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Environmental Sanitation  
Information Bulletin #2  
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New Jersey (State) Department of Health,  
Division of Environmental Sanitation.

Subject: Prevention of Human Trichinosis

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This bulletin is issued to aid in the prevention of Trichinosis in humans. Most persons realize that "Pork Products Should Be Cooked Thoroughly Prior To Being Eaten." It is not, however, generally realized that many prepared pork products which are smoked and appear cooked are actually potential sources of viable Trichinae.

The following material is presented in detail; it is intended for use as a guide for the food inspector, also for the Meat Industry, and particularly for the local processor who prepares and sells sausage products and other items made from pork. If the methods described are followed there will be no cause to have apprehension as to the safety of pork or its products.

1) PORK AND PRODUCTS THAT DO NOT REQUIRE TREATMENT:

*Trichinella spiralis*, a small worm, which is found in the musculature of infected swine, is killed when such products are well cooked at home, or elsewhere, prior to consumption. Therefore, fresh pork, sausage and other by-products which are subjected to a curing or smoking process that does not impart to the product a cooked appearance need not be further treated by the processor to kill Trichinae prior to the thorough home cooking.

CAUTION: In this connection, however, it is important to realize that those products of ethnic, national and regional favoritisms, which are known to be eaten as obtained from the processor, must only be made from pork previously treated to kill trichinae. Such products often contain raw pork as an ingredient and it is from such items that epidemiologic investigations reveal the major portion of Trichinosis cases appear in New Jersey.

2) PORK AND PORK PRODUCTS THAT REQUIRE TREATMENT TO KILL TRICHINAE PRIOR TO PREPARATION PROCESSING AND SALE TO THE UNTIMATE CONSUMER.

In this group is included all pork and pork products which

- (a) Appear cooked due to a partial heat treatment but not heated to the temperature of safety, or 137°F;
- (b) Appear cooked due to the smoking process or by the addition of dark colored spices, herbs and flavorings or,
- (c) Products are normally and usually eaten by the consumer as purchased, without further cooking, regardless of the fact that the product contains Raw Pork,

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Any product which meets any of the situations referred to in a-b- or c above must be prepared only from pork or pork products which have been treated by one of the following outlined methods known to kill trichinae, namely, (a) heating, (b) freezing, or (c) curing. Some products normally encountered in this category are listed for your information and guidance: Bologna; frankfurts; viennas; smoked sausage; knoblauch sausage; mortadella; all forms of summer or dried sausage, including mettwurst, cooked loaves; roasted, baked, boiled, or cooked ham, pork shoulder, or pork shoulder picnic; Italian-style ham; Westphalia-style ham; cured meat rolls; capocollo (capicola, capicola); coppa; fresh or cured boneless pork shoulder butts, hams, loins, shoulders, picnics, and similar pork cuts in casings or other containers in which ready-to-eat delicatessen articles are customarily enclosed; cured boneless pork loin; boneless back bacon (Canadian-style bacon); pork cuts such as hams, shoulders, picnics and butts which are subjected to smoking at sufficiently high temperatures to impart a partially cooked appearance to the meat (ordinarily, such cuts fall in this class when heated to an internal temperature above 110°F. or obtain a color change from smoke or dye.)

### 3) TREATMENT OF PORK TO KILL TRICHINAE

The treatment shall consist of heating, freezing or curing as follows:

(A) HEATING - All parts of the pork muscle tissue shall be heated to a temperature not lower than 137°F., and the method used shall be one known to insure such a result. On account of differences in methods of heating and in weights of products undergoing treatment it is impracticable to specify details of procedures for all cases.

Procedures which insure the proper heating of all parts of the product shall be adopted. It is important that each piece of sausage, each ham, and other product treated by heating in water be kept entirely submerged throughout the heating period; and that the largest pieces in a lot, the innermost links of bunched sausage or other massed articles, and pieces placed in the coolest part of a heating cabinet or compartment or vat be included in the temperature tests.

(B) FREEZING - At any stage of preparation and after preparatory chilling to a temperature of not above 40°F. or preparatory freezing, all parts of the muscle tissue of pork or product containing such tissue shall be subjected continuously to a temperature not higher than one of those specified in table 1, the duration of such refrigeration at the specified temperature being dependent on the thickness of the meat or inside dimensions of the container.

TABLE 1. - Required period of freezing at temperature indicated.

Temperature	Group 1	Group 2
°F.	Days	Days
5	20	30
-10	10	20
-29	6	12

Group 1 comprises product in separate pieces not exceeding 6 inches in thickness, or arranged on separate racks with the layers not exceeding 6 inches in depth, or stored in crates or boxes not exceeding 6 inches in depth, or stored as solidly frozen blocks not exceeding 6 inches in thickness.

Group 2 comprises product in pieces, layers, or within containers, the thickness of which exceeds 6 inches but not 27 inches, and product in containers including tierces, barrels, kegs, and cartons having a thickness not exceeding 27 inches.

The product undergoing such refrigeration or the containers thereof shall be so spaced while in the freezer as will insure a free circulation of air between the pieces of meat, layers, blocks, boxes, barrels, and tierces in order that the temperature of the meat throughout will be promptly reduced to not higher than 5°F., - 10°F., or - 20°F., as the case may be.

During the period of refrigeration the product or lot thereof must be kept separate from other products. Rooms or compartments equipped for being made secure with lock or seal should be provided. The rooms or compartments containing product undergoing freezing must be equipped with accurate thermometers placed at or above the highest level at which the product undergoing treatment is stored and away from refrigerating coils. After the prescribed freezing has been finished, the product must be kept under close supervision until it is prepared in finished form. Accurate dating of product and identify as to temperatures must accompany each frozen lot as follows:

"PORK PRODUCT \_\_\_\_\_ DEGREES F. \_\_\_\_\_ DAYS' REFRIGERATION".

(C) CURING - (A) Sausage. Sausage may be stuffed in animal casings, hydrocellulose casings, or cloth bags. During any stage of treating the sausage for the destruction of live trichinae, except as provided in method 5, these coverings shall not be coated with paraffin or like substance, not shall any sausage be washed during any prescribed period of drying. In the preparation of sausage, one of the following methods may be used:

Method No. 1. The meat shall be ground or chopped into pieces not exceeding three-fourths of an inch in diameter. A dry-curing mixture containing not less than 3 1/3 pounds of salt to each hundredweight of the unstuffed sausage shall be thoroughly mixed with the ground or chopped meat. After being stuffed, sausage having a diameter not exceeding 3 1/2 inches, measured at the time of stuffing, shall be held in a drying room not less than 20 days at a temperature not lower than 45°F., except that in sausage of the variety known as pepperoni, if in casings not exceeding 1 3/8 inches in diameter measured at the time of stuffing, the period of drying may be reduced to 15 days. In no case, however, shall the sausage be released from the drying room in less than 25 days from the time the curing materials are added, except that sausage of the variety known as pepperoni, if in casings not exceeding the size specified, may be released at the expiration of 20 days from the time the curing materials are added. Sausage in casings exceeding 3 1/2 inches, but not exceeding 4 inches, in diameter at the time of stuffing, shall be held in a drying room not less than 35 days at a temperature not lower than 45°F., and in no case shall the sausage be released from the drying room in less than 40 days from the time the curing materials are added to the meat.

Method No. 2. The meat shall be ground or chopped into pieces not exceeding three-fourths of an inch in diameter. A dry-curing mixture containing not less than  $3 \frac{1}{3}$  pounds of salt to each hundredweight of the unstuffed sausage shall be thoroughly mixed with the ground or chopped meat. After being stuffed, the sausage having a diameter not exceeding  $3 \frac{1}{2}$  inches, measured at the time of stuffing, shall be smoked not less than 40 hours at a temperature not lower than  $80^{\circ}\text{F.}$ , and finally held in a drying room not less than 10 days at a temperature not lower than  $45^{\circ}\text{F.}$  In no case, however, shall the sausage be released from the drying room in less than 18 days from the time the curing materials are added to the meat. Sausage exceeding  $3 \frac{1}{2}$  inches, but not exceeding 4 inches, in diameter at the time of stuffing, shall be held in a drying room, following smoking as above indicated, not less than 25 days at a temperature not lower than  $45^{\circ}\text{F.}$  In no case, however, shall the sausage be released from the drying room in less than 18 days from the time the curing materials are added to the meat. Sausage exceeding  $3 \frac{1}{2}$  inches, but not exceeding 4 inches, in diameter at the time of stuffing, shall be held in a drying room following smoking as above indicated, not less than 25 days at a temperature not lower than  $45^{\circ}\text{F.}$ , and in no case shall the sausage be released from the drying room in less than 33 days from the time the curing materials are added to the meat.

Method No. 3. The meat shall be ground or chopped into pieces not exceeding three-fourths of an inch in diameter. A dry-curing mixture containing not less than  $3 \frac{1}{3}$  pounds of salt to each hundredweight of the unstuffed sausage shall be thoroughly mixed with the ground or chopped meat. After admixture with the salt and other curing materials and before stuffing, the ground or chopped meat shall be held at a temperature not lower than  $34^{\circ}\text{F.}$  for not less than 36 hours. After being stuffed the sausage shall be held at a temperature not lower than  $34^{\circ}\text{F.}$  for an additional period of time sufficient to make a total of not less than 144 hours from the time the curing materials are added to the meat, or the sausage shall be held for the time specified in a pickle-curing medium of not less than  $50^{\circ}$  strength (salometer reading) at a temperature not lower than  $44^{\circ}\text{F.}$  Finally, the sausage having a diameter not exceeding  $3 \frac{1}{2}$  inches, measured at the time of stuffing, shall be smoked for not less than 12 hours. The temperature of the smokehouse during this period at no time shall be lower than  $90^{\circ}\text{F.}$ , and for 4 consecutive hours of this period the smokehouse shall be maintain at a temperature not lower than  $128^{\circ}\text{F.}$  In regulating the temperature of the smokehouse for the treatment of sausage under this method, the temperature of  $128^{\circ}\text{F.}$  shall be attained gradually during a period of not less than 4 hours.

Method No. 4. The meat shall be ground or chopped into pieces not exceeding one-fourth of an inch in diameter. A dry-curing mixture containing not less than  $2 \frac{1}{2}$  pounds of salt to each hundredweight of the unstuffed sausage shall be thoroughly mixed with the ground or chopped meat. After admixture with the salt and other curing materials and before stuffing, the ground or chopped sausage shall be held as a compact mass, not more than 6 inches in depth, at a temperature not lower than  $36^{\circ}\text{F.}$  for not less than 10 days. At the termination of the holding period, the sausage shall be stuffed in casings or cloth bags not exceeding  $3 \frac{1}{2}$  inches in diameter, measured at the time of stuffing. After being stuffed, the sausage shall be held in a drying room at a temperature not lower than  $45^{\circ}\text{F.}$  for the remainder of a 35-day period, measured from the time

the curing materials are added to the meat. At any time after stuffing, if a concern deems it desirable, the product may be heated in a water bath for a period not to exceed 3 hours at a temperature not lower than 85°F., or subjected to smoking at a temperature not lower than 80°F., or the product may be both heated and smoked as specified. The time consumed in heating and smoking, however, shall be in addition to the 35-day holding period specified.

Method No. 5. The meat shall be ground or chopped into pieces not exceeding three-fourths of an inch in diameter. A dry-curing mixture containing not less than 3 1/3 pounds of salt to each hundredweight of the unstuffed sausage shall be thoroughly mixed with the ground or chopped meat. After being stuffed the sausage shall be held for not less than 65 days at a temperature not lower than 45°F. The coverings for sausage prepared according to this method may be coated at any stage of the preparation before or during the holding period with paraffin or other substance approved by the chief of division.

(B) Capocolle (capicola, capacola). Boneless pork butts for capocollo shall be cured in a dry-curing mixture containing not less than 4 1/2 pounds of salt per hundredweight of meat for a period of not less than 25 days at a temperature not lower than 36°F. If the curing materials are applied to the butts by the process known as churning, a small quantity of pickle may be added. During the curing period the butts may be overhauled according to any of the usual processes of overhauling including the addition of pickle or dry salt if desired. The butts shall not be subjected during or after curing to any treatment designed to remove salt from the meat, except that superficial washing may be allowed. After being stuffed, the product shall be smoked for a period of not less than 30 hours at a temperature not lower than 80°F., and shall finally be held in a drying room not less than 20 days at a temperature not lower than 45°F.

(C) Coppa. Boneless pork butts for coppa shall be cured in a dry-curing mixture containing not less than 4 1/2 pounds of salt per hundredweight of meat for a period of not less than 18 days at a temperature not lower than 36°F. If the curing mixture is applied to the butts by the process known as churning, a small quantity of pickle may be added. During the curing period the butts may be overhauled according to any of the usual processes of overhauling, including the addition of pickle or dry salt if desired. The butts shall not be subjected during or after curing to any treatment designed to remove salt from the meat, except that superficial washing may be allowed. After being stuffed, the product shall be held in a drying room not less than 35 days at a temperature not lower than 45°F.

(D) Hams. In the curing of hams either of the following methods may be used:

Method No. 1. The hams shall be cured by a dry-salt curing process not less than 40 days at a temperature not lower than 36°F. The hams shall be laid down in salt, not less than 4 pounds to each hundredweight of hams, the salt being applied in a thorough manner to the lean meat of each ham. When placed in cure the hams may be pumped with pickle if desired. At least once during the curing process the hams shall be overhauled and additional salt applied, if necessary, so that the lean meat of each ham is thoroughly covered. After removal from

cure the hams may be soaked in water at a temperature not higher than 70°F. for not more than 15 hours, during which time the water may be changed once; but they shall not be subjected to any other treatment designed to remove salt from the meat, except that superficial washing may be allowed. The hams shall finally be dried or smoked not less than 10 days at a temperature not lower than 95°F.

Method No. 2. The hams shall be cured by a dry-salt curing process at a temperature not lower than 36°F. for a period of not less than 3 days for each pound of weight (green) of the individual hams. The time of cure of each lot of hams placed in cure should be calculated on a basis of the weight of the heaviest ham of the lot. Hams cured by this method, before they are placed in cure, shall be pumped with pickle solution of not less than 100° strength (salometer), about 4 ounces of the solution being injected into the shank and a like quantity along the flank side of the body bone (femur). The hams shall be laid down in salt, not less than 4 pounds of salt to each hundredweight of hams, the salt being applied in a thorough manner to the lean meat of each ham. At least once during the curing process the hams shall be overhauled and additional salt applied, if necessary, so that the lean meat of each ham is thoroughly covered. After removal from the cure the hams may be soaked in water at a temperature not higher than 70°F. for not more than 4 hours, but shall not be subjected to any other treatment designed to remove salt from the meat, except that superficial washing may be allowed. The hams shall then be dried or smoked not less than 48 hours at a temperature not lower than 80°F., and finally shall be held in a drying room not less than 20 days at a temperature not lower than 45°F.

(E) Boneless Pork Loins and Loin Ends. In lieu of heating or refrigerating to destroy trichinae in boneless loins, the loins shall be cured for a period of not less than 25 days at a temperature not lower than 36°F. by the use of one of the following methods:

Method No. 1. A dry-salt curing mixture containing not less than 5 pounds of salt each hundredweight of meat.

Method No. 2. A pickle solution of not less than 80° strength (salometer) on the basis of not less than 60 pounds of pickle to each hundredweight of meat.

Method No. 3. A pickle solution added to the approved dry-salt cure provided the pickle solution is not less than 80° strength (salometer).

After removal from cure, the loins may be soaked in water for not more than 1 hour at a temperature not higher than 70°F. or washed under a spray but shall not be subjected, during or after the curing process, to any other treatment designed to remove salt.

Following curing, the loins shall be smoked for not less than 12 hours. The minimum temperature of the smokehouse during this period at no time shall be lower than 100°F. and for 4 consecutive hours of this period the smokehouse shall be maintained at a temperature not lower than 125°F.

Finally the product shall be held in a drying room for a period of not less than 12 days at a temperature not lower than 45°F.

Conclusion:

The treatments described above have been proven effective. Compliance with these treatments and procedures can be readily checked, and, most effectively, by an examination of the products for live Trichinae. Presence of live Trichinae in any product **that is to be eaten as sold is presumptive evidence of failure to properly comply with the information herein supplied.**

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For: Alfred H. Fletcher, Director  
Division of Environmental Sanitation

Attach: Regulations - N.J. State Department of Health #20, 21 and 22 Referring to Cold Storage Warehouses provides for a system whereby certified trichinae free pork may be purchased for use in situations as described in Section 2 of this Information Bulletin.

AUTHORITY 24:2-1 REVISED STATUTES

REGULATIONS GOVERNING THE CERTIFICATION OF THE REFRIGERATION  
OF PORK BY OPERATORS OF COLD STORAGE WAREHOUSES IN REFERENCE  
TO THE CONTROL OF TRICHINOSIS

Regulation 20. Operators of cold storage warehouses in which foods are held at temperature of 5°F. or less may apply to the State Department of Health for special permission to issue certificates certifying the refrigeration of pork at the required temperature and for the periods of time necessary for the destruction of trichinae.

Regulation 21. The temperature and periods of time necessary for the destruction of trichinae shall be based upon the size of the pieces or packages of pork. Pork in group 1 shall consist of pieces not exceeding six inches in depth, or stored as solidly frozen blocks not exceeding six inches in thickness. Pork in group 2 shall consist of pieces or layers or contents of barrels or containers, the thickness of which exceeds six inches, but is not in excess of twenty-seven inches. Pork in group 1 and group 2 to be refrigerated for the destruction of trichinae shall be subjected to a temperature of 5°F., or minus 10°F., or minus 20°F. for not less than the corresponding number of successive days, as indicated in the following table:

TABLE

<u>Temperature</u>	<u>Group 1</u>	<u>Group 2</u>
5°F.	20 days	30 days
-10°F.	10 days	20 days
-20°F.	6 days	12 days

Regulation 22. Marking of containers. The boxes or other containers of pork, to be subjected to the required refrigeration for the destruction of trichinae, shall be marked when received with the words "Cold Storage" and with the word "Received" followed by the month, day and year when placed in cold storage and with a lot number assigned to the pork and, when so refrigerated and released to the owner, with the word "Delivered" followed by the month, day and year, together with the words "Refrigerated for the destruction of trichinae at" followed by the temperature and the number of days the pork was held under such temperature.

Regulation 23. Issuance of certificates regulated. A certificate certifying that the pork had been kept at the required temperature and number of days for the destruction of trichinae shall be executed in duplicate by the permittee and the original issued to the owner of the pork at the time of the release of each lot or part of lot of pork refrigerated in accordance with the provisions of Regulation 21. The duplicate certificate shall be retained by the permittee and kept on file. The certificate shall be in the following form:

"(NAME AND ADDRESS OF REFRIGERATING COMPANY)

TO \_\_\_\_\_  
Name of Owner

\_\_\_\_\_  
Address

Lot No. \_\_\_\_\_

Certificate No. \_\_\_\_\_

This is to certify that the pork consisting of \_\_\_\_\_  
(describe types of cut of meat)

weighing \_\_\_\_\_ lbs., contained in \_\_\_\_\_ and con-  
(number and type of container)

stituting \_\_\_\_\_ lot above indicated, has been kept at  
insert "the full" or "part of"

\_\_\_\_\_ DEGREES TEMPERATURE FOR \_\_\_\_\_ DAYS for the destruction of  
trichinae in accordance with the Regulations adopted by the Board of Health of  
the State of New Jersey.

DATED \_\_\_\_\_ 19 \_\_\_\_\_

\_\_\_\_\_  
Name of Refrigerating Company

BY \_\_\_\_\_ "

Regulation 24. Records to be kept. The permittee shall assign to each lot of pork, when received for refrigeration for the destruction of trichinae, a distinguishing lot number for the purpose of identification and shall keep an accurate record of such lot number and shall make and keep a record of (1) date of receipt, (2) the name and business address of owner, (3) the number and type of containers constituting the lot together with the types of cut of meat and the weight, (4) the temperature and number of days kept under such temperature for the destruction of trichinae and (5) the number of certificates issued for said lot. These records shall be kept by the permittee at his place of business for at least one year, and shall be open for inspection to authorized representatives of the Department of Health.