHIS. The Labeling Products Standards and General Labeling tasks are on the task calendar for today. You proceed to the processing room and note that both processing lines are in operation today. At the end of line one, Italian sausage stuffed into natural casings is being tray packed and placed in cardboard shipping containers. You verify that the shipping containers have an inspection legend and handling statement (“keep refrigerated”). The label below is being applied to the film wrapped trays.



Ingredients: Pork, water, corn syrup, green peppers, and less than 2% of the following: salt, spices, paprika, dextrose, monosodium glutamate, flavoring, BHA, propyl gallate, citric acid

You take one label from the roll of labels and ask the production supervisor to show you the formula for the Italian sausage. He opens a binder at his work bench and shows you the following formula.

Italian Sausage (§319.145)

Batch Formula

Pork Trimmings (20/80% fat/lean ratio)	285.00 lb.
Pork Jowls (Skinned) (85/15% fat/lean ratio)	155.00 lb.
Spice and Seasoning Mix*	14.00 lb.
Water	13.00 lb.
Corn Syrup	10.00 lb.
Green Peppers	10.00 lb.
Salt	6.00 lb.
Paprika	4.00 lb.
Dehydrated Parsley	<u>3.00 lb.</u>
Total batch weight	500.00 lb.

(Fat content target = 34%)

*Spice and Seasoning Mix (14 lb.)

Fennel	3 lb.
MSG	3 lb.
Dextrose	3 lb.
Cumin	2 lb. 7.75 oz.
Black Pepper	2 lb. 7.0 oz.
Antioxidant mix	1.25 oz. (BHA-20%; propyl gallate-20%; citric acid-10%; salt-50%)

You write down the meat block, water, and antioxidant mix weights, and fat to lean ratios for the meat ingredients from the formula in your small green notepad and take the label to your office. You review the standard of identity for Italian sausage in §319.145.

For the Labeling Product Standards task, you perform the calculation to answer the following questions.

1. What is your first name? (online only)
2. What is your last name? (online only)
3. Do the additives in the product meet the standard of identity for Italian sausage?
Yes No
4. Does the product contain the required amount of meat or meat and fat combination?
Yes No



04B01 - % Meat or Poultry (single component product)

$$\frac{\text{meat/poultry in the formula}}{\text{batch weight}} \times 100 = \text{\% meat/poultry in the formula}$$

Calculate



Reset

As part of the General Labeling task, while you were looking at the formula in the binder you compared the ingredients statement on the label you brought from the packaging area with the formula in the binder. All ingredients were listed by their common and usual name in descending order of predominance. In your office, you determine that the label contains all of the mandatory features (required information). Next, you proceed to the QC office to determine if the label you have with you is on file. It is in the establishment's file and the processing procedures and formula are attached. The formula in the file is the same formula as you observed on the processing floor. You proceed to the spice room. You notice pre-weighed non-meat ingredients in plastic bags for 2 batches of the Italian sausage. You weigh the spice and seasoning mixture, salt, and paprika for one of the batches. The weights recorded on the bags were accurate and agreed with the formula you observed. You look at the label on the barrel of Acme antioxidant mix, write down the ingredients and percentages in your green notepad, and return to your office to perform the calculations necessary to answer the following questions.

5. What is the fat content of the Italian sausage?

- a. 30.8%
- b. 35%
- c. 37.75%
- d. 54.65%



04B04 - Percentage of Fat in a Formula

$$\begin{array}{r}
 \boxed{} \text{ lb batch weight} \\
 \times \boxed{} \text{ target fat percentage} \\
 \hline
 \boxed{} \text{ lb fat in product}
 \end{array}
 \qquad
 \begin{array}{r}
 \text{lb fat from ingredients} \\
 \hline
 \boxed{} \text{ lb batch weight}
 \end{array}
 \times 100 = \text{ \% fat on product}$$

meat/poultry/byproduct		% fat	=	lb fat
<input type="text"/>	X	<input type="text"/>	=	
<input type="text"/>	X	<input type="text"/>	=	
<input type="text"/>	X	<input type="text"/>	= +	<input type="text"/>

Calculate



lb fat from ingredients

Reset

6. Is the fat content in the Italian sausage in compliance with the standard of identity?

Yes No

7. Is the antioxidant mix in compliance with the Italian sausage product formulation?

Yes No



04B04 - Maximum Antioxidant Mix Allowed (raw product e.g., meatballs)

lb batch weight
x percentage fat in product, e.g. 25%

lb fat
x antioxidant restricted limit

 maximum lb antioxidant allowed

=
 total antioxidant percent, e.g. 55% lb antioxidant mix allowed

Add-up antioxidants
 Example: BHA 25%
 BHT 20%
 + Propyl gallate 10%
 Total Percent 55%

When no individual antioxidant or synergist is more than half of the total antioxidant percentage, use .0002 (.02%) as the restricted limit.

x 16 =

lb antioxidant mix allowed

oz antioxidant mix allowed

Calculate



Reset

Cooked Sausage Example

The establishment has the following bologna formula on file. The IPP determines the Calculated Finished Weight (CFW) or Projected Finished Weight (PFW) and then verifies that the binder and phosphates are in compliance.

Beef	250 lb.	(Finished Product Target = 10% Water, 30% Fat)
Pork	250 lb.	
Water and ice	70 lb.	
Rework	50 lb.	
NFDM (nonfat dry milk)	18 lb.	
Salt	5 lb.	
Flavorings	4 lb.	
Sodium phosphates	2 lb. 10.5 oz.	
Sodium erythorbate	4.25 oz.	
Sodium nitrite	1.25 oz.	
Total batch weight	650 lb.	

She wants to verify if the amount of nonfat dry milk (NFDM) binder and the amount of sodium phosphate the establishment intends to use in the formula are in compliance.

Binders and Phosphates Compliance Determination

NOTE: The CFW or PFW always includes the *maximum* targeted water. Once the IPP determines a CFW or PFW, they can use the weight to calculate the maximum amount of binders and extenders and phosphates permitted in each formula. Remember to always remove rework weights from the formula total!

Step 1: Subtract the rework from the batch weight

$$650 \text{ lb.} - 50 \text{ lb. [rework]} = 600 \text{ lb. [100\% batch total]}$$

Step 2: Subtract the *weight and percentage* of the targeted added water and the restricted ingredient(s) that have regulatory limits based on the PFW.

$$\begin{array}{l} 600 \text{ lb. [100\% batch weight]} \\ - 70 \text{ lb. [- 10\% water]} \\ \hline 530 \text{ lb. [90\% batch weight]} \end{array}$$

530 lb. [90% batch weight]
- 18 lb. [- 3.5% NFDM]
512 lb. [86.5% batch weight]

512 lb. [86.5% batch weight]
- 2.65 lb. [- 0.5% phosphate]
509.35 lb. [86.0% formula weight]

Step 3: Divide this portion (509 lb.) by its percent (86.0%), to determine 100% of the formula.

$509.35 \div 0.86 [86.0\%] = 592.26 \text{ lb. PFW}$ [86% formula weight, 10% added water, 3.5% NFDM, 0.5% sodium phosphate]

Step 4: Multiply the PFW by 3.5% to determine the maximum amount of NFDM permitted.

592.26
 $\times 0.035$ [3.5% binder limit]
20.72 lb. [NFDM permitted]

Binder is in compliance because the 18 lb. of NFDM used is less than the 20.72 lb. maximum amount permitted.

Step 5: Multiply the PFW by 0.5% to determine the maximum amount of sodium phosphate permitted.

592.26
 $\times 0.005$ [0.5% phosphate limit]
2.96 lb. [sodium phosphate permitted]

Sodium phosphate is in compliance because the 2.65 lb. used is less than the maximum permitted amount of 2.96 lb.

Liver Sausage Example

Liver Sausage Compliance (§319.182)

Braunschweiger formula:

Skinless pork jowls	250 lb.
Pork livers	100 lb.
Water	17 lb.
Salt	8 lb.
Corn syrup	4 lb.
Sodium lactate	3 lb.
Dried onions	3 lb.
Sodium diacetate	2 lb.
Dextrose	1 lb. 7.6 oz.
Flavorings	1 lb. 7.6 oz.
Sodium nitrite	<u>0.8 oz.</u>
Total batch weight	390 lb.

Determine the minimum amount of liver required in this formula.

Step 1: Subtract the liver weight and the minimum percentage (30%) from the formula weight (100%).

$$\begin{array}{r} 390 \text{ lb. [100\% formula weight]} \\ - \underline{100 \text{ lb. [- 30\% liver weight]}} \\ 290 \text{ lb. [70\% batch weight]} \end{array}$$

Step 2: Divide the remaining portion of the formula (290 lb.) by the percentage it represents (70%).

$$290 \text{ lb.} \div 0.70 \text{ [70\%]} = 414.28 \text{ lb. [100\% batch with 30\% minimum liver limit]}$$

Step 3: Subtract 290 lb. (70%) from 414.28 lb. (100% total ingredients with 30% minimum liver).

$$\begin{array}{r} 414.28 \text{ lb. [100\% batch weight]} \\ - \underline{290 \text{ lb. [- 70\% batch weight, less liver]}} \\ 124.28 \text{ lb. [minimum fresh liver required]} \end{array}$$

This Braunschweiger formula is not in compliance because only 100 lb. of liver was added and a minimum of 124.28 lb. of fresh liver is required to meet the product standard of identify.

Cooked Sausage Workshop

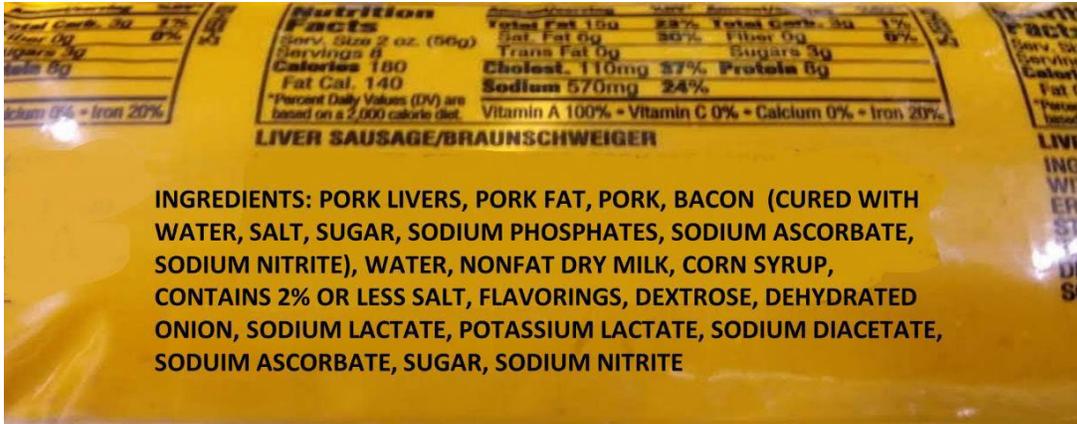
Using the methods outlined in this handout, answer the questions related to the following cooked sausage formulas and perform the required calculations. If you need help, contact your instructor.

You are a CSI assigned to an establishment that produces several types of cooked and smoked sausages, cooked sausages, and non-specific loaf. When you arrive at the establishment, you log-on to your computer and bring up the task calendar in PHIS. The Labeling Products Standards and General Labeling tasks are on the task calendar for today. You start the General Labeling task by proceeding to the processing room.

The establishment is stuffing Braunschweiger sausage into impervious saran casings (sticks) and cooking them in water. You notice staged, properly identified, pre-weighed ingredients for a batch of the Braunschweiger sausage in plastic totes and brown bags on a rack next to the large blender. You have the production supervisor weigh the sodium nitrite, sodium ascorbate, and nonfat dry milk (NFDM). You write the weights in your small green notepad. You proceed to the grinding area and notice the meat components staged in stainless steel totes for a batch of the Braunschweiger sausage. You have the production supervisor weigh the pork livers and you write the weight of the livers in your green notebook.

You enter the ready-to-eat product packaging room and find that the establishment is slicing the Braunschweiger sticks into 1 lb. portions and shrink wrapping the portions in plastic film that has the labeling below applied to it. You take a piece of plastic film with the labeling on it from the end of the packaging line.





You proceed to the production office. You ask the production supervisor to show you the formula for the Braunschweiger sausage being produced today and he shows you the following formula.

Braunschweiger (\$319.182)

Batch Formula

Pork Livers	150 lb.
Pork Fat	150 lb.
Skinned Pork Jowls	75 lb.
Bacon (cured)	53 lb.
Rework	25 lb.
Water	20 lb.
Nonfat Dry Milk (NFDM)	16 lb.
Corn Syrup	11 lb.
Salt	8 lb.
Flavorings*	6 lb.
Potassium Lactate	3 lb.
Sodium Lactate	2 lb.
Dehydrated Onion	2 lb.
Dextrose	1 lb. 12 oz.
Sodium Diacetate	1 lb.
Sugar	14 oz.
Sodium Ascorbate	4 oz.
Sodium Nitrite	2 oz.
Total Batch Weight	525 lb.

*Flavorings (6 lb.)

White Pepper	2 lb.
Marjoram	2 lb.
Mace	1 lb. 12 oz.
Ground Cloves	4 oz.

You review the labeling on the plastic film wrap and verify that all required information (i.e., the mandatory labeling features) is on it. You compare the sodium nitrite, sodium ascorbate, and liver weights you recorded in your green notepad with the weights in the above formula. The ingredient weights you recorded are the same as the ingredient weights in the above formula. You compare the ingredients statement on the plastic film wrap with the formula in the binder (above) and answer the questions below.

1. *What is your first name? (onlineonly)*
2. *What is your last name? (onlineonly)*
3. Identify the meat byproduct(s) used in the formula.

- Pork livers
- Pork fat
- Skinned pork jowls
- Bacon

4. Is the ingredients statement in compliance with the standard of identity for Braunschweiger?

Yes No

You proceed to your office and for the Labeling Product Standards task, you perform the calculation necessary to answer the following questions.

5. Does the Braunschweiger formula contain the required amount of liver?

Yes No

6. Is the product name "Braunschweiger" in compliance with the standard of identity for a liver sausage based on all of the ingredients used in the formula?

Yes No

You continue performing the General Labeling task by performing the calculations necessary to answer the following questions.

7. Is the amount of nonfat dry milk (NFDM) added to the formulation in compliance?

NOTE: For this problem *only*, use the batch weight to determine NFDM compliance. It is normal for this type of product to have less than 10% added water in the formula (because it is cooked in an impervious casing, thus there isn't any cook shrink). If you were to calculate a CFW for this formula, the CFW would be greater than the batch weight.

Yes No



04B04 - Percent Binder/Extender

lb of binder used

lb PFW

x 100 =

percent binder in the finished product

Calculate



Reset

You are a CSI assigned to an establishment that produces several types of cooked and smoked sausages, cooked sausages, and non-specific loaf. When you arrive at the establishment, you log-on to your computer and bring up the task calendar in PHIS. The General Labeling task is on the task calendar for today. You start the task by proceeding to the packaging room. The establishment is packaging 8 per lb. franks in pre-labeled plastic film in the ready-to-eat (RTE) product packaging room.

You take a discarded film with the pre-printed label (shown below) from the end the packaging line with you to the production office.

ABC'S Quality Franks

KEEP REFRIGERATED

INGREDIENTS: Beef, Pork, Water, Mechanically Separated Chicken, Soy Flour, Salt, Contains 2% or Less Corn Syrup, Dextrose, Potassium Lactate, Flavorings, Sodium Phosphates, Sodium Diacetate, Paprika, Ascorbic Acid (Vitamin C), Sodium Nitrite **Contains Soy**

Nutritional Facts	Amount serving	%DV*	Amount serving	%DV*
Total Fat 11g		17%	Total Carb. 2g	1%
Serv. Size 1 Frank	Sat. Fat 4g	21%	Fiber 1g	3%
Servings 8	<i>Trans Fat</i> 0g		Sugars 0g	
Calories 120	Cholest. 15mg	8%	Protein 5g	
Fat Cal. 100	Sodium 480mg		20%	

*Percent Daily Values (DV) are Vitamin A 0% • Vitamin C 0.5% • Calcium 0% • Iron 2%
Based on a 2,000 calorie diet



ABC PACKING, P.O. BOX 0000
ANYWHERE, USA 00000

NET WT.
16 OZ.
(1 LB.)

The label on the plastic film is on file and the processing procedures and formula are attached to it. You write the ingredients and weights from the formula down in your green notepad. You proceed to the production room.

The establishment has a continuous system for producing small diameter cooked sausages, e.g., sausage in casings on metal trees enter a cooking and chilling tunnel and then the finished sausage enters the RTE product packaging room.

You notice staged, properly identified, pre-weighed ingredients for a batch of franks in plastic totes and brown bags on a rack next to the large blender. You have the production supervisor weigh the sodium nitrite, ascorbic acid, and soy flour. You compare their weights to the weights from the formula you wrote in your small green notepad. The weights are the same. You proceed to the grinding area and notice the meat and poultry components are staged in stainless steel totes for a batch of frankfurters. You have the production supervisor weigh the mechanically separated chicken and you compare the weight on the scale to the weight of the mechanically separated chicken in your green notebook. The weights are the same.

You ask the sausage foreman to show you the formula for the frank. He opens a binder at his work bench and shows you the following formula.

Quality Franks Batch Formula

Beef (boneless cow meat)	250 lb.	
Pork Trimmings	200 lb.	<i>(Finished Product Target = 30% Fat)</i>
Mechanically Separated Chicken	100 lb.	
Water and Ice	120 lb.	<i>(Finished Product Target = 10% Water)</i>
Frank rework (like product)	50 lb.	
Soy Flour	22 lb.	
Salt	15 lb.	
Corn Syrup	11 lb. 12 oz.	
Dextrose	8 lb.	
Potassium Lactate	7 lb.	
Flavorings	7 lb.	
Sodium Diacetate	4 lb.	
Sodium Phosphates	3 lb.	
Curing Mix (6.25% nitrite salt carrier)	1 lb. 6 oz.	
Paprika	10 oz.	
Ascorbic Acid	<u>4 oz.</u>	
Total Batch Weight	800 lb.	

You compare the weights you recorded in your green notepad with the weights in the above formula. The ingredients and weights you recorded from the formula on file in the production are the same as ingredients and weights in the above formula. You compare the ingredients statement on the frank label you have with you (i.e., the label being applied to product) to the frank formula above. All ingredients were listed by their common and usual name in descending order of predominance. You also verify that the mandatory features (required information) are on the label.

NOTE: The mandatory labeling features were discussed in the labeling module. Cure agents and cure accelerators will be discussed in the Cured Meats and Poultry module.

You proceed to your office and perform the calculations necessary to answer the following questions.

8. Is the amount of binder added in compliance?

Yes No

9. Is the amount of sodium phosphate added in compliance?

Yes No



04B04 - Projected Finished Weight (PFW)

<input type="text"/>	lb batch weight		
- <input type="text"/>	lb rework		
<hr/>			
	lb		100%
- <input type="text"/>	lb water		<u>-10%</u>
<hr/>			
	lb		90%
- <input type="text"/>	lb binder(s)		<u>- 3.5%</u>
<hr/>			
	lb		86.5%
- <input type="text"/>	lb phosphate(s)		<u>- 0.5%</u>
<hr/>			
	lb		86%
<hr/>			
<input type="text"/>		=	
	% of formula remaining		lb PFW

Calculate



Reset

10. Is the amount of added MSKP (chicken) in compliance?

Yes No



04B04 - Maximum Amount of Poultry

<input type="text"/>	lb batch weight		
- <input type="text"/>	lb water and ice		
- <input type="text"/>	lb poultry		
<hr/>			
	minimum lb (85%)		
	minimum lb (85%)		
<hr/>			
0.85		=	lb
	lb		
- <input type="text"/>	minimum lb (85%)		100%
<hr/>			
	maximum amount of poultry		<u>- 85%</u>
			15%

Calculate



Reset

05 - Cured Meat and Poultry Product Operations

The definitions of two terms that are used throughout this module: *curing and smoking*.

Curing is placing specific chemical agents in or on meat and poultry, such as pork ham, pork shoulder picnics, pork bellies, beef top and bottom rounds, beef knuckles, beef briskets, beef tongues, and poultry cuts to preserve it.

Smoking is subjecting meat and poultry cuts to an environment of smoke generated from hardwood, hardwood sawdust, corn cobs, or natural or artificial liquid smoke that has been transformed into a true gaseous state by applying direct heat.

As the process of meat and poultry curing developed, the industry emphasized four factors: preservation, flavor, color, and tenderness. In recent years, a fifth factor, yield, has come into the forefront. The following are descriptions of each factor as they apply to meat and poultry curing.

Curing Factors

As the years progressed and the process of curing meat and poultry products continued to develop, industry began to focus on specific curing factors, which are: preservation, flavor, color, tenderness and yield.

Preservation

The first factor is preservation. To preserve meat and poultry, the undesirable microorganisms on the meat surfaces that cause spoilage must be destroyed. One of the most effective means of accomplishing this is by introducing salt into the meat. Since the salt has to penetrate the meat to preserve it, the temperature must be kept low enough to prevent decomposition but high enough to induce salt penetration.

Flavor

Another factor of concern is flavor. The flavor development occurs through a combination of the flavor of curing agents and those developed by bacterial and enzymatic action. Salt has a dual purpose, it is bacteriostatic and it also adds flavor to the meat. Because of the amount of salt used in the curing process, the salt flavor is the most predominant.

When sugar is used, it plays an important role as food for the flavor-producing bacteria of meat during long curing processes. Sugar can also serve to reduce the harshness of the salt in some cured meat and poultry.

The addition of protein materials such as hydrolyzed plant protein [H(P)P], hydrolyzed vegetable protein [H(V)P], and monosodium glutamate (MSG) acts as a flavor enhancer and

must be sufficient for the purpose in which it is used. Gelatin acts as a binder or congealer for certain meat food products.

Note: On meat and poultry product labels, proteinaceous materials must be specifically listed by their common or usual name because their primary purpose is not flavor. For instance, the terms "plant" and "vegetable" are **NOT** acceptable. The source of the protein must be specified, such as hydrolyzed **soy** protein.

The use of approved hardwoods, such as: hardwood, hardwood sawdust, mesquite wood, or mesquite sawdust, in the process of smoking gives product the characteristic smoke flavor and color. Smoking also acts to preserve flavor. To some degree, smoking is bacteriostatic (inhibits bacterial growth) and bactericidal (kills bacteria) to most surface organisms. It also dehydrates the surface of the product and deposits a resinous material on the meat surface due to the condensation of some phenolic and aldehyde compounds. These compounds produce an effective chemical barrier against growth and penetration of organisms.

Color

The next factor to consider is color. The development and maintenance of a stable red color is very important in cured and smoked meat operations. Sodium or potassium nitrate or nitrites are the cure agents used to process cured meats. Cure agents are responsible for the development of the characteristic stable red color in the meat.

Nitrate is used as the source of nitrite or a reservoir for nitrite. Nitrate has no direct effect on meat or poultry products. Because it acts as a reservoir from which nitrite can be produced over time, it is more practical to use nitrates in cured products requiring long production times such as dry-cured pork products.

When nitrate is used as the cure agent, the conversion (reduction) of nitrate to nitrite by bacteria in the meat or poultry is a necessary step in the development of the cure color. The amount of nitrate that is reduced to nitrite is dependent upon the numbers of nitrate-reducing bacteria and several environmental conditions such as temperature, moisture content, salt content, and pH. Hence, the conversion rate and subsequent amount of nitrite that is formed is difficult to control. Similarly, the further reduction of nitrite to nitric oxide, which reacts with myoglobin (muscle pigment) to produce the cured color, is affected by the same environmental conditions. If nitrite is used as the cure agent, there is no need for the nitrate reduction step, and the development of the cure color is much more rapid.

If the cured meat is heated, exposed to a more acidic environment, or left long enough under normal conditions, the nitric oxide myoglobin is converted into a stable red pigment called nitrosohemochrome. This is why a cured piece of meat remains red when heated and

a fresh piece turns gray or brown. The amount of color that develops during the curing process depends on the amount of muscle pigment (myoglobin) present in the meat.

The time required for a cured color to develop may be shortened with the use of cure accelerators. Examples are ascorbic acid and erythorbic acid, or their derivatives, sodium ascorbate and sodium erythorbate. Cure accelerators tend to speed up the chemical conversion of nitrous acid to nitric oxide. Myoglobin must be in a reduced state to combine with nitric oxide. Cure accelerators tend to keep myoglobin in the reduced state and readily combines with nitric oxide. Cure accelerators also serve as oxygen scavengers, preventing the fading of the cured meat color in the presence of sunlight and oxygen.

Tenderness

Product tenderness is a processor's concern. Tenderness is more of a problem with certain beef cuts than with pork cuts. Consequently, more emphasis is placed on tenderness when beef is used. With the original methods of curing, which involved long periods of time, both pork and beef were excessively salty and tough. This toughness was probably due to the continued action of the salt dehydrating the meat fibers. With the advent of artery pumping, quick curing, and high temperature smoking, the packer could produce meats that are definitely tenderer.

Yield

This brings us to the fifth and final factor which is yield. By necessity, the packer is very concerned with yields in cured and smoked meat and poultry products. The market is extremely competitive, thus adding to the incentive to produce noncomplying product.

Factors Affecting Yield

Phosphates. The primary purpose of phosphates is to reduce excessive shrinkage or "purge" (cook out) when the product is cooked. Phosphates also increase the water holding capacity of the available protein in the product, without increasing the apparent saltiness of the product. Test results with phosphates indicate that their use to increase yields is much more effective at high processing temperatures, such as those used to produce fully cooked product.

Binders and Extenders. The following binders and extenders are used in cured pork products to prevent purging of the brine solution. The approved binders listed below must be used individually, unless otherwise stated. In some cases, certain binders and extenders may be combined, but only in specified amounts. (For more details, see §424.21(c)).

Other Factors. Other factors that affect yield are smoking and cooking time, humidity, the type of casing used, i.e., pervious or impervious.

Massaging and Tumbling

Massaging or tumbling. Massaging or tumbling involves placing product in a vat with an agitator or in a tumbler for varying periods of time depending upon the type of equipment used. These methods subject meat or poultry chunks to mechanical treatment to facilitate protein extraction.

Basically, the results of the treatment on the meat and poultry chunks are muscle fiber disruption with a corresponding release and coating of the muscle with a salt-soluble protein. The protein then is heat-coagulated by cooking to form a binding matrix between muscle chunks, thus giving the muscle chunk an intact muscle appearance.

There are some distinct **advantages** in massaging. There is an accelerated brine dispersion in the cured product; improved uniformity of cured color and texture; an enhanced release of salt-soluble protein (myosin) to produce a creamy, tacky, exudate; increased yield because of reduced weight loss during cooking; and facilitating water binding without using prepared gelatins or binders.

There are also some **disadvantages** with massaging. Excessive mechanical treatment may cause excessive muscle destruction. Insufficient treatment may cause product to exhibit poor binding and slicing characteristics. There is also the possibility of poor cure distribution, poor color development, and bacterial contamination due to excessive handling.

Curing Methods

There are three general methods of curing, with a number of variations for each method. These methods are pickle curing, dry curing, and dry salt curing.

Dry Curing

Dry curing is the application of salt alone; salt, nitrate, and/or nitrite; or salt, nitrate, and/or nitrite with sugar directly to the surface of the meat. Meat subjected to this curing method cannot be injected with, or immersed in, a cure solution.

Dry Salt Curing

Dry salt curing is modification of the dry curing method, which includes the same mixtures in dry curing, except that product may be injected with cure solution directly into the muscle tissue (not through the circulatory system). Just prior to being covered with the dry mix, the meat may be momentarily moistened to facilitate salt penetration.

Curing Solution

A cure solution could be prepared with a:

- **brine** (water and salt);
- **pickle** solution (water, salt, nitrate and/or nitrite); or
- **sweet pickle** solution (water, salt, nitrate and/or nitrite, and a sugar).

Other ingredients could be added to enhance flavor. When formulating a brine or pickle solution some operations prepare the brine in 100° salometer strength (saturated solution approximately 26% salt by weight). This is then diluted to the desired strength at the time of formulation. At 60°F, one gallon of saturated brine weighs approximately 10.03 lb and contains approximately 2.64 lb salt or 26.4% salt. Additional salt will settle to the bottom of the container. The temperature of pumping pickle usually runs from about 40°F to 70°F.

A pumping pickle may also be used as a cover pickle. Product covered with cover pickle for any length of time should be checked by the IPP to assure the amount of added solution does not affect the establishment's procedural controls. After mixing, a pickle solution should be continually agitated to assure a uniform blend of the curing agents and to prevent ingredients such phosphates from precipitating out of the pickle.

Cure solutions are often reused. When a cure solution is reused, it should be filtered to keep it clear, free of sediment, and prevent decomposition. Mechanical pumping devices are sometimes used to recirculate the solution that spills directly from the product and the needles through a continuous filtration system. The IPP should check the filter to ensure that it is in good repair and removing meat residue and sediment.

Application of Curing Solutions

There are several methods of applying curing solutions to meat and poultry cuts. There are five basic methods to apply *curing solutions* to meat and poultry cuts. They are: Osmosis, Stitch, Spray pumping, Artery pumping, and Needle injection.

Osmosis was the earliest method used. This method involves covering the meat cuts with dry cure or completely submerging the meat cuts in a curing solution for an extended period (2 to 6 weeks) which is also called immersion curing.

The **stitch method** injects curing solution deep into the muscle with a single orifice needle. This method is considered better than the submerging method because the packer can quickly get a deeper penetration of the cure.

Spray pumping is a variation of the stitch method using a needle with many orifices to allow for more uniform distribution of the pickle.

Artery pumping introduces the curing solution into the natural circulatory system.

The last method, **needle injection**, is essentially the stitch method. The difference is that a machine with ten or more needles, sometimes spring-loaded for injecting bone-in product, is used. This method is considered more efficient and economical.

Cured Meat and Poultry Product Standards

FSIS has established maximum limits for the amount of solution and ingredients that may be added to cured **raw and cooked** meat and poultry products. If the amount of added solution is equal to or less than the maximum limit, the processor **is not** required to declare the addition and amount of the solution on the product's label.

The words “**added solution**” are often replaced by more specific processing terms such as “pump” or “pick-up”. Which term is used depends on the method of applying the solution.

- **Pump** is the amount (pounds) of a solution *injected*, either intramuscularly or intra-arterially, into a piece of meat or poultry.

- **Pick-up** is the amount (pounds) *absorbed* by a piece of meat or poultry when the solution is **mechanically agitated** (massaged or tumbled) into it or when the meat or poultry has been submerged or immersed in the solution.

Note: The Calculation Aid uses the term “**Gain**” in the main menu for these values!

NOTE: Yield limitations and added solution (pump/pick-up) limitations are interrelated. For instance, corned beef brisket can be pumped with a curing solution up to 20%. Hence, the finished cured briskets shall not have a yield greater than 100% + 20%, which is a total of 120%.

Establishment Responsibilities

Establishments that produce Protein Fat Free (PFF) controlled *cured* pork products, pickle-*cured* beef products, pickle-*cured* poultry products, pickle-*cured* pork bellies have specific responsibilities for controlling product preparation and following their processing procedures. Establishment management has the following responsibilities:

- Utilize in-plant controls, such as accurate pre-weighing of ingredients, to ensure **all** regulatory requirements are met,
- *Adhere to proven processing procedures for curing, cooking and chilling,*
- *Adopt procedures to minimize product variation, e.g., lot product to be pumped (hams, picnics, or briskets) into two-to three-pound weight ranges,*
- *Furnish all necessary assistance (labor) to the IPP so he or she can perform the added solution, yield or shrink check rapidly and accurately,*

- Assist the IPP in determining the tare weight of trucks or containers used for the added solution, yield or shrink regulatory determination, and
- Provide accurate scales, lighting, tanks, and carts necessary to conduct the added solution, yield or shrink regulatory determination.

The establishment's written processing procedures at a minimum must list the ingredients

(names and weights) used to formulate the pickle solution and the targeted percent pump/pick- up. If the pickle cured product is cooked, additional information is needed such as smokehouse cook times and temperature, chilling times and temperatures and targeted cook and chill shrinks—9 CFR 320.1(b)(10) and 381.175(b)(6).

Effective controls must be implemented to prevent adulteration with excess cure solution. One way to accomplish this is with in-plant "weight control." The establishment may submit lab samples periodically to determine the effectiveness of the control.

The establishment could positively identify the product by placing a tag bearing the date, product name, curing ingredients, green weight, piece count, pumped weight, signature of establishment employee, and lot number on each container (vat, truck, drum, etc.) of briskets. During the curing period, if pieces are removed from any container, the establishment should enter the number and weight of pieces removed on the tag attached to the container. The establishment should check any or all containers at the time of shipment (up to ½ hour after cover pickle has been drained). The weight and number of pieces removed during the curing period must be added back to the shipping weight to facilitate correct calculations for percent added solution (no more than 20% over green weight).

NFSCP PHIS Tasks

The proper inspection tasks used to verify the cured meat and poultry product regulatory requirements may not always be readily apparent. Below are two commonly used tasks for the products covered in this module.

Performing the General Labeling Task

Inspection program personnel perform this task to verify general labeling regulatory requirements and determine if the label accurately reflects the finished product.

General Labeling Requirements

When verifying that the general labeling requirements have been met, Inspection Program Personnel should:

- observe the application of the label or labeling - they should ensure that immediate containers of meat and poultry products have a label attached to them and that shipping containers bear the required information.
- select labels and labeling for review - determine if:
 - the label contains the mandatory features and other required information such as a qualifying statement or descriptive designation, and
 - any printing or colors on the label and packaging material gives a false impression or does not meet specific formatting criteria.

NOTE: Product is misbranded if its label is missing a required feature, qualifying statement, or descriptive designation or is anyway false or misleading.

- review the establishment's labeling records - determine if the:
 - label is on file and either met the generic approval requirements or was sketch approved by LPDS,
 - label required sketch approval by LPDS and if so, the sketch is attached to the final label,
 - label is being used beyond the expiration date if it has been granted a temporary approval by LPDS, and
 - product's formulation (if applicable) and processing procedures are attached to or accompany the label/labeling.

NOTE: If a noncompliance is found, IPP should issue an NR and take the appropriate action necessary to ensure misbranded product does not enter commerce.

Label Accurately Reflects the Product

Determining that the label accurately reflects the finished product involves reviewing the product's formulation record and observing its actual preparation and, in some cases, performing formula calculations.

When IPP perform this task, they should select one or more batches of product at formulation and verify ingredient amounts comply with the formula on file and that no undeclared ingredients are added or declared ingredients are omitted.

The verification may involve:

- observing pre-weighed ingredients for proper identification and weights, or
- observing establishment employees weighing ingredients or
- actually, weighing pre-weighed ingredients to determine if the weight on the container is accurate.
- An ingredient added at a different level than indicated in the product formula could affect the ingredient order of predominance on the label. The product is misbranded if a declared ingredient is omitted, an ingredient is added but not declared on the

label, or the ingredient order of predominance is not accurate. Depending on the type of undeclared ingredient (e.g., an allergen) that is added to the product, it may be either adulterated or misbranded or both. The regulations and many product standards of identity allow the establishment to add various ingredients to the formulae of certain meat and poultry products.

Some meat and poultry components used in the formulation may have regulatory limits. Some nonmeat ingredients have a specified maximum amount or percentage allowed in the product. These nonmeat ingredients are called **restricted** ingredients. The establishment **MAY** add the component or ingredient in any amount up to its permitted limit.

If the product is formulated with a meat or poultry component with a regulatory limit or with a restricted ingredient, the IPP should select one or more batches of product during formulation. They should determine the amount or percentage of the meat or poultry component and/or the amount one or more restricted ingredients used in the formula. The IPP verifies that the:

- percentage of meat or poultry component meets the regulatory limit,
- restricted ingredient is allowed in the product, and
- the amount of the restricted ingredient added to the product does not exceed the regulatory limit.

Verifying meat and poultry components or restricted ingredients are in compliance with regulatory limits usually requires the IPP to perform a formula calculation.

When meat or poultry components or restricted ingredients are added at levels in excess of their maximum regulatory limit, they become **economic adulterants**. For example, a RI ingredient, e.g., nitrite exceeds the maximum amount allowed.

If IPP find noncompliance, they issue an NR and take the appropriate action necessary to ensure adulterated or misbranded product does not enter commerce.

Performing the %Yield/Shrink Task

Inspection program personnel (IPP) perform the percent yield/shrink task in establishments that are preparing meat or poultry cuts, parts and products with added solutions at levels that **do not** require the product's label to be qualified with a statement to indicate the percent of the solution and ingredients added to the product.

When performing this task IPP select an appropriate product and verify compliance with regulatory requirements by reviewing establishment records and labels, calculating the % added solution, yield or shrink, and comparing the result with the appropriate regulatory requirement and product label.

The added solution, product shrink, and yield verification determinations are performed on one or more **subgroups** (samples) of product or on entire batches of product. To calculate the % yield, shrink or added solution, IPP have the establishment weigh a subgroup (sample) of product before and after the appropriate step in the process (pumping, injecting, dipping, cooking, chilling, or drying). There is not a specified number of pieces of product that must make up a subgroup. The number of pieces selected and weighed should be representative of the lot size. For example, the IPP may select 20 or 30 pieces of meat or poultry and have them weighed before the solution is applied (green weight) and 20 or 30 pieces after the appropriate processing step, e.g., pumping, immersion, or cooking and chilling, and have them weighed (finished weight). After IPP obtain the subgroup or batch weights (green and finished weights), they are to perform a calculation to verify that the added solution or the product's yield or shrink complies with the product's standard of identity or regulatory requirement.

When verifying added solution compliance, IPP may have the **SAME** pieces of meat or poultry weigh before (actual green weight) and after the application of the curing, tenderizing or flavoring solution (treated or pumped weight). Identification of the pieces of meat or poultry should be maintained. This method is the most accurate way to determine the percent added solution.

IPP may use another method to determine the percent added solution under certain circumstances, e.g., the scale and pumping or injecting apparatus are not in the same area or room. In this situation, IPP **may** select and have pumped or treated pieces of meat or poultry weighed before selecting fresh unpumped or untreated pieces **provided** that the pieces **are uniform** in size and weight (e.g., lotted into 2-to-3 lb weight ranges). The green weight is determined from different pieces of meat or poultry. All pieces selected must be in the same weight range.

Shrink and yield determinations should be conducted on entire lots of product. However, in many instances it is not feasible to perform shrink and yield tests with the entire weight of the lot (inspection personnel time constraints or extremely large lot size). Therefore, weighing a large enough portion (subgroup sample) to represent the lot would be acceptable.

*To accurately determine the percent of the solution and the amount of each restricted ingredient added to a product via the solution, IPP have to differentiate between an **actual** or **effective percent pump or pick-up**.*

- **Actual Percent Pump or Pickup** is the amount (pounds) of a water-based or oil-based solution (curing, tenderizing, marinating, etc.) pumped or injected into or picked up by a piece of meat or poultry that **is not held for a period of time** and allowed to drain prior to being further processed. This is expressed as a percentage of the weight of the meat or poultry before it is pumped with the solution.

- **Effective Percent Pump or Pickup** is the weight gained (expressed as a percent) by the meat or poultry **after draining for the specified amount of time** in the establishment's written procedure and represents the amount of reactive solution that remains in the product. Any reactive ingredients (nitrites, phosphates, enzymes, flavors, etc.) in the solution are thought to remain in solution during the drain time after pumping, rather than reacting immediately with the meat or poultry protein. Therefore, using the effective percent pump in calculations more accurately reflects the ingoing amount of solution and RI ingredients.

If the IPP determines that the effective or actual % pump or pickup (gain) exceeds the maximum amount of solution allowed in the product, i.e., the standard of identity for the product, there may be regulatory noncompliance. The IPP would need to determine if the establishment has records or data to demonstrate that it is consistently or routinely adding solution below the maximum amount of solution allowed. If the IPP determines that the ingoing amount of a restricted ingredient exceeds the regulatory limit, there is regulatory noncompliance.

Note: Both methods of determining compliance above (i.e., weighing product) also apply to **cured cooked beef** products, except that the percentage of solution remaining in the product after cooking and chilling (finished weight) is used rather than actual or effective % pump in the calculation.

Restricted Ingredients

This section includes information on ingredients and the limitations for their use in curing compounds and curing solutions that are to be applied in or on meat and meat food products and poultry and poultry food products. It also covers mathematical calculations to determine compliance for the following restricted ingredients:

- Curing agents and curing compounds,
- Curing accelerators, and
- Phosphates

Note: *In the establishment, FSIS Directive 7620.3, Processing Inspectors' Calculations Handbook can be used to assist you.*

IPP may use two methods to determine curing agent, curing compound, curing accelerator or phosphate compliance. They can determine the ingoing parts per million of the cure agent, cure accelerator, or phosphate used in the pickle formula and then compare their result against the ingoing amount allowed by the Meat and Poultry Inspection (MPI) regulations. If the calculated ingoing amount is equal to or less than the amount allowed by regulation, the

product is in compliance. Alternatively, they could determine the maximum amount of the cure agent, cure compound, cure accelerator or phosphate allowed in the formula and then compare their calculated result to the amount that is actually being used in the formula. If the amount used in the pickle formula is equal to or less than the maximum amount allowed, the product is in compliance.

Limits for restricted ingredients (RI) permitted in pickle cured meat and poultry products are expressed in terms of ounces (oz) or pounds (lb) per gallons of pickle solution, or as percentages (%) in the Table of Approved Substances in section 424.21(c) of the MPI Regulations and FSIS Directive 7120.1. The same limits may be expressed in parts per million (ppm) which are more convenient units for verifying food additive compliance. The conversion of curing agent and accelerator weight limits, and the phosphate percentage limit to parts per million (ppm) limits is shown in Table I.

Note: *When nitrate and nitrite are used in combination, the limits are calculated separately and the permitted maximum (weight or ppm) of each may be used.*

TABLE 1

Conversion of Restricted Ingredient Weight or Percentage Limitations to PP limitations

<p>Cure Agent Limits in Regulations</p>	<p>Converted to Maximum PPM Limit</p>
<p><i>Nitrite</i></p> <p>2 lb to 100 gallons of pickle at 10% pump</p> <p><i>Nitrate</i></p> <p>7 lb to 100 gallons of pickle at 10% pump</p> <p>Note: <i>When nitrite and nitrate are used in combination, the limits are calculated separately and the permitted maximum (weight or ppm) of each may be used.</i></p>	<p>General PPM Equation for Pickled Product:</p> $\text{ppm} = \frac{\text{lb RI} \times \% \text{ pump} \times 1,000,000}{\text{lb of pickle}}$ <p>If 1-gallon pickle weighs 10 lb (wt. base when regulations were written), then 100 gallons weighs 1000 lb.</p> $\frac{2 \text{ lb} \times .10 (10\%) \times 1,000,000}{1000 \text{ lb}} = 200 \text{ ppm}$ $\frac{7 \text{ lb} \times .10 (10\%) \times 1,000,000}{1000 \text{ lb}} = 700 \text{ ppm}$
<p>Cure Accelerators in Regulations</p> <p><i>Ascorbic Acid and Erythorbic Acid</i></p> <p>75 oz to 100-gal pickle at 10% pump</p>	<p>Converted to ppm</p> <p>If 1 gal pickle weighs 10 lb, then 100-gal pickle weigh 1000 lb</p> <p>75 oz. = $75/16 = 4.687$ lb</p> $\frac{0.10 \times 1,000,000}{1000} = 469 \text{ ppm}$

<p><i>Ascorbate and Erythorbate</i></p> <p>87.5 oz to 100-gal pickle at 10% pump</p>	<p>$87.5 \text{ oz} = 87.5 \text{ oz}/16 = 5.468 \text{ lb}$</p> <p>$\frac{0.10 \times 1,000,000}{1000} = 547 \text{ ppm}$</p>
<p>Phosphates in Regulations</p> <p><i>Used to decrease cooked out juices:</i></p> <p>5 percent of phosphate in pickle at 10% pump (meat regulations)</p> <p>0.5% of total product (poultry regulations)</p> <p>0.5% of phosphate in product (meat regulations)</p> <p><i>Used to protect flavor:</i></p> <p>0.5% of total product (meat regulations)</p>	<p>Converted to ppm</p> <p>5% in pickle = 5 lb in 100 lb</p> <p>$\frac{10 \times 1,000,000}{100} = 5000 \text{ ppm}$</p> <p>$5000 \text{ ppm} = 0.005 = 0.5\%$</p> <p>$5000 \text{ ppm} = 0.005 = 0.5\%$</p> <p>$5000 \text{ ppm} = 0.005 = 0.5\%$</p>

Curing Agent (Nitrite and Nitrate) Compliance Determinations

Table II lists the maximum parts per million (ppm) for each of the four curing agents permitted in products, based on the curing method used. The limits vary among curing methods because the methods differ in the efficiency with which the curing agent is brought in contact with the meat and/or poultry. Limits for nitrite/nitrate combinations and combination procedures (such as pumping and dry curing) are addressed in the Processing Inspectors' Calculation Handbook.

TABLE II

Maximum Ingoing Nitrite and Nitrate Limits (in PPM) for Meat and Poultry Products*

Curing Agent	Curing Method			
	Immersion Cured	Massaged or Pumped	Comminuted	Dry Cured
Sodium Nitrite	200	200	156	625
Potassium Nitrite	200	200	156	625
Sodium Nitrate	700	700	1718	2187
Potassium Nitrate	700	700	1718	2187

** There are more stringent limits for curing agents in bacon to reduce the formation of nitrosamines. For this same reason, nitrate is no longer permitted in any bacon (pumped and/or massaged, dry cured, or immersion cured).*

The amount of ingoing nitrite or nitrate used in pumped, massaged, injected, or immersion-cured products, such as hams, poultry breasts, poultry rolls, corned beef, etc., is based on the **green weight** of the meat and/or poultry used in the product formulation.

The green weight is the weight of the meat and/or poultry (e.g., ham, chicken breast, pork belly, beef brisket or pork trim for sausage) prior to processing (such as grinding and adding ingredients, pumping with a solution, adding batter and breading, cooking, or drying). Nothing has been added or removed from the meat and/or poultry.

Nitrate is converted (by bacterial action) to nitrite and is a color fixer. Nitrate can be used in pickle alone. It can be used in pickle with nitrite. If nitrate is used in conjunction with nitrite, the limits of the two compounds are calculated separately and the permitted maximum of each may be used. Refer to this calculation in the Processing Inspectors' Calculation Handbook.

In immersion curing, the submerged meat or poultry absorbs the cover pickle solution, slowly, over a long period of time. The calculation for nitrite or nitrate uses percent pick-up rather than the percent pump. The percent pick-up is the total amount of cover pickle absorbed by the meat or poultry. It is used in the calculation for immersion cured products in the same way percent pump is used in the calculation for pumped products

Curing Accelerator Compliance Determinations

*Cure accelerators speed up the color development (color fixing) of cured products by accelerating the chemical conversion of nitrite to nitric oxide. In addition, cure accelerators aid in keeping myoglobin (muscle pigment) in the reduced state so that it can readily combine with nitric oxide to form nitric oxide myoglobin. Since cure accelerators aid the curing agents in cure color development, they **may only** be used in combination with the curing agents*

Table III lists the permitted maximums for accelerators used alone **and** in combination in the curing of pumped, massaged, and immersed meat or poultry products other than bacon. Maximums for sodium ascorbate and sodium erythorbate (isoascorbate) in bacon are given on page 15 of this handout.

TABLE III
Maximum Ingoing Cure Accelerators (in PPM)
for Meat and Poultry Products

Cure Accelerator	Maximum Limit
Ascorbic Acid	469 ppm*
Erythorbic Acid	469 ppm*
Sodium Ascorbate	547 ppm*
Sodium Erythorbate (isoascorbate)	547 ppm*
Citric Acid or Sodium Citrate	may replace up to half of any one of the above
	*Except in bacon

The amount of ingoing cure accelerators used in cured, pickled products, such as ham, corned beef, turkey ham, etc., is based on the ***green weight of the meat and/or poultry and/or meat/poultry byproducts*** used in the product formulation.

All the methods for calculating nitrite and nitrate amounts also apply in the calculation of cure accelerator amounts. Different limits apply, depending upon which cure accelerator is used as shown in Table III.

Phosphate Compliance Determinations

Phosphates are frequently added to curing solutions and cured product formulations because of the numerous beneficial effects they have in meat and poultry curing. Phosphates increase the water retention (water binding capacity) of the meat and poultry, which reduces the shrinkage (moisture loss) and purge (cook-out) of pickle-cured products during further processing. The improved water binding results from the reaction of the phosphate ions with the meat and poultry proteins. Phosphates also improve the sensory characteristics of the product (texture, juiciness, and tenderness), improve the stability and uniformity of the cure color, and suppress the development of rancidity in cured products. Phosphates tend to precipitate out of pickle if not agitated.

Phosphates are permitted in meat and poultry products, unless otherwise prohibited by the regulations, to reduce the amount of cooked-out juices. Phosphates in pickle-cured meat products such as ham, corned beef, and bacon are limited to 5% in a pickle at a 10% pump level. Phosphates in pickle-cured poultry products such as turkey ham are limited to .5% in the total product. Both limits are equivalent to 5000 ppm. For **pickle cured meat products**, the maximum ingoing phosphate limit is based on the green weight of the meat or meat byproduct in the product formulation. Calculations for phosphate(s) are the same as those for nitrite and cure accelerators in pickle-cured **meat** products.

Pickle Solution Compliance Determinations

First, when the pickle is measured by volume, not weight, determine its weight by multiplying the number of gallons of water by 8.33 (the weight in pounds of a gallon of water) and adding the actual weight of the other ingredients. Next, if two parts of the equation are known, the third can be calculated by substituting the known values using the following **calculation equation**:

$$\text{ppm (parts per million)} = \frac{\text{lb Restricted Ingredient (RI)} \times \% \text{ Pump} \times 1,000,000}{\text{lb Pickle}}$$

Example Problem

1. Solving for ingoing RI parts per million (ppm)

An establishment's written procedure calls for 10% pump, 100 gal of pickle weighing 1,000 lb, and 2 lb of sodium nitrite.

("X") = unknown

$$X = \frac{2 \times 0.1 \times 1,000,000}{1,000}$$

$$X = \frac{200,000}{1,000}$$

$$X = 200 \text{ ppm ingoing nitrite}$$

Note: Ingoing parts per million for cure accelerators and phosphate (meat product only) are determined using the same method except the weight of the cure accelerator or phosphate would be substituted into the equation for the weight of nitrite.

2. Solving for maximum percent pump

Pickle "A" contains 1 lb 12 oz of nitrite for 1,000 lb. What percent of pump is permitted?

Calculation: Convert 1 lb 12 oz to 1.75 lb nitrite allowed at 200 ppm

$$200 = \frac{1.75 \times X \times 1,000,000}{1,000}$$

In this instance, all the known values are moved to the left side of the equation, leaving "X" on the right and keeping it in the numerator. To transfer a value from one side of the equation to the other, it is simply moved to the numerator on the other.

$$\frac{200 \times 1,000}{1.75 \times 1,000,000} = X$$

$$\frac{200,000}{1,750,000} = X$$

$$0.1142 = X$$

11.42% maximum % pump allowed

3. Solving for maximum amount of restricted ingredient

Establishment 38 is using a cure mix with 6.25% nitrite. The establishment is planning to pump hams at 12% using a pickle solution. How much cure mix can the establishment use per 100 gal of pickle at this level of pump if the pickle weight is 9.5 lb per gallon?

$$\text{Calculation: } 200 = \frac{X \times 0.12 \times 1,000,000}{950}$$

In this instance, all the known values are moved to the left of the equation, leaving "X" on the right where it is in the numerator.

$$\frac{200 \times 950}{0.12 \times 1,000,000} = X$$

$$\frac{190,000}{120,000} = 1.58 \text{ lb nitrite allowed per 100 gal of curing solution}$$

Special Note: To find the amount of cure mix allowed, IPP divide the amount of nitrite allowed (in this case 1.58 lb) by the percent nitrite in the mixture (in this case 6.25% nitrite).

$$\frac{1.58}{0.0625} = 25.28 \text{ lb pickle solution allowed in each 100 gallons of pickle}$$

4. Determining the volume of a container

Pickle tank "C" is a rectangular tank with these dimensions: Length = 60 inches; Width = 48 inches; Height = 48 inches

How many gallons will it hold when completely filled?

Special Note: There are 231 cubic inches in a gallon and 7.48 gallons in a cubic foot.

$$\text{ANSWER: } V = \frac{LWH}{231}$$

$$V = \frac{60 \times 48 \times 48}{231}$$

$$V = 598.44 \text{ gal}$$

Special Note: When calculating for restricted ingredients, the tanks are usually never filled to the brim. Therefore, IPP may calculate for the gallons per inch of depth and multiply the gallons per inch by the height in inches that the tank will be filled to find the total volume.

5. Determining volume in a partially filled tank

Pickle tank "D" is a rectangular tank with these dimensions: Length = 65 inches; Width = 60 inches; Height = 48 inches

How many inches from the top would 600-gal measure in this tank?

$$\text{ANSWER: } V = 65'' \times 60'' \times 48''$$

$$V = \frac{187200}{231}$$

$$V = 810.39 \text{ gallons}$$

$$V = \frac{810.39 \text{ gal}}{48 \text{ in}}$$

$$V \text{ per inch in height} = 16.88 \text{ gal}$$

$$H = 600 \text{ gal} \div 16.88 \text{ in}$$

$$H = 35.55 \text{ inches in tank}$$

$$H = 48 \text{ in} - 35.55 \text{ in}$$

$$H = 12.54 \text{ inches or } 12.5 \text{ inches from the top of the tank}$$

Cure Agent and Cure Accelerator Determination Workshop Curing Problem 1

The General Labeling task appears on the task calendar today. The establishment's production sheet indicates that boneless ham water added using processing procedure A03 is being prepared today. You go to the production office and review procedure A03. Procedure A03 indicates that pickle solution is prepared in a 200-gallon batch. A gallon of pickle weighs 10 lb. The target pump is 14%.

The restricted ingredients used in the pickle formula for procedure A03: Phosphate—72 lb; Nitrate—8 lb; Nitrite—2 lb 10 oz.; and Sodium Ascorbate—5 lb

In the pickle preparing room, you find procedure A03 posted above the pickle tank. It is the same procedure you observed in the production office. You find the tank used for mixing this pickle has these dimensions:

40" length; 40" width; 30" height

The 200-gallon mark is located 3" from the top of the tank.

Note: *There are 231 cubic inches in a gallon*

QUESTIONS

1. Is the mark on the tank correct (i.e., 200 gallons)? If not, what concerns do you have?

2. a) Calculate the ingoing parts per million (PPM) for each restricted ingredient based on 200

gallons of pickle.

b) Calculate the ingoing PPM for nitrite based on the gallons of pickle you determined in question 1.

c) *Did these calculations support your concern(s) from question 1?*

YES _____ NO _____

If you answered yes, why?

d) *Based on the A03 pickle formula (200 gallons), was the regulatory limit exceeded for any of the restricted ingredients?*

YES _____ NO _____

Curing Problem 2

The General Labeling task is on the task calendar today. The establishment's written procedure states that the beef brisket pickle solution is prepared in an 860-gallon curing vat. The total ingredients (including water) weigh 8,586 lb. The pump target is 12%.

(Note: *The cure ingredients are combined in a curing compound.***)**

The cure compound label states:

Sodium nitrite	23%
Sodium erythorbate	25%
Salt carrier	<u>52%</u>
Total	100%

What is the maximum amount of curing compound permitted in this pickle formula?

_____ lb

Curing Problem 3

A. How many gallons are contained in a cylindrical drum filled to within two inches of the top with pickle if the drum dimensions are 24" (diameter) X 30" (height)?

Note: $V = \pi r^2 h$ $\pi = 3.14$ $r = \text{radius}$ $h = \text{height}$ $V = \text{volume}$
There are 231 cubic inches in a gallon

_____ gallons

How much nitrite, nitrate, and ascorbic acid could be used if the establishment wants to pump 15%? (A gallon of pickle weighs 9.68 pounds.)

Nitrite _____ lb

Nitrate _____ lb

Ascorbic Acid _____ lb

Added Solution and Shrink Determinations

Several meat food products and turkey ham have specific regulatory limits for the amount of water that can be added or picked-up from a curing solution. Inspection program personnel must perform pump or pick-up determinations to verify that the amount of solution added to the product is in accordance with the regulations, the establishment's written procedures, or product label. IPP also perform shrink and yield tests to verify that the product's finished weight meets the regulatory requirement prior to packaging.

This supplement includes examples and/or practice problems designed to assist IPP in:

- Υ *Performing percent added solution (pump/pick-up) determinations;*
- Υ *Performing product shrink determinations*
- Υ *Performing cooking/cooler shrink determinations;*
- Υ *Interpreting processing procedure charts; and*
- Υ *Calculating maximum amounts of restricted ingredients allowed.*

Percentage of Added Solution (Gain in the Calculation Aid) Determination

Calculation Equation

$$\frac{(\text{pumped, treated, or massaged}) \text{ weight} - \text{green weight}}{\text{green weight}} \times 100 = \% \text{ pump or pick-up}$$

Note: Pumped weight, treated weight, or massaged weight can be inserted into the above equation depending upon the method in which the solution is applied, e.g., *treated weight* is used when the product is dipped or submerged in the solution; ***pumped weight*** is used when the solution is injected into the cut.

Note: The green weight is the weight of the meat and/or poultry prior to processing (such as adding ingredients, pumping with a solution, cooking, or drying)

Calculation Method

IPP can use the steps in the table below to compare a product's green weight with its pumped, treated, or massaged weight and determine the percent added solution.

STEP		EXAMPLE
1	Determine the green weight of a given number of pieces of fresh (unpumped, untreated, etc.) meat or poultry or an amount of fresh (unpumped, untreated, etc.) meat or poultry product that will represent the lot.	Fifteen beef briskets to be pickled weigh 227.6 lb.
2	If a drain time is listed in the establishment's written procedure, allow the pumped/treated product to drain for the specified time period and then weigh. If no drain time is listed, take the weight directly after pumping.	After <i>pumping</i> , the <i>same</i> fifteen beef briskets weigh 271.1 lb.
3	Subtract the green weight from the pumped or treated weight to obtain the pounds of added solution.	$\begin{array}{r} 271.1 \text{ lb} \\ - \underline{227.6 \text{ lb}} \\ 43.5 \text{ lb of solution} \end{array}$
4	Divide the pounds added solution by the green weight.	$43.5 \text{ lb} \div 227.6 \text{ lb} = 0.1911$

5	Convert the decimal answer into the percentage of added solution by multiplying by 100.	$0.1911 \times 100 = 19.11\%$ added solution. In this case 19.11% could also be referred to as the <i>effective</i> percent pump (if product is drained) or <i>actual</i> percent pump (if product is not drained).
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Additional Added Solution Example Calculations

1. A pump test shows 30 fresh, uncured hams had a green weight of 450 pounds; the same 30 pumped hams had a weight of 510 pounds. The procedure indicates 16% target pump.

What percent added solution does this test show?

Answer: $510 - 450 = 60$ lb
 $60 \div 450 = 0.133$ or 13.3%

If a consistent pattern of under pumping is identified, then the IPP should request that management adjust the procedure to reflect the actual pumping percentage. Pumping equipment is checked for accuracy daily by the establishment and should be spot checked by the IPP. The under pumping should be discussed at the weekly meeting and the establishment's response documented in the MOI.

2. A second test was conducted on 25 pork hams. The procedure indicates a 19% effective pump.

Pumped weight = 260 lb; Green weight = 210 lb

What is the percentage of added solution?

Answer: $260 - 210 = 50$ lb of solution
 $50 \div 210 = 0.2380$ or 23.80%

Note: The IPP should request that the establishment demonstrate that these hams are in compliance with the minimum PFF value in the table in 9 CFR 319.104 after they are cooked and accurately labeled because they have been over pumped by 4.8%. IPP should also verify the amount of ingoing restricted ingredients are in compliance using the 23.8% effective pump. This finding should also be discussed at the weekly meeting and the establishment's response documented in the MOI.

Maximum Percent (Gain, Pump or Pick-up) Determination

To verify that the level of ingoing restricted ingredients (curing agents, cure accelerators, phosphates, etc.) in a pickle formula are in compliance, IPP can determine the maximum % pump for each restricted ingredient and compare it to the targeted % pump. The listed target % pump *shall never be greater than* the maximum % pump allowed for any restricted ingredient in the solution. To verify restricted ingredient compliance at the time of pumping, the effective or actual % pump must be compared to the maximum % pump allowed for the picklesolution. Calculation Equation

$$\frac{\text{lb restricted ingredient} \times \% \text{ pump} \times 1,000,000}{\text{lb pickle}} = \text{ppm}$$

Calculation Method

IPP may use the steps in the following table to determine the maximum percent pump allowed for each restricted ingredient in a pickle or curing solution.

STEP		EXAMPLE
1	Determine the weight of the nitrite added to the pickle solution, the total weight of the pickle solution, and the target percent pump from the label transmittal form or the establishment's written procedure record/chart. <i>If any two of these quantities are known, the third can be calculated by substituting the known values into the equation.</i>	Pickle Formula Water 1310.00 lb Salt 132.00 lb Dextrose 18.00 lb Phosphate 35.00 lb Sodium Erythorbate 3.25 lb Sodium Nitrite <u>1.75 lb</u> Total 1500.00 lb

2	Enter the weight of the nitrite, the weight of the pickle solution, and the ppm limit for nitrite (200 ppm) into the equation and solve for <i>n</i> , the maximum percent pump.	<p>We have 1.75 lb of nitrite in 1500 lb of solution that is to be pumped into beef briskets at a targeted level of 16%. However, what would be the maximum % pump allowed in the event the establishment exceeded the target % pump?</p> $200 = \frac{1.75 \times n \times 1,000,00}{1500}$
3	Convert the decimal answer into the percent pump by multiplying by 100.	<p>$0.1714 \times 100 = 17.14\%$ is the maximum pump % level for nitrite. Since the target % pump is 16%, this processing procedure would produce beef briskets in compliance for ingoing nitrite.</p>

Maximum Amount of Added Solution (Gain) Allowed Determination

Beef cuts or beef briskets dipped or submerged into or injected with pickle solutions *may not* have more than the 10% or 20% solution added to them in accordance with regulations.

Calculation method

The steps in the table below will assist IPP in determining the maximum amount (pounds) of added solution.

STEP	EXAMPLE	
1	Multiply the green weight of the meat or poultry to be pumped/treated by the amount of solution allowed -- 10% (.10) or 20% (.20).	<p>Ten beef tongues treated with a pickle cure</p> <p>Ten tongues weigh 38 lb</p> <p style="text-align: right;">38 lb</p>

2	Add the untreated (green) weight and the solution permitted to get the total maximum weight of the treated product.	<p>38.0 lb</p> <p>+ <u>3.8</u> lb</p> <p>41.8 lb would be the maximum amount the ten tongues could weigh after being treated.</p>
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Finished Product Shrink and Cooking/Cooling Shrink Determinations

After processing, some products must weigh **a certain percentage less** than the green weight of the fresh meat cut. IPP are responsible for verifying the shrinkage of various cured meat products. For example, dry-cured hams and pork shoulders must shrink a minimum of 18%--9 CFR 319.106(b)(7). IPP may also verify that the establishment is following its written processing procedures required by 9 CFR 320.1(b) (10) and 381.175(b) (6).

Use the equation on the next page to verify the percent shrink compliance of dry cured hams and pork shoulders. This equation may also be used to determine the shrink for other meat food products that are required to have specific amount of shrink, e.g., bacon bits and barbecued meat.

Calculation Equation

$$\frac{\text{green weight meat or poultry} - \text{finished weight}}{\text{green weight meat or poultry}} \times 100 = \% \text{ shrink}$$

Note: *Finished weight is the weight of the meat and/or poultry plus the weight of any ingredients added during processing minus the weight loss (shrink) from smoking, cooking, cooling or drying.*

The steps in the table below should be used when IPP want to find a finished product's percent shrink.

STEP		EXAMPLE
1	Determine the green weight of the meat.	Dry-Cured Pork Shoulders
2	Determine the weight of the product after processing (cooking, drying, etc).	After the specified curing and drying period, the pork shoulders weigh 395 lb
3	Subtract the weight of the product after processing (finished weight) from the green weight of the meat to find the amount the product shrunk.	$ \begin{array}{r} 500 \text{ lb} \\ - \underline{395 \text{ lb}} \\ 105 \text{ lb} \end{array} $
4	Divide the number of pounds the product has shrunk by the green weight of the meat.	$105 \text{ lb} \div 500 \text{ lb} = 0.21$
5	Convert the decimal answer into the percentage of shrink by multiplying by 100.	$0.21 \times 100 = 21\%$ shrink (in compliance). The weight of the pork shoulders is at least 18% less than the fresh uncured (green) weight of the pork shoulders

Cook and Chill Shrink Determinations

*The establishment must adhere to its written procedures, e.g., solution formulation, cooking and chilling time, temperature and humidity, and cook and chill shrinks. Smokehouse instrument charts should be checked periodically against a known accurate thermometer to determine the accuracy of the recording devices. When an establishment is producing a PFF controlled cured pork product and does not meet the target shrinks, the product may not be accurately labeled, e.g., ham natural juices versus ham water added versus ham X% of weight is added ingredients. Likewise, if an establishment is producing cooked cured beef product or cooked turkey ham and does not meet the target shrinks, the finished product weight may exceed the original (green) weight of the beef cut or thigh meat prior to curing, i.e., the product yield is more than 100%. **Cooked** corned beef products and turkey ham, whose weights after cooking exceed the weights of the fresh uncured beef or thigh meat, must be descriptively labeled to indicate the presence and the amount of the additional substances, e.g., “Corned Beef Containing 15% Solution” or “Turkey Ham, Cured Turkey Thigh Meat 25% Added Water.”*

Use the following equation to determine the percent cook shrink or chill shrink of **cooked** bacon bellies, PFF-controlled cured pork products, cured beef products, and turkeyham.

Calculation Equation

$$\frac{\text{weight in (smokehouse/oven/cooler)} - \text{weight out (smokehouse/oven/cooler)}}{\text{weight in (smokehouse/oven/cooler)}} \times 100 \% \text{ shrink}$$

The steps in the following table should be used when IPP want to determine the percentage of cook or chill shrink.

STEP		EXAMPLE
1	Determine the weight of the product (less tare) going into the smokehouse, oven, cooler, etc.	1000 lb. of turkey thigh meat
2	Determine the weight of the product (less tare) coming out of the smokehouse, oven, cooler, etc.	927 lb of Turkey Ham after cooking and smoking
3	Subtract the weight coming out from the weight going in to find the amount of product shrink.	$\begin{array}{r} 1000 \text{ lb} \\ - 927 \text{ lb} \\ \hline 73 \text{ lb} \end{array}$
4	Divide the number of pounds shrunk by the product weight going into the smokehouse, oven, cooler, etc.	$73 \text{ lb} \div 1000 \text{ lb} = 0.073$
5	Convert this decimal answer into the percentage of shrink by multiplying by 100.	$0.073 \times 100 = 7.3\%$ cook shrink

Additional Example Shrink Calculations

1. The establishment may record or periodically monitor the cooking shrink.

Cooking Shrink Example

The weight of 60 hams on a smokehouse tree going into a smokehouse is 990 lb. The hams have been pumped at 14%. The same tree coming out of the smokehouse weighed 910 lb. What is the percentage of smokehouse shrink?

$$\frac{990 - 910}{990} \times 100 \quad 80 \div 990 = 0.0808 \text{ or } 8\% \text{ shrink}$$

2. Similar to the cooking shrink, the establishment may monitor cooler shrink.

Cooler Shrink Example

The weight of 60 hams on a smokehouse tree (hot weight) going into the cooler is 910 lb. The weight of the same 60 hams after the minimum chill time is 895 lb.

$$\frac{910 - 895}{910} \times 100 = .0164 \text{ or } 1.6\% \text{ shrink}$$

Note: When shrinks targets listed in the establishment’s written procedure are exceeded, the IPP should discuss this finding at the weekly meeting and document the establishment’s response in the MOI. If the establishment has a history or pattern of not meeting the target cooking and chilling shrinks, the IPP should request that the establishment update the written processing procedure. When the product is cooked corned beef or turkey ham, the IPP should also determine if the corned beef product or turkey ham returned to the weight of the fresh briskets or turkey thigh meat (green weight). When the product is a PFF-controlled product, the IPP should request that the establishment demonstrate that the product is truthfully labeled, e.g., the minimum PFF value in §319.104 is met for qualifying statement in the product name (ham natural juices, ham water added, or ham X%..., etc.)

Added Solution and Shrink Calculation Workshop

The chart below is a written cured ham example processing procedure for establishment 38. Review the information in the chart and answer the questions on the next page.

Processing Procedures for Cured, Cooked, and/or Smoked Ham

STYLE Fully Cooked

EST. # 38

PRODUCT Bone-in Ham with Natural Juices

Weight

Ranges 14/16

PICKLE FORMULA			USUAL PROCEDURES	
100-Gal Pickle weighing 1000 lb	LB	% PUMP	% PUMP	16
SALT	<u>92.5</u>		LB. PRESSURE	<u>60</u>
CORN SYRUP	<u>40</u>		SPEED	<u>—</u>
WATER 100 GAL	<u>833</u>		BEGIN S.H. TEMP.	<u>140° F</u>
PHOSPHATE	<u>30</u>		TIME	<u>2 hours</u>
			MIDDLE S.H. TEMP.	<u>160° F</u>
			TIME	<u>2 hours</u>
			FINISH S.H. TEMP.	<u>180° F</u>

3. Calculate the pump tests and compare your answers to the procedure chart.

Test dated 2/15_____ % pump

Test dated 2/23_____ % pump

Added Solution and Shrink Problems

1. The % Yield/Shrink task is on the task calendar today. The establishment is producing product labeled Corned Beef Brisket. The target pump on the establishment's written procedure for the beef briskets is 18%. There is a 30-minute drain time for the pumping procedure. The establishment has data indicating that it does % added solution (pump) checks once a month. You select a stainless-steel bin with several corned beef briskets (approximately 90) and follow the establishment to the scale and have them weighed. After the weight of the bin is removed, the beef briskets weigh 895 lb green. You accompany the bin of beef briskets to the pumping machine and observe them being pumped with a curing solution. You place a U.S Retained tag on the bin with the pumped briskets and write pump test on the tag. Thirty minutes later you return to the processing room and have the bin moved to the scale and weighed. After the weight of the bin is removed, the beef briskets weigh 1,105 lb pumped. Are the briskets in compliance?

_____ % pump (added solution)

_____ in compliance

_____ not in compliance

2. *The % Yield/Shrink task is on the task calendar today. The establishment is producing product labeled Country Style Bone-in Hams. The Bone-in hams are place on stainless steel rack and covered with the salt, curing agents, spices, etc. Each rack holds 80 hams. After the hams are placed on the racks but before the dry curing ingredients applied to them, you have the establishment weigh a single rack of hams. The hams weigh 1,280 lb. You place a U.S Retained tag on the rack with the uncured hams and write shrink test on the tag. The establishment begins covering the hams with the dry curing ingredients. Each time the establishment overhauls the hams (adds new dry curing ingredients) they notify you. After 45 days they notify you they are going to hang the hams on tree and move them to the drying (ripening) room. You observe the hams transferred from the rack to a tree and you transfer the U.S. Retained tag to the tree. After another 155 days the establishment informs that they want to remove the hams from drying room and package and label them. While on the way to the packaging room, you have the establishment weigh the hams on the tree. After the weight of the tree is removed, the finished hams weigh 1,042 lb.*

_____ % shrink

_____ in compliance

_____ not in compliance

Bacon Processing

This supplement includes information on bacon manufacturing and IPP verifications activities including bacon restricted ingredients and bacon yield determinations. The establishment is responsible for controlling bacon manufacturing to assure that the finished product is in compliance with FSIS Regulations §318.2, §319.107, and §424.22. Calculation examples are provided for reference purposes.

Introduction

Because of problems associated with *nitrosamine formation* in bacon, FSIS regulations, section 424.22(b) (1) prescribe the regulatory amounts of nitrite and sodium ascorbate or sodium erythorbate (isoascorbate) to be used in pumped and massaged bacon. For the immersion curing and dry curing of bacon, maximum amounts of sodium and potassium nitrite are prescribed in section 424.22(b) (2) and (3) of the regulations.

Establishment management must develop written pickle formulas and processing procedures for preparing bacon (9 CFR 320.1(b)(10))and 381.175(b)(6)). The pickle formula and targeted percent pump or pick-up or cure mixture must ensure that the restricted ingredient limits listed below are met.

Regardless of the curing method used, restricted ingredient calculations for bacon are based

on the **green weight** of the skinless belly. For rind-on bacon, e.g., where the skin is sold as part of the finished product, a restricted ingredient conversion calculation is necessary. **Nitrate is no longer permitted in any curing method for bacon.**

Restricted Ingredient Limits

Pumped and/or Massaged Bacon (rind-off): These bellies are injected with a cure solution or a cure solution is added to them by massaging or tumbling. Pumped and/or massaged bacon must contain 120 ppm ingoing sodium nitrite (or 148 ppm potassium nitrite).

550 ppm ingoing sodium ascorbate or sodium erythorbate (isoascorbate) is required in pumped and massaged bacon, in addition to any prescribed amount of nitrite.

Note: When determining **pumped and/or massaged** product compliance with the nitrite and ascorbate (or erythorbate) limits, the Agency allows a **plus or minus** 20% ppm allowance at the time of injecting or massaging due to variables in pumping procedures, draining, purge, etc.

For example: 20% = 0.20, thus $0.20 \times 120 \text{ ppm nitrite} = 24 \text{ ppm}$

120 ppm	120 ppm
<u>- 24 ppm</u>	<u>+ 24 ppm</u>
96 ppm minimum nitrite	144 ppm maximum nitrite

The same calculation can be done for ascorbate or erythorbate (440 ppm minimum, 660 ppm maximum).

The additional solution added to the product from the higher effective or actual % pump than the establishment's target % pump would be considered negligible because the finished product weight must return to green weight.

The 20% variation is only for actual pump test and is not to be used when determining pickle formulas or % pump for the establishment's written procedure.

Immersion Cured Bacon (rind-off): These bellies may be place in a pickle solution containing salt, nitrite, and flavoring. A maximum of 120 ppm of nitrite or equivalent of potassium nitrite (148 ppm) can be used in immersion cured bacon.

Note: The calculation method for nitrite in immersion cured bacon is the same as that for nitrite in other immersion cured products.

Dry Cured Bacon (rind-off): These bellies are cured by covering them with a pre-measured amount of cure mixture. A maximum of 200 ppm of nitrite or equivalent of potassium nitrite (246 ppm) can be used in dry cured bacon.

Note: The calculation method for nitrite in dry cured bacon is the same as that for nitrite in other dry cured products.

Bacon labeled “Dry Cured” may not be injected with, or immersed in, a curing solution.

Bacon labeled “Dry Salt Cured” may contain a curing solution injected directly into the tissues but not through the circulatory system. It is then covered with dry curing mixtures.

Pumped, Massaged, Immersion Cured, or Dry Cured Bacon (rind-on): The maximum limit for ingoing nitrite and sodium ascorbate or sodium erythorbate must be adjusted if bacon is prepared from pork bellies with attached skin (rind-on). A pork belly's weight is comprised of approximately 10 percent skin. Since the skin retains practically no cure solution or cure agent, the maximum ingoing nitrite and sodium ascorbate or erythorbate limits must be reduced by 10 percent. For example, the maximum ingoing limit for nitrite and sodium ascorbate or erythorbate for pumped pork bellies with attached skin would be 108 ppm [120 ppm – 12 ppm (120 × .10)] and 495 ppm [550 ppm – 55 ppm (550 × .10)], respectively.

Written Bacon Processing Procedure Ingoing Restricted Ingredient Determination

Calculation Equations

The equation for determining nitrite compliance in a proposed pumped or massaged bacon processing procedure is:

$$\frac{\text{lb nitrite} \times \% \text{ pump} \times 1,000,000}{\text{lb pickle}} = \text{ppm}$$

In pumped and/or massaged bacon, this equation can be used to determine:

- The permitted weight of nitrite allowed, if you know the weight of the pickle solution and the target percent pump to be used.
- The minimum weight of the pickle solution that can be made, if you know the weight of the nitrite and the target percent pump to be used
- The maximum percent pump, if you know the weight of the nitrite and the weight of the pickle solution
- Whether or not a procedure will be in compliance with the regulations, if you know the weight of the nitrite, the weight of the pickle solution, and the target percent pump to be used.

To determine nitrite compliance based on the **effective or actual % pump**, you can use the equation above by replacing the target pump with the effective or actual % pump.

Alternatively, you could use the following variations to the equation on the previous page:

$$\frac{\text{lb nitrite} \times 1,000,000}{\text{lb pickle}} = \text{ppm nitrite in the pickle}$$

$$\text{ppm nitrite in the pickle} \times \text{effective or actual \% pump} = \text{ppm nitrite in the bacon}$$

IPP can use the steps in following table to determine if a proposed bacon processing procedure will produce product in compliance with the regulations.

STEP		EXAMPLE
1	Determine the weight of the nitrite added to the pickle solution, the total weight of the pickle solution, and the target % pump from the establishment's written procedure.	<p>Pickle Formula</p> <p>96.3 lb</p> <p>02.2 lb</p> <p>56.2 lb</p> <p>Sodium</p> <p>31.3 lb</p> <p>Sodium</p> <p>11.5 lb</p> <p><u>2.5 lb</u></p> <p>500 lb</p> <p><i>Target pump is 12%</i></p>
2	<p>If all three factors are known, one can just solve for ppm and compare the answer with the regulation to determine if the procedure produces bacon in compliance.</p> <p>Note: <i>The ingoing ppm of sodium erythorbate and sodium phosphate can be determined by replacing the pounds of nitrite with the pounds of sodium erythorbate and sodium phosphate and performing the mathematics.</i></p>	<p>We have 2.5 lb of nitrite and want to make 2500 lb of pickle and pump at a level of 12%. Is this in compliance?</p> <p>$n = \frac{2.5 \times 0.12 \times 1,000,000}{2500}$</p> <p>n = 120 ppm nitrite (in compliance)</p>

Ingoing Nitrite at the Time of Pumping Determination

Example 1

IPP can use the steps in the following table to determine if bacon is in compliance at the time of pumping and/or massaging. The pickle formula in the table above will be used as the example in this table.

STEP		EXAMPLE
1	Multiply the weight of the sodium nitrite by 1,000,000.	2.5 lb sodium nitrite × 1,000,000 = 2,500,000 ppm nitrite.
2	Divide this figure by the weight of the pickle solution.	2,500,000 ÷ 2,500 = 1000 ppm nitrite in the pickle solution.
3	Multiply this figure by effective or actual % pump to obtain ppm. Refer to the How to Determine the Percentage of Added Solution section previously discussed in this handout to learn how to determine the effective or actual % pump.	1000 ppm × 0.096 (9.6 % effective pump) = 96 ppm ingoing nitrite in the pork bellies. Product is in compliance with the 20% ppm allowance.

Example 2

Establishment 38 has a vat of uncured (green) bellies weighing 1,635 pounds. After pumping and draining the vat of bellies weighs 1,782 pounds. The establishment's written bacon production procedure calls for using 1.2 lb of sodium nitrite in a pickle weighing 1,000 lb and a 10% pump.

Step 1: Determine effective % of pump (use the added solution equation)

$1,782 \text{ (treated wt)} - 1,635 \text{ (green wt)} = 147 \div 1,635 \text{ (green wt)} = 0.0899 \times 100 = 8.99\% \text{ pump}$
or 9.0% pump

Step 2: Determine ppm of ingoing nitrite based on effective or actual % of pump (use the ppm equation from Table 1)

$$\text{ppm} = \frac{1.2 \text{ lb} \times 0.09 \times 1,000,000}{1,000 \text{ lb}} = 108 \text{ ppm (above 96 ppm which is the 20\% variation)}$$

The establishment's process produces bacon that is in compliance for ingoing nitrite!

Bacon Yield Determination

In accordance 9 CFR 319.107, the weight of the pork bellies produced by pumping, immersion, massaging, or tumbling that are ready for slicing, packaging and labeling as "Bacon" must not exceed the green (fresh uncured) weight of the pork bellies. In other words, the weight of the cured pork bellies must return to green weight or their yield **CANNOT** be greater than 100%. FSIS does not routinely sample for added solution or ingredients; therefore, the determination of solution above the green weight is accomplished by the IPP's in-plant % yield tests. IPP assigned to a bacon producing establishments will verify that the bacon yield is in compliance when performing %Yield/Shrink task.

Bacon Yield Determination Method

Note: *When determining yield and comparing green weight to pumped weight, it is not necessary to compare the same uncured pork bellies as long as a comparison is done on pork bellies produced under similar conditions and the subgroup (in this case all 100) are in the same weight range.*

Step 1: Use a subgroup such as 50 uncured (green) pork bellies of the same weight range (e.g., 10-12 pounds). Normally bellies are skinned and trimmed prior to pumping.

Step 2: Determine total weight of 50 cured pork bellies that have:

- Υ Completed the chilling cycle as described in the establishment's processing procedure.*
- Υ Previously undergone skinning/trimming prior to pumping.*

If any trimming or removal of any portion of pork bellies occurs after pumping/massaging, the weight of these trimmings must be added when determining the finished weight.

Note: *If the green weight must be calculated with the skin on, the finished weight figures must include the weight of the skin.*

Calculation Equation

Determine the yield by inserting the green (fresh, uncured) weight pork bellies and the finished weight (cured bellies ready for slicing) into this equation:

$$\text{Percent yield} = \frac{\text{finished weight}}{\text{green weight}} \times 100$$

Note: Finished weight is the weight of the meat and/or poultry plus the weight of any ingredients added during processing minus the weight loss (shrink) from smoking, cooking, cooling or drying.

Bacon Yield Determination Example

Establishment 38 produces bacon. The IPP selects 50 chilled bellies from the cooler and has them weighed. The total green weight is 705 lb. The IPP selects 50 uncured bellies and has them weighed. The total finished weight is 717 lb.

The percent of yield is:

$$\frac{717 \text{ lb}}{705 \text{ lb}} \times 100 = 101.7\%$$

Remember that IPP are to determine whether product complies with the regulations based on production lots or process controls rather than on an individual % yield result. Although a % yield result of 101.7 is above 100% before concluding there is regulatory noncompliance, the IPP should determine if the establishment is routinely conducting % yield tests. If so, when the average of the establishment’s recent yield results is 100% or less, then there is no regulatory noncompliance. However, when the establishment’s yield results also indicate a pattern or history of producing bacon with a yield above 100% or the establishment is not routinely conducting bacon yield determinations, then the % yield result of 101.7 would be considered noncompliant.

Bacon Calculation Workshop

1. Establishment 38 has recently expanded its production of cured product to include curing and slicing bacon. The establishment’s pickle formula and written processing procedure on file is provided below. The Labeling-Product Standards task appears on the task calendar today. Review the establishment’s procedure chart and answer the questions related to this bacon processing procedure.

Processing Procedure for Smoked Bacon

STYLE Heat Treated

EST. # 38

PRODUCT Bacon

Weight Ranges 10/12

BACON PICKLE FORMULA				USUAL PROCEDURES	
SKIN OFF X	SKIN O-N	LB	OZS	% PUMP	12
WATER		1990.30		LB. PRESSURE	60

The % yield is _____.

Is the bacon in compliance with 9 CFR 319.107? YES _____ NO _____

Solving for an Unknown Value

Introduction

This section gives a very simplified explanation of how to solve the basic equations used to determine the amount of restricted ingredients permitted.

Methods

Generic Model

To algebraically isolate an unknown value to one side of the equation and have all of the known values on the other, identical functions need to be performed on both sides of the equation.

The following ppm formula will be used to illustrate the generic model.

$$\text{ppm (parts per million)} = \frac{\text{lb Restricted Ingredient (RI)} \times \% \text{ Pump} \times 1,000,000}{\text{lb Pickle}}$$

lb Pickle

If all the values in the equation are known except the pounds of RI, isolate the pounds of RI (which is X) on one side of the equation and solve for it.

$$\frac{X \times \% \text{ Pump} \times 1,000,000}{\text{lb Pickle}} = \text{ppm}$$

lb Pickle

In this instance, move all the known values to the right side of the equation, leaving the X on the left side where it is the numerator. First multiply each side of the equation by "lb Pickle". This cancels "lb Pickle" from the X side of the equation and removes any denominator.

$$\text{lb Pickle} \times \frac{X \times \% \text{ Pump} \times 1,000,000}{\text{lb Pickle}} = \text{ppm} \times \text{lb Pickle}$$

lb Pickle

$$X \times \% \text{ Pump} \times 1,000,000 = \text{ppm} \times \text{lb Pickle}$$

Next, to leave X by itself, divide both sides of the equation by "1,000,000" x "% Pump". This cancels "1,000,000" x "% Pump" on the X side of the equation.

$$\frac{X \times \% \text{ Pump} \times 1,000,000}{\% \text{ Pump} \times 1,000,000} = \frac{\text{ppm} \times \text{lb Pickle}}{\% \text{ Pump} \times 1,000,000}$$

$$X = \frac{\text{ppm} \times \text{lb Pickle}}{\% \text{ Pump} \times 1,000,000}$$

$$X = \frac{\text{ppm} \times \text{lb Pickle}}{\% \text{ Pump} \times 1,000,000}$$

$$\% \text{ Pump} \times 1,000,000$$

Now solve for X. This same procedure is used to isolate X to one side of **any** equation.

Example

In the equation on page 28, the unknown is the maximum percent pump and is represented by the X in the equation below

$$200 = \frac{1.75 \times X \times 1,000,000}{1,000}$$

In this instance, all the known values are moved to the left side of the equation, leaving “X” on the right and keeping it in the numerator. First multiply each side of the equation by 1000. This cancels 1000 from the X side of the equation and removes any denominator.

$$200 \times 1,000 = \frac{1.75 \times X \times 1,000,000}{1,000} \times \frac{1,000}{1}$$

$$200 \times 1,000 = 1.75 \times X \times 1,000,000$$

Next, divide each side of the equation by 1.75 × 1,000,000. This cancels 1.75 × 100,000 on the X side of the equation and isolates the unknown to the right side of the equation.

$$\frac{200 \times 1000}{1.75 \times 1,000,000} = \frac{1.75 \times X \times 1,000,000}{1.75 \times 1,000,000}$$

Next, solve the equation for X.

$$\frac{200 \times 1,000}{1.75 \times 1,000,000} = X$$

$$\frac{200,000}{1,750,000} = X$$

$$0.1142 = X$$

Finally, multiply 0.1142 by 100 to convert to a percent and 11.42% is the maximum percent pump.

Example

In the equation, the maximum amount of sodium nitrite is the unknown and represented by the X in the equation.

$$200 = \frac{X \times 0.12 \times 1,000,000}{950}$$

In this instance, all the known values are moved to the left side of the equation, leaving "X" on the right and keeping it in the numerator. First multiply each side of the equation by 950. This cancels 950 from the X side of the equation and removes any denominator.

$$200 \times 950 = \frac{X \times 0.12 \times 1,000,000}{\cancel{950}} \times \cancel{950}$$

Next, divide each side of the equation by $0.12 \times 1,000,000$. This cancels $0.12 \times 1,000,000$ on the X side of the equation and isolates the unknown to the right side of the equation.

$$\frac{200 \times 950}{0.12 \times 1,000,000} = \frac{X \times 0.12 \times 1,000,000}{\cancel{0.12 \times 1,000,000}}$$

Next, solve the equation for X.

$$\frac{200 \times 950}{0.12 \times 1,000,000} = X$$

190,000 = 1.58 lb is maximum amount nitrite allowed per 100 gal of curing solution

06 - Meat and Poultry Products with Added Solutions

Reference Material

9 CFR Parts 317 and 319

9 CFR 381 Subpart N and P

9 CFR Part 424

FSIS Directive 7000.1 and 7120.1

Policy Memos 57A, 84A, and 109

Processing Inspectors' Calculations Handbook 7620.3

Q & A Descriptive Designation for Raw Meat and Poultry Products with Added Solutions

Introduction

Water-based and oil based solutions (curing, tenderizing, marinating, basting and flavoring) are added to raw meat and poultry cuts for several purposes. These solutions are added by pumping (injecting), tumbling, massaging, dipping, or immersing to impart favorable quality and sensory characteristics and add weight to the finished product. For instance, enzyme tenderizing solutions are often added to raw beef cuts from no-roll carcasses (i.e., a carcass that did not grade as prime or choice) or raw poultry cuts from mature birds to reduce the toughness of connective tissue in the cut. The proteolytic enzymes degrade several tissue proteins, including collagen and elastin, which are major constituents of connective tissue to improve tenderness. Curing solutions are added to meat and poultry cuts to impart specific color and flavoring, but they also serve to preserve the product for food safety and quality purposes. Marinating and basting solutions add unique flavors to the meat or poultry cut and also improve the texture of the cut.

Solutions may be added to raw bone-in or boneless meat and poultry cuts at various amounts unless such use is not allowed or otherwise restricted by FSIS policy or regulation. Some meat and poultry products have a standard of identity which identifies the amount of solution allowed in the product.

Added Solutions Requirements

The Food and Drug Administration (FDA) approves all food safe for human consumption. FSIS additionally has an approval process for determining food ingredients and additives safe and suitable for use in meat and poultry products (9 CFR 424.21 and Directive 7120.1). FSIS additionally determines standards of identity for some products through regulations or as outlined in the Food Standards and Labeling Policy Book. Under certain circumstances, when establishments add solutions to meat and poultry products, these solutions must be declared on the label.

Descriptive Designations - Raw Meat and Poultry Products

Raw (not heated or cooked) meat and poultry products with added solutions that **do not** meet their standard of identity **and raw** meat or poultry products with added solutions that **do not** have a standard of identity are subject to the Descriptive Designation for Raw Meat and Poultry Products Containing Added Solutions final rule.

The rule established specific labeling requirements in 9 CFR 317.2(e)2 and 381.117(h) for **raw** meat and poultry products treated with added solutions. Since addition of solutions to meat or poultry products changes the nature of the product, the label needs to identify the percentage and composition of the solution. These regulations require establishments to inform the consumer that the raw product contains an added solution and make them aware of the ingredients in the solution. The standardized or common and usual name with a truthful descriptive designation distinguishes the product with the added solution from the standardized product.

In accordance with 9 CFR 317.2(e)2 and 381.117(h), establishments must ensure the product name (standardized or common and usual) on the label contains a descriptive designation that includes: 1) the percentage of added solution (which must appear as a number and the percent symbol (%), 2), a declaration that may use the words “containing” or “contains” (such as, “contains 15% added solution of water and salt,” or “containing 15% added solution of water and teriyaki sauce”), and 3) the common or usual name of all individual ingredients or multi-ingredient components in the solution listed in descending order of predominance by weight. The product name and descriptive designation must be printed in a single easy-to-read type style and color, and must appear on a single-color contrasting background. The print may appear in upper or lower case letters with the lower case letters not smaller than 1/3 the size of the largest letter. The product name may not include the word “enhanced.”

Raw corned beef, corned beef brisket, corned beef rounds, other corned beef cuts and cured beef tongue have standards of identity in 9 CFR 319.101-103. Corned beef brisket can contain no more than 20% added solution. Corned beef rounds, other corned beef cuts and cured beef tongue can contain no more than 10% added solution. These products may contain up to 20% or 10% curing solution, respectively, without the presence of the solution being declared on the label. Verify these regulatory limits by calculation when you perform the %Yield/Shrink Task. When these beef products are treated with a solution at levels that **exceed the regulatory limit**, the presence and amount of the ingredients **must** be declared as part of the product name. The percentage of solution declared in the product name is the percentage of added solution above the green weight of the beef cut or part. “Corned Beef Contains Up to 35% of a Solution of Water, Salt, Natural Flavorings, Sodium Erythorbate, Garlic and Sodium Nitrite” would be an acceptable product name. Verify this percentage on the label using the X% Solution Task.

For raw meat and poultry products, the percent added ingredients for the descriptive designation is determined by subtracting the fresh (green) weight of the article from the weight

of the finished product, (e.g., after injecting or marinating), dividing by the fresh (green) weight, and multiplying by 100.

$$\frac{[(\text{pumped or treated}) \text{ weight} - \text{green weight}] \times 100}{\text{green weight}} = \% \text{ added solution (ingredients)}$$

X% Solution Labeled Meat and Poultry Products

Raw Product Example

Given - Product name on the label:

“Corned Beef Brisket, Contains Up to 25% of a Solution of Water, Salt, Sodium Phosphate, and Sodium Nitrite”

$$\frac{[(\text{pumped or treated}) \text{ weight} - \text{green weight}] \times 100}{\text{green weight}} = \% \text{ added solution (ingredients)}$$

Step 1: Weigh the beef briskets. The weight of a steel tub of fresh uncured beef briskets weighs (less the tare) 127.8 lb. This is the green weight.

Step 2: Weigh beef briskets after pumping. After **pumping** the same tub of beef briskets weighs (less the tare) 159.6 lb

Step 3: Subtract the green weight from the pumped weight

$$\begin{array}{r} 159.6 \text{ lb} \\ - 127.8 \text{ lb} \\ \hline 31.8 \text{ lb} \end{array}$$

Step 4: Divide weight difference by the green weight

$$31.8 \text{ lb} \div 127.8 \text{ lb} = 0.2488$$

Step 5: Convert the decimal answer to a %

$$\begin{array}{r} 0.2488 \\ \times 100 \\ \hline 24.88\% \end{array}$$

Since 25% added solution is declared in the descriptive designation in the product name, this product **is** in compliance.

Tenderized Raw Meat and Poultry Products

In some establishments, enzyme tenderizers, such as papain, bromelin, and *Aspergillus oryzae* (a mold) are used on meat and poultry cuts to degrade connective tissue proteins and improve the tenderness of the cut. They are applied to muscle tissue by injection into the animal's (e.g., cattle) circulatory system a few minutes before slaughter, or by direct application to the surface of the cut by injection, dipping or immersion. The enzymes are activated when the meat or poultry cut is heated during cooking by the consumer. As the temperature rises, the enzymes are denatured and become inactive.

Tenderizing agents that may be applied to **raw** meat and poultry cuts and their regulatory limits are identified in 9 CFR 424.21(c) and in FSIS Directive 7120.1. The regulation states that a solution consisting of water and a proteolytic enzyme (e.g., papain) applied or injected into the tissue of a raw meat or poultry cut shall not result in a weight gain (solution pick-up or pump) of more than 3% above the weight of the untreated cut (green weight). When proteolytic enzymes are used on raw meat and poultry cuts, the qualifying statement "Tenderized with (Approved Enzyme)" must prominently appear on the label.

If an establishment produces a tenderized product with more than 3% added solution, it must have a descriptive designation for the amount above 3%. The percent solution reflected on the label for tenderizers is the actual percentage minus the 3% which is already allowed. For example, if the establishment added 20% of a flavoring and proteolytic enzyme solution to a meat or poultry cut, the name of the product must show that the product contains 17% added solution in a descriptive designation that meets the requirements in 9 CFR 317.2(e)(2) and 381.117(h). When a descriptive designation and the "Tenderized with (Approved Enzyme)" qualifying statement appear on the label, the "Tenderized with (Approved Enzyme)" may not intervene between the product name and descriptive designation. The product name may read: "Beef Skirt Steak, Contains Up To 17% Solution of Water, Natural Flavor, Salt, Spice, Sugar, Hydrolyzed Corn Protein, Spice Extract, Citric Acid, Sodium Lactate, Sodium Phosphate, Soybean oil, and Yeast Extract - Tenderized with Bromelin." The "tenderized" qualifying statement may be incorporated into the descriptive designation, for example, "Beef Skirt Steak Tenderized and Flavored with 17% Solution of Water, Natural Flavor, Salt, Spice, Sugar, Hydrolyzed Corn protein, Spice Extract, Citric Acid, Sodium Lactate, Sodium Phosphohate, Soybean Oil, and Yeast Extract."

When a descriptive designation and a product name qualifier (e.g., "Tenderized with Papain") appear on the label, the Tenderized with Papain may not intervene between the product name and descriptive designation. The qualifying statement and descriptive designation can be combined. For example, "Beef Skirt Steak Tenderized and Flavored with 7% Solution of water, salt, spices, and papain."

X% Solution Labeled Meat and Poultry Products

Raw Product Example

Tenderizing Agents (Enzyme) Example

$$\frac{[(\text{pumped or treated}) \text{ weight} - \text{green weight}]}{\text{green weight}} \times 100 = \% \text{ added solution (ingredients)}$$

Given - Product name on the label:

“Beef Skirt Steak Tenderized with Bromelain, Contains up to 15% Solution”

200 oz represents the green weight of the skirt steak. After treated with the tenderizer, the weight is 236 oz.

Step 1: $236 \text{ oz} - 200 \text{ oz} = 36 \text{ oz}$

Step 2: $\frac{36 \text{ oz}}{200 \text{ oz}} = 0.18 \times 100 = 18\%$

15% was declared on the label. Subtract the 3% allowed, $18\% - 3\% = 15\%$. In Compliance.

Workshop 1

Meat and Poultry Products Treated with Added Enzyme Solutions

1. What is your first name?
2. What is your last name?

3. Which of the following enzyme is not approved for tenderizing meat and poultry cuts?
 - a. protozoa
 - b. *Aspergillus oryzae*
 - c. bromelin

4. The maximum pick-up of solution used for tenderizing purposes is (without 20% allowance):
 - a. 1%
 - b. 2%
 - c. 3%

5. The regulations do not require that proteolytic enzymes be approved if they tenderize the product.
 - a. TRUE
 - b. FALSE

6. Untreated boneless chicken breasts weigh 160 lb. How much can the boneless chicken breasts weigh after being treated with a tenderizing solution (without 20% allowance)?
 - a. 160 lb
 - b. 164.8 lb
 - c. 170.2 lb

7. An establishment produces a product labeled “Beef T-Bone Steak, Tenderized with Papain.” While performing the % Shrink/Yield task, the IPP randomly selected 10 beef T-bone steaks to conduct an added solution or pick-up test. The untreated steaks weigh 12 oz each. After the steaks are dipped in the enzyme solution, the same 10 steaks weigh 123.9 oz. The establishment does not implement a procedure for monitoring the amount moisture the meat and poultry cuts it tenderizes picks up. The percent solution pick-up is:

- a. 3.15%
- b. 3.25%
- c. Less than 3%

8. Based on the answer to the previous question, the IPP would:

- a. Attach a U.S. Retained tag to all tenderized Beef T-Bone Steaks produced on the shift until the establishment takes corrective action.
- b. Weigh additional sample units as another verification pick-up test.
- d. Allow product to move freely.

Cooked or Raw Cured Pork Products

Cooked and raw cured pork products covered by the cured pork products regulations (9 CFR 319.104 and 105) have labeling schemes for indicating the presence of added solutions in these products listed in the regulation. For example, the presence and amount of added ingredients must be declared as part of the product name, e.g., "Ham and Water Product-- X% of Weight is Added Ingredients." The *percent* of added ingredients in the *finished product* is inserted as the "X" value.

Cooked Poultry Products

Turkey ham cured and cooked has a standard of identity in 9 CFR 381.171 that requires the finished product weight to be no more than the original weight of the turkey thigh meat prior to curing. In accordance with Policy Memorandum 57A, turkey ham weighing more than the original weight of the turkey thigh meat used prior to curing shall be descriptively labeled as "Turkey Ham," with words that specify the amount of the additional ingredients, e.g., "and X% Water," "With X% Water Added" or "Turkey Ham and Water Product X% of Weight is Added Ingredients". The ingredients of the added solution may be incorporated into the product name, e.g., "Turkey Ham and Water Product X% of Weight is Added Water, Salt, Dextrose, Sodium Phosphate, and Sodium Nitrite." The X is filled in with a percent determined by subtracting the original weight of the turkey thigh meat from the weight of the cooked finished product. "Turkey Ham, Cured Turkey Thigh Meat, 12% Water Added" is an example product name.

Added Solutions in Cooked Product, Policy Memorandum 84A

Cooked Cured Beef and Pork Products

Per Policy Memorandum 84A, **cooked** cured beef products and **cooked** cured pork products not addressed by the cured pork products regulation (9 CFR 319.104), that weigh more than the weight of the fresh uncured article (green weight), may be prepared if they are descriptively labeled to indicate the presence and amount of the added solution. Acceptable product names include: "Corned Beef and X% Water" or "Cured Pork and Water Product, X% of Weight is Added Ingredients," and "Beef Pastrami Contains Up to X% of a Solution." The ingredients of the solution may accompany the product name or appear in locations prescribed for ingredient statements. If product name qualifiers, such as "X% of Weight is Added Ingredients," are used, the labeling prominence guidelines used for cured pork products as found in 9 CFR 319.104(b) apply.

Cooked Uncured Meat Products

Policy Memorandum 84A also addresses labeling requirements for **uncured meat** products to which solutions are added to impart flavor and other sensory characteristics then are subsequently **cooked**. It does not apply to solutions containing ingredients used to extend a product, such as isolated soy protein (ISP) and carrageenan.

These products must be labeled to identify the amount and composition of solutions added. For a product to be truthfully labeled, a differentiation must be made from a cooked product (e.g., Cooked Beef) that has had **no** solution added to it from a cooked product labeled with the same name (e.g., Cooked Beef) that has had solution added. Remember, meat and poultry products with added solutions that are heat treated or cooked are not subject to the Descriptive Designation for Raw Meat and Poultry Products Containing Added Solutions final rule.

There are two allowable methods of providing descriptive labeling necessary to distinguish cooked meat products with added solutions from the traditional products without added solutions.

Establishments may choose either of two labeling methods:

Labeling Method 1

When solutions are added to uncured **meat** products **prior to cooking** and return to equal to or less than the green weight after cooking, words, such as "seasoned" or "flavored," are to be used to reflect the addition of the added solutions, e.g., "Seasoned Cooked Beef." (Verify this requirement while performing the General Labeling Task.)

Labeling Method 2

Uncured **meat** products that weigh more than the green weight after cooking must be labeled with a product name qualifying statement indicating the amount of solution remaining after cooking, e.g., "Contains X% of a Solution." The ingredients of the solution may accompany the qualifying statement or appear in locations prescribed for ingredient statements, e.g., "After cooking, Contains X% of a Seasoning Solution of Water....." The qualifying statement must be one-fourth the size of the largest letter in the product name. If the ingredients of the solution accompany the qualifier, they must appear in print one-eighth the size of the most prominent letter in the product name.

For cooked products, the percent added solution for the label statement is determined by subtracting the fresh (green) weight of the article from the weight of the finished cooked product, (e.g., after injecting or marinating **and cooking**), dividing by the weight of the finished product, and multiplying by 100.

X% Solution Labeled Meat and Poultry Products Cooked Product Example

$$\frac{[\text{finished weight} - \text{green weight}]}{\text{finished weight}} \times 100 = \% \text{ added solution}$$

Given: “Beef Pastrami Contains up to 10% of a Solution” in the product name on the label.

Step 1: Weigh beef top rounds. The weight of a stainless steel vat of fresh uncured beef top rounds weighs (less the tare) 161.4 lb.

Step 2: Weigh the top rounds after cooking and chilling. The same beef top rounds finished weight is 178.7 lb.

Step 3: Subtract the green weight from the finished weight

$$\begin{array}{r} 178.7 \text{ lb} \\ - 161.4 \text{ lb} \\ \hline 17.3 \text{ lb} \end{array}$$

Step 4: Divide weight difference by the finished weight

$$17.3 \text{ lb} \div 178.7 \text{ lb} = 0.0968$$

Step 5: Convert the decimal answer to a %

$$\begin{array}{r} 0.0968 \\ \times 100 \\ \hline 9.68\% \end{array}$$

Since 10% added solution is declared in the qualifying statement in the product name, this product *is* in compliance.

NFSCP PHIS Tasks

Performing the X Percent (%) Solution Task

Inspection program personnel (IPP) perform the X percent (%) solution task in establishments that are producing meat or poultry cuts, parts, and products containing added solutions that are required to have the percent (X) of the solution identified in the product's name to be truthfully labeled.

When performing this task, IPP select an appropriate product and verify compliance with regulatory requirements by reviewing establishment records and labels, calculating the amount of solution added to the product and comparing the result with the regulatory requirement, when applicable. Compare the calculated amount of added solution with the X% declaration in the product's name.

IPP have the establishment weigh a subgroup (sample) or batch of product before and after the appropriate step in the process (pumping, injecting, dipping, or cooking and chilling). The number of pieces selected and weighed should be representative of the lot size. For example, the IPP may select 20 or 30 pieces of meat or poultry and have them weighed before the solution is applied (green weight) and 20 or 30 pieces after the appropriate processing step, e.g., pumping, dipping or cooking and chilling, and have them weighed (finished weight). After obtaining the subgroup weights (green and finished weights), perform a calculation to verify the percentage of solution (the value for the "X") in the product name is accurate and truthful.

To accurately determine the percent of the solution added to a **raw** products, IPP have to differentiate between an **actual** or **effective** percent pump or pickup.

The **actual percent pump or pick-up** is the amount (pounds) of a water-based or oil-based solution (curing, tenderizing, marinating, etc.) pumped or injected into or picked up by a piece of meat or poultry that **is not** held for a period of time and allowed to drain prior to being further processed. This is expressed as a percentage of the weight of the meat or poultry before it is pumped with the solution.

The **effective percent pump or pick-up** is the weight gained (expressed as a percent) by the meat or poultry **after draining** for the specified amount of time in the establishment's written procedure, and represents the amount of reactive solution that remains in the product. Any reactive ingredients (nitrites, phosphates, enzymes, flavors, etc.) in the solution are thought to remain in solution during the drain time after pumping, rather than reacting immediately with the meat or poultry protein. Therefore, using the effective percent pump in calculations more accurately reflects the ingoing amount of solution and reactive ingredients.

Weighing the **same** pieces of meat or poultry weighed before and after the solution application is the most accurate way to determine the percent added solution.

Identification of the pieces of meat or poultry should be maintained. IPP may use another method to determine the percent added solution under certain circumstances, e.g., the scale and pumping or injecting apparatus are not in the same area or room. In this situation, IPP **may** select and have the pumped or treated pieces of meat or poultry weighed before selecting fresh unpumped or untreated pieces **provided** that the pieces **are uniform** in size and weight (e.g., lotted into 2-to-3 lb weight ranges). The green weight is determined from different pieces of meat or poultry. All pieces selected must be in the same weight range.

Compliance Determinations

FSIS allows the added solution to be 20% above the X% solution declaration in the product name, before there is noncompliance, provided that the establishment does not have a history of (or is routinely) adding the solution above the percentage declared in the product name. For cured products with X% solution declarations, the establishment is allowed up to 20% solution above the percent declared in the product name, provided the establishment is not routinely adding solution above the percentage declared in the product name **AND** the added solution does not result in any restricted ingredient (e.g., cure agent) regulatory limit being exceeded. ***The 20% solution allowance relates to the truthfulness of the product name and not for other regulatory limits or product standards of identity.***

When the IPP's added solution or pick-up test reveals that the product has gained more than 3% tenderizing solution and there is no descriptive designation indicating the percent above 3% in the product name, he or she needs to determine if the establishment has data that demonstrates it is producing tenderized product in compliance with the regulatory limit. For instance, the establishment may be implementing a written program that includes conducting pick-up tests and the records show the process is still under control even though the IPP's pick-up test is over the regulatory limit. Normal variation in the process of tenderizing meat and poultry cuts may occasionally result in a solution pick-up test being over 3%. When the establishment does not have data that demonstrate control over the process of tenderizing meat and poultry cuts and the IPP's pick-up test exceeds the regulatory limit, the IPP should retain all of the product on hand from that shift's production.

Noncompliance

After performing the tasks, IPP are to use the GAD thought process to determine compliance.

Examples of Noncompliance:

- Label, solution formula or processing procedure is not on file.
- LPDS temporary approved label is used beyond the expiration date.
- Label requiring sketch approval by LPDS has not received sketch approval by LPDS
- Missing mandatory feature, e.g., safe handling instructions or handling statement.

- Missing product name qualifying statement
- Solution ingredients not listed in the descriptive designation
- Ingredients not listed in descending order of predominance in either the descriptive designation and/or ingredients statement
- Inaccurate ingredients statement
- Any false or misleading information
- A RI ingredient, e.g., nitrite exceeds the maximum amount allowed
- The % solution declaration (X%) listed on the label is false or misleading (not truthful)

Workshop 2

X% Solution Labeled Meat and Poultry Products Summary Workshop

Using the methods outlined in this handout, perform the required calculation to verify the X% solution label declaration is accurate and the product name is truthful.

1. First Name 2. Last Name

Scenario A

You are a CSI assigned to an establishment that adds water-based tenderizing and flavoring solutions to raw meat and poultry products. When you arrive at the establishment, you log-on to your computer and bring up the task calendar in PHIS. The X Percent (%) Solution task is on the task calendar for today. You start the X Percent (%) Solution task by proceeding to the processing room. You know this establishment has a history of exceeding the regulatory limit for this added solution, therefore they are not given a 20% allowance. The establishment is applying a tenderizing and flavoring solution to beef skirt steaks. After the solution is added to the skirt steaks, the treated beef skirt steaks are moved to the packaging room and vacuum packaged in a plastic film with the pre-printed label below.



The establishment uses a tumbler to mechanically agitate the tenderizing and flavoring solution into the beef skirt steaks. You notice beef skirt steaks in stainless steel containers and a plastic container of solution with the label staged next to the tumbler. You have the production supervisor move the stainless steel containers and plastic container with the tenderizing/flavoring solution to the scale. After removing the tare weight of the containers, the beef skirt steaks weigh 199.5 lb and the solution weighs 43 lb. The tumbler runs for 15 minutes and the solution is completely absorbed, which makes the treated weight equal to the addition of the green weight and the weight of the solution.

3. Calculate the percentage of solution added to the beef skirt steaks and select your answer.
 - a. 21.55%
 - b. 22.02%
 - c. 17.00%

4. Is the X% solution label declaration in compliance? Yes No

Scenario B

You are a CSI assigned to an establishment that adds water-based flavoring solutions to raw beef cuts that are subsequently cooked to produce roast beef, cooked beef and beef pastrami. The cooked beef products do not return to green weight, thus the finished beef products have an X% solution qualifying statement in the product name. When you arrive at the establishment, you log-on to your computer and bring up the task calendar in PHIS. The X Percent (%) Solution task is on the task calendar for today. You start the X Percent (%) Solution task by proceeding to the processing room. The establishment is pumping beef top rounds with a seasoning solution today. After the top rounds are cooked, they are sliced in the RTE product packaging room and the slices are vacuum packaged in 7 oz plastic trays that have the following label.



The establishment's processing procedures attached to the label indicates that the beef top rounds are weighed and grouped into 10 to 12 lb or 12 to 14 lb weight ranges. The top rounds are pumped with 30% of a flavoring/seasoning solution. The top rounds are cooked in an oven for 2 to 2.5 hours based on the weight range to an internal temperature 145 degrees fahrenheit for 3 minutes. The cook shrink is 8 to 9% and the chiller shrink is 2 to 3%.

You have the production supervisor assist you in weighing 15 unpumped (green) top rounds from lot A2456. The 15 unpumped top rounds weigh 169.5 lb. The next day, before the top rounds are moved from the cooler to the RTE product room for slicing, you have the production supervisor assist you in weighing 15 cooked top rounds from lot A2456. These top rounds weigh 214.6 lb. The establishment does not routinely monitor the amount of solution remaining (or the "X" % on the label) for its finished cooked beef product. The 20% allowance is not given.

5. Calculate the percentage of solution remaining in the beef top rounds and select your answer.

- a. 26.60%
- b. 25.04 %
- c. 21.01 %

You review the MOIs for the establishment and find that the previous three added solution tests for this product were above the 20% declared on the product's label but were within the 20% solution allowance. Each time the IPP's added solution calculation was above the percentage declared in the product name (20%), the IPP discussed the added solution result with establishment management at the weekly meeting. Each time the establishment stated it would adjust the pumping procedure.

6. Based on the information you have gathered, is the establishment in compliance?

Yes No

Attachment 1: Demonstrating the Use of the Calculation Aid

Accessing the Calculation Aid

Step 1: Click on the Start button (or Windows button) lower left corner computer screen

Step 2: Click on FSIS Applications

Step 3: Highlight and double click on Calculation aid in the menu

Calculation Aid Menu

Antioxidants	Net Weights
Batter/Breading	Percent Batter/Breading
Beef Cheek Meat (lb of beef cheek meat known)	Percent Proteinaceous Ingredients
Beef Cheek Meat (lb of beef known)	Projected Finished Weight
Binders and Extenders	Shrink
Cure Accelerators	Shrink (dry cured pork product)
Cure Agents	Volume of a Container
Fat Content	X % Solution (uncooked product)
Gain	X% Solution (cooked product)
Maximum Amount of Poultry	Yield
Minimum Meat or Poultry	



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Calculation Aid Menu

- | | |
|---|-----------------------------------|
| Antioxidants | Net Weights |
| Batter/Breading | Percent Batter/Breading |
| Beef Cheek Meat (lb of beef cheek meat known) | Percent Proteinaceous Ingredients |
| Beef Cheek Meat (lb of beef known) | Projected Finished Weight |
| Binders and Extenders | Shrink |
| Cure Accelerators | Shrink (dry cured pork product) |
| Cure Agents | Volume of a Container |
| Fat Content | X % Solution (uncooked product) |
| Gain | X% Solution (cooked product) |
| Maximum Amount of Poultry | Yield |
| Minimum Meat or Poultry | |



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X% Solution Labeled Meat and Poultry Product Raw Product Example Problem



04A02 - X% Solution (uncooked product)

$$\frac{(\text{pumped, treated, or massaged}) \text{ weight} - \text{green weight}}{\text{green weight}} \times 100 = \% \text{ added ingredients}$$

pumped, treated, or massaged weight	-	green weight		
<input type="text" value="159.6"/>		<input type="text" value="127.8"/>		
<hr/>			X 100 =	24.88
		<input type="text" value="127.8"/>		% added ingredients
		green weight		

Calculate



Reset

Tenderizing Agents (Enzyme) Example

Macromedia Flash Player 7

Menu

04A02 - X% Solution (uncooked product)

$$\frac{(\text{pumped, treated, or massaged}) \text{ weight} - \text{green weight}}{\text{green weight}} \times 100 = \% \text{ added ingredients}$$

pumped, treated, or massaged weight green weight

-

X 100 = **18**

% added ingredients

Calculate  Reset

Windows taskbar: 6:43 PM X%

Solution Labeled Meat and Poultry Product Cooked Product Example

Menu

04A02 - X% Solution (cooked product)

$$\frac{\text{finished weight} - \text{green weight}}{\text{finished weight}} \times 100 = \% \text{ added ingredients}$$

finished weight green weight

-

X 100 = **9.68**

% added ingredients

Calculate  Reset

07 - Inspection Responsibilities

Verification Methodology for NFSCP Tasks

NFSCP tasks are performed to verify that meat, poultry, and egg products distributed to consumers are not economically adulterated or misbranded. As with other inspection tasks, IPP are to schedule the tasks on the dates most appropriate for performing the particular verification task.

FSIS Directive 7000.1 provides IPP with guidance for verifying that an official establishment complies with consumer protection regulatory requirements that are not related to food safety. An attachment in this directive identifies each PHIS NFSCP verification task, verification instructions for the task, regulatory references, and guidance documents.

Before performing the NFSCP task, IPP are to review the regulatory requirements associated with the scheduled task listed in the attachment of FSIS Directive 7000.1. Always use the GAD thought process.

When a NFSCP task is performed, IPP may gather information by conducting one or more of the following verification activities as appropriate for the task and product produced.

- Observing the formulation of the product
- Verifying the accuracy of product's labeling
- Observing processing procedures
- Reviewing establishment records [9 CFR 320.1(b)(10) and 381.117(b)(6)]
- Examining product
- Checking product identification, condition and temperature
- Performing a variety of other in-plant (hands-on) measurements, such as weighing ingredients, and calculating RI amounts.

Documentation and Enforcement

IPP assess all the information gathered and determine compliance by comparing what was observed to the relevant regulatory requirements. Compliance with most of the NFSCP requirements is based on production lots and assessing the establishment's control of the process (e.g., applying accurate labeling, applying added solutions to products, or adding ingredients or meat and poultry components that meet the product's standard of identity). Before making a determination that the establishment's process is out of control, IPP consider all available sources of information (e.g., establishment records, and/or monitoring or testing results). IPP may exercise additional discretion when the establish has an effective quality control (QC) program.

IPP are to consider any relevant factors when determining the amount of noncompliant product involved. Factors to be considered include factual information such as the establishment's lot identification procedures, receiving records, and production records, as well as those facts that can be reasonably ascertained based on the average amount of product produced per shift or per production line. When necessary, IPP consult with their supervisor for assistance in determining the extent of product involvement.

When noncompliance is found, IPP take the appropriate regulatory control actions, such as retention of product, rejection of equipment or facilities, stopping lines, or refusing to allow the processing of specifically identified product (9 CFR 500.1(a), if it is determined that misbranded or economically adulterated product would otherwise enter commerce or be shipped from the establishment. Additionally, FSIS may rescind or refuse approval of false or misleading marks, labels, or sizes, or forms of any container for use with any meat or poultry product per 9 CFR 500.8. If it is determined that economically adulterated or misbranded product has entered commerce, FSIS may implement recall procedures.

IPP should associate the NRs when noncompliances are related to the same process (e.g., the application of solutions to meat and poultry products) as described in FSIS Directive 5000.1. Notify the District Office (DO) through supervisory channels when establishment management is unwilling or unable to take necessary steps to re-establish control of its process. The DO may notify the establishment in writing that the repetitive noncompliances may lead to a regulatory control action (9 CFR 500.1-3) that would affect the entire production of the product in question because product may be economically adulterated or misbranded.

The DO may notify the Office of Investigation, Enforcement, and Audit (OIEA) Regional Manager if there is a reason to believe that NFSCP noncompliances involve the shipment of economically adulterated or misbranded product or criminal intent to defraud the consumer.