UNITED STATES DEPARTMENT OF AGRICULTURE
FOOD SAFETY AND INSPECTION SERVICE
WASHINGTON. D.C.

FSIS DIRECTIVE | 7110.3 Rev. 1 | 1-24-89

TIME/TEMPERATURE GUIDELINES FOR COOLING HEATED PRODUCTS

I. PURPOSE

This directive clarifies the intent of the time and temperature guidelines for cooling heated products distributed in May 1988.

II. CANCELLATION

Page 1 of FSIS Directive 7110.3, which transmitted Time/Temperature Guidelines for Cooling Heated Product, dated 5/12/88.

III. REASON FOR REISSUANCE

To clarify that the intent of the recently issued Attachment to FSIS Directive 7110.3 concerning time/temperature controls for the cooling of heated products is to provide guidance for producing wholesome, unadulterated product, not to institute mandatory processing controls.

II. REFERENCE

FSIS Directive 5400..1, Inspection System Guide (ISG), dated 9/21/88

III. POLICY

A. FSIS Directive 7110.3 conveyed guidelines which describe time/temperature controls that the inspector and inspected establishments may rely on to ensure that the procedures used by the plant for that purpose will not cause or contribute to the adulteration of product. However, establishments may elect to adhere to such guidelines, or they may choose an alternative means to the same end. The cooling of heated products if not properly done may result in bacterial growth that can adulterate the product. Adherence to

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an agency guideline effectively removes any concerns the inspector might otherwise have as to the adequacy of these cooling procedures. Non-adherence to the guideline alone does not mean the procedure is inadequate. However, unless some routine procedure which the program already has found to be adequate is used, the inspector must make an independent determination of whether the process being used adequately precludes production of adulterated product.

B. The Inspection System Guide is a compilation of existing inspection requirements coupled with the inspection tasks that are applied by the program to determine compliance. It is described in FSIS Directive 5400.1, reference B above, but to date only has had limited distribution -- outside the Directive system as part of FSIS's Performance Based Inspection System (PBIS) training program. The ISG is the key document to be used to help make FSIS inspection more efficient and more effective. However,, it is also intended to help inspected establishments be informed of inspection procedures applicable to their plant so they may take measures to ensure the plant will be found in compliance when it is inspected.

1. With regard to ISG provisions concerning the cooling of heated product, the specifications recited in-the following sections are intended to be guidelines:

Page 6-12: O6C05al; 06C05a2

Page 6-48: O6N12a2

Page 6-57: 06Q10al; 06Q10a2

2. Those who have copies of the ISG are advised that changes to the above-noted sections will be made in the next edition of the ISG; but, should make the following pen and ink changes in their copy of the ISG to remove any confusion on this point:

a. In column two on pages 6-12, 6-48, and 6-57, substitute the following narrative:

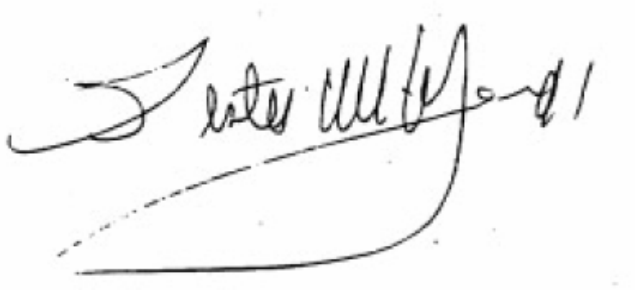
> Plant meets Agency's Guidelines for Cooling Heated Product or can demonstrate adherence to an alternate cooling procedure shown to maintain such product in a wholesome and unadulterated state.

b. In column three on pages 6-12, 6-48, an1 delete "318. l7Ig

c. In column four on pages 6-12, 6-48; and substitute the following narrative:

> Compare the plant's product cooling practices to those that the Agency will recognize as safe practice as covered in the Time/Temperature Guidelines for Cooling Heated Products. For cooling practices which are significantly different from those in.the Guidelines and are not alternative cooling procedures developed by a processing authority, report to headquarters through supervisory channels, for evaluation on a case-by-case basis.
>
> If results are not comparable, initiate appropriate action.
>
> Compare internal temperature, cold storage temperature, intermediate holding temperature of one or more units of cooked product'with plant results.
>
> If results are not. comparable, initiate appropriate action.

Administrator



NOTE: Please file this revision with the attachment to FSIS Directive 7110.3 dated 5/12/88.

THE LONG VERSION, INCLUDING

INTRODUCTION

This Processing Policy Memo contains guidelines for cooling cooked or heated products in a manner that FSIS recognizes as good practice. It also describes how to develop an acceptable alternative cooling control program and how to improve cooling efficiency.

Most cooked foods are not sterile; many spores will survive an hour or more of boiling. In addition to the heat-resistant bacteria which survive cooling, post-cooking contamination is possible even in an environment which appears entire sanitary. Therefore, processors must cool heated products rapidly if they are to prevent these bacteria from growing and causing problems.

USDA research 1, 2 has provided new information on cooling rates that will minimize growth of pathogenic bacteria that generally cause problems in slowly cooled foods. The cooling rates are based on that research. However, to safely use these cooling rates, processors need to consistently control the cooling of their products. Lack of control will erode the safety margin in these cooling rates. Maintaining control requires efficient, knowledgeable employees who use the cooling facility and monitor the process carefully. The guidelines thus recommend not only cooling rates, but also processor control.

1) Blankenship, L. R. et. al. (1986) Growth of Clostridium perfringens in chill during post cook chilling. ASM Annual Meeting. Abstract p-28.

2) Blankenship, L. R. et. al. (1988) Applied and Environmental Microbiology. In Press.

Significant Food Safety Temperatures

To help the processor understand the basis of these cooling guidelines, FSIS has developed this list of current and traditionally cited temperatures.

35 °F FSIS recommended storage temperature for periods exceeding one week. This storage temperature will greatly reduce the growth of psychrotrophic spoilage bacteria as well as psychrotrophic pathogens such as Listeria and Clostridium botulinum type B.

40 °F Traditional FSIS recommended maximum storage temperature and control point.

45 °F FDA recommended temperature cooling control point and maximum storage temperature for retail establishments.

55 °F FSIS poultry and roast beef cooling control point.

80 °F Approximate transition between rapid growth and slower growth of many food-borne pathogenic bacteria; little or no growth of Clostridium perfringens below this point.

100 °F Rapid growth of most food poisoning bacteria.

120 °F FSIS cooling control point for roast beef; traditional USDA cooling control point; rapid germination and growth of *C. perfringens*; minimal to no growth of Staphylococcus aureus, *C. botulinum*; minimum trichina treatment temperature for cured pork products.

125 °F Upper growth limit for C. perfringens.

130 °F FSIS recommended control point; recommended holding temperature for up to 4 hours, minimum cooking temperature for roast beef.

140 °F FDA recommended holding temperature and cooling control point for retail establishments; USDA recommended minimum holding temperature for extended periods, minimum shipping temperature.

155 °F FSIS recommended minimum cooking temperature for a product which is to be shipped hot.

FSIS has based these cooling guidelines on several premises:

1. Heat-resistant food-poisoning bacteria can grow from 38°F up to approximately 125°; however, their range of rapid growth is from approximately 80°F to 125°F. Thus, cooling product quickly through the rapid growth range is more important than cooling through the slow growth range.

2. The rate of heat transfer (cooling rate) from the product's center to its surface is directly proportional to the difference in temperature (dT or delta T) between those two points. Thus, as the product temperature approaches the coolant temperature, the cooling rate diminishes.

3. Traditional cured products, containing high amounts of salt and nitrite, together with low moisture content are more resistant to bacterial growth than similar newer products; some are even shelf-stable. Thus, rapid cooling of these traditional products is not always necessary. However, manufacturers are making fewer products of this type today. Instead, to meet present consumer tastes, most of their cured products contain less salt and more moisture. These changes minimize the inhibitory effect of added nitrite and increase the need to rapidly cool these products.

4. If the cause of a small problem, such as a cooling variance, is not traced and corrected when first noticed, the problem will probably recur and grow more severe, until it becomes a disaster resulting in widespread illness among the public and large financial losses for the manufacturer.

5. Clearly written employee instructions are valuable in themselves and as an educational tool for management..

6. A temperature measurement probably represents neither the minimum nor the maximum temperature of a product lot because (a) the temperature is not the same throughout the lot, and (b) the temperature measuring device conducts heat better than the product. Processors can minimize these errors by (a) measuring more than one piece of product and (b) using thin temperature probes and shielding or insulating the part exposed to the coolant.

7. The more closely processors operate to the known limits of safety, the more important it is that they control the product temperature well; this in turn requires them to accurately monitor the critical parameters.

To incorporate these principles into a practical guideline, FSIS has:

1. Emphasized the need to quickly cool past the rapid growth range.

2. Acknowledged the relationship between the recommended temperature and the time periods involved,

3. Identified those products that may be cooled more slowly,

4. Listed the responsibilities of processors who wish to use the more liberal cooling rates, and

5. Added safety margins to compensate for inherent errors.

I. COVERAGE

A. COVERED PRODUCTS

Processors should use these cooling guidelines for all heated, perishable meat and poultry products, and their ingredients, except for those listed in Section B below. These guidelines cover ingredients such as cooked beans, noodles, or rice which may either become a part of the product or be packed in a separate container. Examples are the beans to be added to a burrito, the noodles for a stroganoff, the peas for a frozen dinner, and the rice for a jambalaya.

B. PRODUCTS NOT COVERED

These guidelines are not intended for the following products:

1. **Products covered by cooling regulations,** i.e., those specified in Section 318.17 of the Meat Inspection Regulations, such as roast beef and cooked corned beef, and in Section 381.149 of the Poultry Products Inspection Regulations, such as canned poultry.

2. **Shelf stable products,** i.e : products which after processing, do not require special cooling instructions, such as fully retorted products, shelf-stable semidry sausages, and dry cured hams.

3. **Cooked products shipped hot,** i.e., products heated to an internal temperature of 155 °F or more, and conspicuously labeled with a statement such as "This product must either be maintained at no less than 140 °F during shipment or discarded."

II. RECOMMENDED COOLING RATES FOR HEATED PRODUCTS

A. RAPID COOLING.

To avoid product adulteration, processors should rapidly and continuously cool all products not included in Section B below. To rapidly cool, processors should meet the cooling rates below.

1. During cooling, the product's maximum internal temperature should not remain between 130 °F and 80 °F for more than 1.5 hours nor between 80 °F and 40 °F for more than 5 hours, except for product described in paragraph 2 below.

2. Product consisting of pieces of intact muscle, such as turkey breast or pork loin, may be cooled according to the requirements of Section 318.17(h)(10) of the Meat Inspection Regulations.

B. SLOW COOLING FOR SOME CURED PRODUCTS.

Processors may slowly cool cured products if the product satisfies condition 1, one of the two choices in condition 2, and one of the three choices in condition 3 below.

1. the internal temperature does not remain between 120 °F and 40 °F for more than 20 hours

2. the cooling process

   a. causes a continuous drop in product temperature

   b. controls the product's surface temperature so that it does not stay between 120 °F and 80 °F for more than 2 hours

3. the product is formulated

   a. with no less than 120 ppm of sodium nitrite or its equivalent and a brine concentration of 3.5 percent or more

   b. with no less than 40 ppm of sodium nitrite or its equivalent and a brine concentration of 6 percent or more

   c. with or without nitrite (such as salt cured product), but with a maximum water activity of 0.92.