

# Meats, Variety (Offal)

Revised 2018

## Storage Conditions

Sanitation	Variety meats should be thoroughly washed and drained prior to packaging or storage
Chilling	Chill to 36°F (2.2°C) or lower within 4 hours after removal from the carcass
Packaging	Vacuum packaging variety meat protects against weight loss and quality deterioration
Boxing	Boxes containing 30 lbs (13.6) of meat should be made of 200-lb (91-kg) test, water-resistant, corrugated fiber material When 30-60 lbs (13.6-27.2 kg) are boxed, use 275-lb (125-kg) test material
Box Marking	Clearly mark each box with the pack date and code date
Palletizing	Provide at least 2 inches (5 cm) air space around the sides and ends of each box.
Freezing	Blast freeze to reach 40°F (4.4°C) within 15 hrs after harvest, 28°F (-2.2°C) within 60 hrs after harvest, and 0°F (-18°C) within 120 hrs after harvest
Storage Life	Varies with cooling rate, draining, and packaging methods Additional information is in Tables 1 and 2

Variety meats, commonly called “Offal”, consist of the entrails and internal organs of an animal. Commonly separated in to “white” offal and “red” offal, they can include, but are not limited to the following items:

Examples of White Offal	Examples of Red Offal
Stomach, Tripe, Intestine, Chitterlings, Trachea, Lips, Tendons	Heart, Liver, Kidney, Blood, Oxtail, Snout, Trotters, Spleen, Tongue, Esophagus, Head Meat, Cheeks

Inconsistent quality of variety meats packaged and frozen for domestic and/or export markets suggests a need for guidelines. The economic opportunities associated with improved quality for both the producer and storage warehouse are significant. Wholesome, high quality, convenient products can be consistently marketed, provided one adheres to good sanitation, chilling, and handling practices.

## Sanitation

Microflora associated with unfrozen and temperature-abused animal variety meats have been identified. Variety meat items are generally contaminated with a combination of bacteria commonly associated with unfrozen red meat, with *Micrococcus* being the most frequently isolated gram-positive bacterium and *Escherichia coli* the predominating gram-negative isolate. It is not uncommon to find

variety meat possessing aerobic plate counts greater than  $10^4$  and often greater than  $10^3$  per  $\text{cm}^2$ . The method of washing, draining, and packaging greatly influences the microbial level.

All meat items arriving at a warehouse direct from the slaughter floor should be thoroughly washed and drained to remove most of the surface contamination. Care should also be taken to maintain facilities and equipment sanitation so that no more than 100 organisms/ $\text{in}^2$  (16 organisms/ $\text{cm}^2$ ) originate from this source. Meticulous attention to equipment sanitation will help minimize bacterial pick-up. Conveyors, scalders, washers, drain tables, racks, trays, and other in-line equipment must be thoroughly cleaned and sanitized after each production shift, using USDA-approved materials and concentrations. Microbiological cleanliness should be monitored and routinely verified by random swab samples of the equipment for aerobic plate count. Effectively cleaned and sanitized equipment should not exceed an aerobic plate count of 100 per  $\text{in}^2$  (16 per  $\text{cm}^2$ ) of surface. Prior to packaging, all variety meats should be drained of blood, water, and fluid to avoid weakening the shipping container. Sanitation must not be limited to production shifts. Good sanitary habits should also be practiced during operation breaks, by cleaning of knives, gloves, boots, and other equipment. Hands and gloves should be washed and frequently sanitized during each operation shift.

### Chilling

Rapid chilling of variety meats is a major factor in maintaining quality and extending storage life. Rapid temperature reduction is absolutely necessary reducing bacterial growth. Therefore, these products should be chilled as rapidly as possible to a uniform product temperature of  $32^\circ\text{F}$  ( $0^\circ\text{C}$ ) or lower. A good manufacturing practice (GMP) is to reduce perishable products to a maximum of  $36^\circ\text{F}$  ( $2.2^\circ\text{C}$ ) within 4 hours after removal from the carcass. Maintain the product holding area at  $36^\circ\text{F}$  ( $2.2^\circ\text{C}$ ) or less. This may be accomplished through tray chill, rack chill, hydro chill (i.e., liquid immersion and/or spraying), or blast freezing at  $-5^\circ\text{F}$  ( $-20.6^\circ\text{C}$ ) with an air velocity of 500-1000 ft/min (152-305 m/min). One may expect a significant increase in aerobic plate count of variety meats when subjected to  $86^\circ\text{F}$  ( $30^\circ\text{C}$ ) for 6-12 hours. Plate counts may increase from 5,000 per  $\text{in}^2$  (790 per  $\text{cm}^2$ ) at slaughter to 323,000 per  $\text{in}^2$  (50,000 per  $\text{cm}^2$ ) at 12 hour post-slaughter when meat is held at  $86^\circ\text{F}$  ( $30^\circ\text{C}$ ).

### Packaging

Variety meat items are packaged and packed in a multitude of ways, often to buyer specifications. As a general rule, products over 30 lbs (13.6 kg) are packed without overwrapping in wax-coated leak-proof boxes. Ten- to thirty-pound (4.5-13.6 kg) boxes are used for variety meats that are individually wrapped or in a poly-lined box.

Poly-liner bags or sheet liners can be troublesome if the film becomes folded into the meat prior to freezing, resulting in entrapped plastic, which can be problematic during further process steps. They do, however, provide good product protection from freezer dehydration. Therefore, when poly-liners are used, care should be taken to assure that the bags do not become folded into the meat. Polyvinyl chloride bags having a minimum wall thickness of 3 mils are recommended. Poly bags should be closed with a positive seal, such as the use of a twist tie or heat seal.

The best method for protecting unfrozen variety meat against weight loss and quality deterioration during transit and storage is vacuum packaging following a thorough wash immediately after removal from the carcass. When protection from weight loss, off-odor, and excessive microbial growth during refrigerated transportation is the goal and if the product is not to be displayed, freezing in polyethylene-lined boxes may be more practical.

### Boxing

The box or carton used for variety meats should be constructed of materials adequate to withstand normal production and transportation abuse. Wet strength adhesive should be used in the construction of the corrugated paper. Boxes should be staple-free and the inside surface should be wax coated or covered with some other moisture resistant lining. Box size should permit a desirable net weight but not over 60 lbs (27.2 kg). Boxes containing 30 lbs (13.6 kg) of meat should be made of 200-lb (91-kg) test, water-resistant, corrugated fiber material. When 30-60 lbs (13.6-27.2 kg) are boxed, use 275-lb (125-kg) test material. Box style may consist of a 2-piece full telescope or 1-piece folded inter-locked box. Depth of box should not exceed 6 inches (15 cm) in order to facilitate chilling and freezing.

NOTE: Box filling should avoid bulging tops or bottoms to reduce difficulties in pallet stacking. A 0.5 inch (13 mm) head space within the box is suggested. Either code or open dating should be printed on each box with 3/4 inch (2 cm) letters. Mark top and both ends of the box "KEEP FROZEN 0°F (-18°C) OR COLDER." Box weight should be clearly marked and should include metric weights when for export. Bilingual titling should also be used for export.

### Packing Procedures

Packing procedures in general use are cold pack and/or hot pack. Cold pack procedure requires a well-drained product to be chilled to 36°F (2.2°C) at the geometric center. The hot pack (50-100°F or 10-37.8°C) commonly used for variety meat includes boxing of well-drained, un-chilled product.

NOTE: Dry ice may be used for each 10 lbs (4.5 kg) of meat and is spread throughout the box. Avoid dumping the dry ice in a localized area. This quantity of dry ice will serve to increase the rate of chill when used with air cooling at 28-30°F (-2.2 to -1.1°C).

A 60-lb (27.2-kg) box of hot-pack liver would represent approximately 3,612 BTUs (3,811 kJ) when the specific heat is 0.86 BTU/lb·°F (3.6 kJ/kg·K) and the T (delta T) is 70°F (21.1°C). One pound of dry ice pellets or snow could remove 100 BTUs (1 kg removes 233 kJ). Consequently, it would take 36 lbs of dry ice pellets or snow to cool a 60 lb box of liver from 100 to 30°F (37.8 to -1.1°C). It is important to note that the use of dry ice can only serve to start a rapid chill. Product not packed with dry ice should be quickly removed from the slaughter floor to a blast chilling unit for rapid cooling.

Regardless of the packing procedure employed, product must be promptly removed to the initial chill within 30 minutes after harvest. During worker lunch periods, work breaks, or other production interruptions, all product in the pack-off-process should be held at 36°F (2.2°C) or colder. Staggering lunches and breaks may be a suitable alternative to assure temperature control at all times.

### Box Marking

Each packed box should be clearly marked with pack date and shift in cryptic or open code as preferred. The markings should be 3/4 inch (2 cm) minimum height and located on the same end panel as the USDA inspection legend. Code dating will assist in product rotation during storage. The general storage life of frozen variety meats is 2-9 months depending upon the class of animal, microbial load, rapidity of handling, and composition of the particular type meat. See Tables 1 and 2.

Additional information on palletizing boxed meat is located elsewhere in this manual, under **Red Meats, Chilled and Frozen**.

### Freezing

Meat products begin a process of deterioration immediately after being removed from the carcass. The rate of deterioration can be controlled by expeditious reduction of product temperature to 0°F (-18°C) or colder. The first 30 minutes after harvest is the most critical period. Therefore, all variety meat products should be moved from the harvest area within 30 minutes after being removed from the carcass and placed in a blast chill or freezer to start the chilling cycle. A good practice would be to reduce the internal temperature to:

- 40°F (4.4°C) or colder within 15 hours after harvest
- 28°F (-2.2°C) or colder within 60 hours after harvest
- 0°F (-18°C) or colder within 120 hours after harvest

These time/temperature requirements may be accomplished through the use of a cooler at 28-36°F (-2.2 to 2.2°C) when the air circulation over the product is 500 ft<sup>2</sup>/min (152 m/min). The blast freezer should be over-rated at -25°F (-31.7°C) with air circulation at 500-1000 ft<sup>2</sup>/min (152-305 m/min). Place all palletized product within the blast freezer so that air flow through the spacers is not interrupted. The product temperature should be 0°F (-18°C) or colder within 120 hours after being removed from the carcass.

The blast freezer capacity along with the total load, product temperature, product flow, pallet characteristics, temperature, and air flow will all influence the rate of freezing. It is recommended that the smaller hot-packed boxes be frozen to 0°F (-18°C) within 72 hours and the large hot-packed boxes in 120 hours. Comparable palletized cold pack (40°F/4.4°C or less) product should be frozen to 0°F (-18°C) in 72 hours. Each firm is encouraged to conduct studies using thermocouples placed in the geometric center of the palletized boxes to determine the time, temperature, and uniformity of freezing within the freezer for each package character and size. WFLO also provides a Time-to-Freeze computer program to estimate the time it takes to freeze product to a given temperature.

### Storage Life

There is very limited information available on the 0°F (-18°C) storage life of animal variety meats. A few studies have been conducted on the microbial composition of liver, heart, tongue, kidney, lung, and

esophagus with specific reference to *Salmonella*. Other studies were concerned with packaging type and weight losses of frozen offal. Even though the export of variety meats throughout the world is a large business, very little research data are available on these products. One of the most important features governing 0°F (-18°C) storage life of variety meat is cooling and draining the products prior to packaging. Vacuum packaging appears to extend the shelf life of chilled variety meat. However, studies are not available on the improved shelf life compared to poly wrapped items.

Despite the lack of storage information on variety meats, it is clear that rapid freezing of variety meats is very important in maintaining product quality. Because research data are not available, the commercial industry has practiced a variety of systems for handling, packaging, and freezing variety meats. For example, it has been suggested that brain and kidney should be slow frozen while cheek meat, lip, snouts, head meat, and weasand are best fast-frozen. This points out that the chemical and physical composition of each variety meat is unique and different, and each may require different freezing conditions to provide the most suitable quality.

General commercial practice suggests that one may store variety meat without wrapping or packaging in a box for 2-3 months, while keeping a similar product 4-5 months if loosely poly wrapped and 8-9 months when vacuum-packaged. It appears that, with adequate packaging, most variety meats can be kept at 0°F (-18°C) for 12 months.

Lack of research data has caused industry wide variation in the recommended handling and storage of variety meat and further serves to indicate a need for research information specifically designed to study the most suitable freezing method and storage life of each product type. Storage life data presented in Tables 1 and 2 are estimates based on eleven industry reports of Good Manufacturing Practices (GMP). No original research reports have been found to substantiate the presented data.

<b>TABLE 1, Chilled and Freezer Storage Life (Poly Lined Box)</b>					
<b>Not Based on Research Data</b>					
<b>Beef</b>			<b>Pork</b>		
	<b>Chilled 32°F (0°C)</b>	<b>Frozen 0°F (-18°C)</b>		<b>Chilled 32°F (0°C)</b>	<b>Frozen 0°F (-18°C)</b>
	<b>Days</b>	<b>Months</b>		<b>Days</b>	<b>Months</b>
Liver	5	3	Liver	7	4
Tongue	5	6	Tongue	7	5
Intestines	5	3	Kidney	7	6
Intestines (Large)	5	3	Lung	8	6
Oxtail	8	6	Pancreas	6	4
Brain	5	3	Feet	7	6
Kidney-Edible	7	4	Tail	7	6
Sweetbreads	6	3	Ear	7	6
Leg Tendon	8	6	Chitterlings	5	6

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Tripe (Honeycomb)	5	6	Spleen	7	5
Tripe (Scalded)	5	6	Cheek Meat	8	6
Heart	8	6	Snout	7	6
Head Meat	8	6	Heart	8	6
Cheek Meat	8	6	<b>Lamb</b>		
Oxlip	5	6			
Weasand (Esophagus)	5	6		<b>Chilled 32°F (0°C)</b>	<b>Frozen 0°F (-18°C)</b>
Trachea	8	6			
Gullet	8	6		<b>Days</b>	<b>Months</b>
Spleen	7	5	Liver	7	4
Lung	8	6	Tongue	7	6
Salivary Gland	8	5	Kidney	7	4
Pancreas	6	4	Lung	8	6
Rennet	5	4	Pancreas	6	4
Feet	7	6	Spleen	7	4
Kidney-Pet Food	7	6	Heart	8	6

**TABLE 2, Storage Life in Months, Frozen at 0°F (-18°C)  
Not Based on Research Data**

<b>BEEF</b>	<b>Naked</b>	<b>Poly Wrapped</b>	<b>Vacuum Packaged</b>
Liver	2	6	9
Tongue	2	6	9
Intestine	2	6	8
Intestine (L)	2	6	8
Oxtail	2	6	9
Brain	2	4	8
Kidney-Edible	2	6	9
Sweetbreads	2	4	8
Leg Tendon	2	6	9
Honeycomb Tripe	2	6	9
Scalded Tripe	2	6	9
Heart	2	6	9
Head Meat	2	6	9
Cheek Meat	2	6	8
Oxlip	2	6	8

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Weasand (Esophagus)	2	6	8
Trachea	2	6	8
Gullet	2	6	8
Spleen	2	6	8
Lung	2	6	8
Salivary Glands	2	6	8
Pancreas	2	6	8
Rennet	2	6	8
Feet	2	6	8
Kidney-Pet Food	2	6	8
<b>LAMB</b>			
Liver	2	6	8
Tongue	2	6	8
Kidney	2	6	8
Lung	2	6	8
Pancreas	2	4	8
Spleen	2	6	8
Heart	2	6	8
<b>PORK</b>			
Liver	2	6	8
Tongue	2	6	8
Kidney	2	6	8
Lung	2	6	8
Pancreas	2	4	6
Feet	2	6	8
Tail	2	6	8
Ear	2	6	8
Chitterlings	2	6	8
Spleen	2	6	8
Cheek Meat	2	6	8
Snout	2	6	8
Heart	2	6	8

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