# Meat and Meat Products Processing Level II

Based on May 2011, Version 2 Occupational standards

## Module Title: - Performing Offal's processing

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**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying, describing and washing edible and non-edible offal.
- Inspecting offal and identifying defects including disease and contamination
- Trimming Offal of connective tissue and other material considering OHS
- Placing trim in bin or chute
- Identifying types and sources of contamination

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify, describing and washing edible and non-edible offal.
- Inspect offal and identifying defects including disease and contamination
- Trim Offal of connective tissue and other material considering OHS
- Place trim in bin or chute
- Identify types and sources of contamination

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

## Information Sheet 1- Identifying, describing and washing edible and non-edible offal

### 1.1. Introduction

There is no hard and fast definition of edible and inedible offal. Depending upon the customs and economic circumstances, public may value an organ as foodstuff or may regard it as useless. In developed countries with wealthy customers, inedible offal include blood, feet, head, lungs, windpipes, spleen, intestines, genitals, trimmings, floor sweepings, udders, features and all the tripes. Nearly all of these are used as edible offal in less developed countries. Hides, skins and bones are very important inedible by-products and these Inedible offal are used for preparation of stock feed and fertilizers through the process of rendering. The manufacture of stock feed is very important from the viewpoint of economic utilization of slaughter-house offal. Animals unfit for human consumption, destroyed animals, bones, rejected hides and skins, tannery fleshing and trimmings are used for manufacture of stock feed.

Offal are those parts of an animal which are used as food but which are not skeletal muscle, including internal organs such as the heart, liver and lungs, all abdominal organs and extremities i.e. feet, and head (including brains and tongue). Offal, especially the liver, kidney and heart, are good sources of protein, fats and micronutrients, with the liver being particularly rich in iron, vitamin A and other micronutrients.

Moreover, Carcass Dressed Weight = Live weight – {hide weight + blood weight + head weight + hooves weight + visceral}

$$Carcass\ Dressing\ Percentage = \frac{\text{Carcass Dressed weight}}{\text{Liveweight}} \text{ X } (100)$$

Generally, sheep, goat, cattle and buffalo carcasses include the portions of body after removal of the blood, hide/skin, head, feet, digestive tract, bladder, pluck and adhering tissues etc. In case of pig carcass, skin and head are included in the carcass. Carcass mainly consists of muscular tissues, fatty tissues, bones, tendons and other connective

tissues, large blood vessels etc. Approximately, 50,55 and 75 per cent of the live weight of sheep, cattle and pigs respectively remains in the carcass.

The following table provides information about the amount of meat and different by products obtained from alive animal after slaughter and dressing.

Table 1.1. Percentage of meat and Different by-products available from cattle, pig and sheep carcass

| Component | Cattle (%) | Pig (%) | Sheep (%) |
|---|---|---|---|
| Carcass meat | 34 | 52 | 32 |
| Bones | 16 | 17 | 18 |
| Organs | 16 | 7 | 10 |
| Skin and attached fat | 6 | 6 | 15 |
| Blood | 3 | 3 | 4 |
| Fatty tissues | 4 | 3 | 3 |
| Horns, hooves, feet and skull | 5 | 6 | 7 |
| Abdominal and intestinal contents | 16 | 6 | 11 |

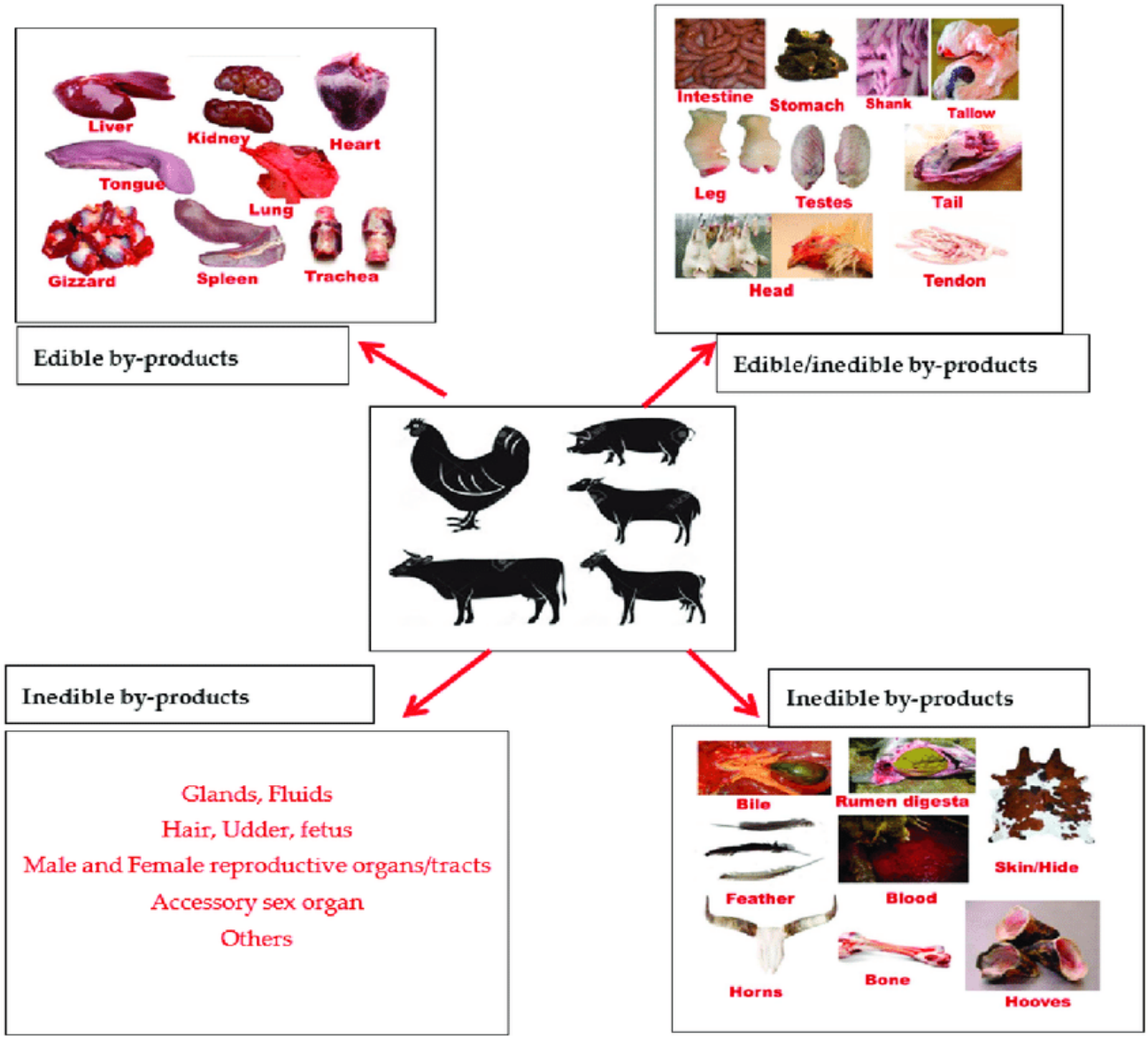


**Figure 1.1. Edible and inedible animal by product.**

## 1.2. Common types of offal

**Liver:** Liver is very fine textured and is almost devoid of the characteristic fibre bundles found in red meat (liver has no grain). Consequently, it is very tender and can be sliced in any direction needed to attain the best yield. It can be prepared using dry heat. It has a very distinct flavour and is relatively inexpensive.

**Kidney**: Kidneys are either smooth, bean-shaped (in lamb and pork) or irregularly shaped with reddish-brown lobes and deep clefts (beef). Beef kidneys are very tough and require intense moist heat cookery.

**Heart:** Heart is retailed whole, halved, or cut into slices depending on species and size. The inside of the heart contains string-like sinew, which should be removed if the heart is being stuffed and cooked. Dry heat is suitable for cooking heart. It is commonly stuffed and roasted whole or slices are seasoned and pan-fried.

**Tongue:** Once skinned, the tongue can be sliced and is quite tender. There is a very large amount of gelatine in the meat which provides a rich flavour. It is often pickled or corned before cooking. Whole tongue with root, and usually hyoid bones, removed. Excess muscle from underneath the tongue may be removed and fat is well trimmed. Tongue skin is very tough and must be peeled off after cooking. The cooked meat is very tender.

**Tripe:** Tripe is processed from the muscular inner lining of the stomach. It can be smooth or honey-combed depending on which chamber of the animal's stomach it is harvested from. It is commonly sold fresh or pickled. Washed tripe, also known as dressed tripe, is boiled and bleached, giving it the white colour more commonly seen for sale. Tripe requires moist heat cookery to break down its rubber-like texture. It is most commonly used in soups and stews.

**Sweetbreads**: Sweetbreads are the thymus glands of calves and mature beef. They are pinkish-white in colour. Veal or calf sweetbreads are considered a great delicacy. They are largest in size when the calf is five to six weeks old and decrease in size as the animal ages. Sweetbreads should be thoroughly soaked in cold water, then blanched so that the membrane can be removed. They then can be braised, or cooled then sliced and breaded for pan frying.

**Brain:** They perish very quickly so are generally frozen at the plant as soon as they are harvested from the animal. They are mild in flavour and have a delicate texture. Calves

brains are most commonly used. They can be prepared much the same as sweetbreads. Brain is extremely high in cholesterol.

**Oxtail:** Oxtail is classified as offal even though it is not an internal organ. Oxtail is mainly used for making soup to extract its rich flavours. It is more bone than meat, but the meat from the oxtail, once properly braised, is very rich in flavour.

**Beef cheek-** The cheek is the muscle, together with the mouth lining, that lines the upper and lower jaw bones. The thinner part of the cheek (called the lips) has papillae attached and is sold separately. Purchase cheek with membrane and fat removed. More often used for stock, but can be braised.

**Caul fat:** Fine membrane of fat which covers the stomach of hogs, Caul fat is used for barding (wrapping or covering) lean cuts of meat, ground fillings and sausage meat.

**Intestines-** during casing preparation the first operation in handling intestines is 'running', that is, the separating the intestines from the mesentery. This is carried out either manually or by machine. The next step is to run the intestine through a 'manure stripper' comprising large rollers (which resemble a laundry wringer), to squeeze out the contents of the intestines. This step requires the use of a great quantity of potable water to wash the casings and the correct arrangement and alignment of equipment to ensure control and removal of dirty water from the process without back flow, to ensure progressive cleaning of the intestines. The casing should then be soaked in water for approximately 30 minutes at 38–42 °C. In some areas of the world, casings then go through a fermentation cycle, but in other countries (e.g. the United Kingdom and the United States), casings processed by fermentation are no longer acceptable. Intestines which have not been fermented are run through a crushing machine and soaking tank. This breaks the intramucosal membrane and separates it from the rest of the intestine. Next, the intestine goes through a mucosa stripper, which looks and acts essentially like the manure stripper used for the initial emptying. Potable water at 42 °C is again used to wash away the waste material. Any remaining string-like material and mucosa are removed by rolling. After cleaning, the casings are placed in a cold salt solution and

held overnight. The next day they are graded, salted with fine salt until they have absorbed 40% salt and packed into barrels.

**Table 1. 2. Types of offal by category**

| Category | Raw byproduct | Principal use |
|---|---|---|
| **Edible offal** | Brain | Variety meats |
| | Head meat | Sausage ingredients, variety meats |
| | Heart | Variety meats |
| | Kidneys | Variety meats |
| | Liver | Variety meats |
| | Spleen (melt) | Variety meats |
| | Stomach (tripe) | Cheese making components, sausage components, variety meats |
| | Tail | Variety meats |
| | Testicles (fries) | Variety meats |
| | Thymus or pancreas (sweetbreads) | Variety meats |
| | Tongue | Variety meats |
| **Inedible/edible Offal** | Blood | Adhesives, ceramics, cosmetics, feed use, fertilizer, foam in fire extinguishers, insecticides, laboratory use, medical use, plastics, sausage components |
| | Bones | Animal feed, buttons and handles, capsules for medications, cosmetics, emulsions, fertilizer, gelatines, glues, hardening steel, candies and dairy products, ointments, paper, photographic films, refining sugar, textiles |
| | Connective tissue | Gelatines |
| | Ears | Pet food, variety meats |
| | Fats | Candies, chewing gum, germicides, industrial oils, insecticides, lubricants, soap, glycerine, medicinal products, shortenings, tires |
| | Feet | Fine lubricants, leather preparations, variety meats |
| | Intestines (chitterlings or natural casings) | Sausage components, variety meats, medical use |
| | Skin | Candies, capsules for medications, cosmetics, dairy products, emulsions, gelatines, leather goods, ointments, paper, photographic films, rinds, textiles |
| **Inedible offal** | Glands | Industrial products, medicines |
| | Hair | Athletic equipment, brushes, felt, insulation, rugs, upholstery |
| | Hide | Boxes and plywood, gelatines, glues, leather goods |
| | Lungs | Pet foods |

## 1.3. Handling, washing and storing of offal

Offal can be handled and stored based on their colour classification:

- **Red offal**: liver, kidney and heart,
- **Grey offal:** stomach, intestine, lungs and spleen and
- **Dark offal:** head and feet.

The red offal can be given the same cooling treatment as the carcass, but the others should be sold quickly. If storage is desired the grey and dark offal should be held in a separate chamber and spread out to allow for more effective cold action. Grey offal which include the stomach and intestines must be moved to an area provided for this purpose and they should be emptied of their contents then flushed with water. The dark offal should be roasted, scraped and washed outside the premises. The dark and grey offal are utilized as by products and should therefore be disposed of as soon as possible or be refrigerated.

Offal such as liver, lungs and kidneys should be trimmed and then placed in a chill or freezing room depending on the ultimate system of disposal. Offal for edible purposes should be held at a temperature not exceeding 3° C.

Blood should be transported within four to six hours for processing. Skin and hide should be transported within eight hours of collection. Pancreas and endocrine glands should be collected in ice and preserved under frozen conditions. Bones should be free of adhering flesh and dried Green bones should be broken, boiled, dried and stored at room temperature. The intestines and stomach should be cleaned in the unclean section of abattoir.

Due to higher glycogen content and lesser fat covering, edible offal's are pore perishable than carcass, therefore, it is essential to remove the edible offal's soon after slaughter from the carcass, cooked and served preferably on the day of slaughter. High degree of care is to be taken to handle them to prevent contamination.

Carbon dioxide gas/dry ice accelerates chilling of offal's. Freezing arrest the growth of organisms. vacuum packing doubles the refrigerated shelf life of organs like liver, kidneys and heart. However, it is advisable to utilize the organ meat without delay.

In advisable to freeze the liver, heart, oxtail and giblets for longer keeping quality. But care should be taken that these organs are thawed refrigerators. Similarly, sweetbreads and brains are also stored in frozen condition but thawing is done in hot water. For organs such as kidney, tongue and tripe, it is advisable to use as fresh or within 24 hours of refrigeration. tongue may be smoked and refrigerated or pickled and refrigerated to use within 3 days or 7 days respectively. Giblets kept under refrigeration should be consumed within 12 hours.

| Self-check 1 | Written test |
|---|---|

Name…… ID……. Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer (4 point)**

1. From the following which one is dark offal
   a. Head
   b. Feat
   c. Stomach
   d. A and B
2. Which one is not Inedible offal?
   a. Glands
   b. Hair
   c. Hide
   d. Lungs
   e. Tripe
3. ----------is thymus glands of calves and mature beef that are pinkish-white in color
   a. Sweetbreads
   b. Head
   c. Feat
   d. None
4. From the following one is not grey offal.
   a. Lungs
   b. Spleen
   c. Stomach
   d. Head

**Test II: Short Answer Questions (10 pts)**

1. List at least five edible offal's
   a.----------
   b----------
   c.----------
   d.----------
   e.----------
2. Write at least five in edible offal's.
   a.----------
   b----------
   c.----------
   d.----------
   e.----------

***Note:*** **Satisfactory rating - 12 points** **Unsatisfactory - below 12 points**

**Information Sheet 2- Inspecting offal and identifying defects including disease and contamination**

## 2.1. Inspection of offal carcasses

Offal's must be inspected for abnormalities and disease conditions prior to further handling. Blood, liver, trachea, oesophagus, spleen, brain, kidneys and fat should be collected under hygienic conditions. They should be used immediately or stored at 4-7 $^{o}$ C in stainless steel containers.

### 2.1.1. Head Inspection

The sequence of inspection of the head tissues, lymph nodes, cheek muscles, and tongue is determined by the direction of movement of the heads and whether the tongue is in front of the head or behind it. Usually, the leading tissues are examined first, and the trailing tissues are examined last. In the establishment, your supervisor and the other inspectors will show you the sequence of inspection. The presentation methods used by establishments can vary. Following are the general steps you will perform.

**There are four steps in head inspection.**

**Step one**: observe the outer surface of the head and eyes.

**Step two:** incise and observe the four pairs of lymph nodes – mandibular, parotid, lateral retropharyngeal, and medial retropharyngeal.

**Step three**: incise and observe the masticatory or cheek muscles.

**Step four**: observe and palpate the tongue.

**Conditions which you may see during head inspection include the following.**

**Contamination** may be observed the in form of pieces of hide, hair, ear tubes, ingesta, rust, and grease. When these or any other contaminants are present on the head when it is presented for inspection, you will delay inspection until the condition is removed by a company employee.

**Abscesses** are a common finding in soft tissues of the head, particularly the lymph

nodes. The abscesses are generally localized, but you should retain the head and carcass until completion of all inspection.

***Actinomycosis (acti) (lumpy jaw)*** -is generally located in the bony structures of the head and jaws. It may be abscessed and is usually characterized by swelling. When the condition is localized, the head is usually condemned and the corresponding carcass will be retained, pending further inspection.

***Actinobacillosis (acti) (wooden tongue)-*** is generally located in the soft tissue of the head, such as the tongue and/or lymph nodes. The condition is frequently mistaken for an abscess and, if localized, part of the head may be salvaged after the removal of affected tissue. In some cases, this condition may be found in the viscera and lungs of the animal so the carcass is retained until after all inspection has been completed.

***Epithelioma (cancer eye) (bug eye)-*** is the most common neoplasm of cattle. All breeds are susceptible, but Herefords are by far the most commonly affected. It is felt the tumor originates in either the cornea, third eyelid, or the eyelids, and usually progresses to the surrounding bone and adjacent region. The obvious lesions will have been detected on antemortem inspection, and the animals will be handled as suspects. The lesion may appear as a small growth on the cornea or eyelid or there may be no lesion at all. In some cases, the eye may be missing after having been surgically removed prior to slaughter. You would retain all heads and their corresponding carcasses when they exhibit any of these signs.

**Tuberculosis** - One of the primary reasons you incise lymph nodes is to detect TB. The affected lymph node involvement will vary from slightly involved to totally involved. When incised, the node affected usually exhibits a yellowish semi-liquid to caseous (cheese-like) mass of tissue interspersed with some normal tissue, greyish in color, and often showing signs of inflammation. When you detect what you suspect is TB, you must retain the head and corresponding carcass.

### 2.1.2. Viscera Inspection

Remember that the viscera include the contents of the abdominal and thoracic cavities plus the tubes that lead into and out of some of the organs in these cavities. Viscera separation is the dividing of the internal organs of the body such as the heart, lungs, liver, kidneys, intestines, etc., into various offal products. Offal parts are animal parts other than the carcass (body). Viscera are typically presented for inspection in a viscera truck or on a moving table. Regardless of the method used by the establishment to present the viscera, certain tissues are always examined.

**The following steps are performed in viscera inspection.**

**1**. Observe cranial and caudal mesenteric (mesenteric) lymph nodes, and abdominal viscera.

**2.** Observe and palpate rumen-reticular junction.

**3.** Observe esophagus and spleen.

**4.** Incise and observe lungs lymph nodes - mediastinal [caudal (posterior), middle, cranial (anterior)], and tracheobronchial (bronchial) right and left.

**5.** Observe and palpate costal (curved) surfaces of lungs.

**6.** Incise heart, from base to apex or vice versa, through the interventricular septum, and observe cut and inner surfaces.

**7.** Turn lungs over; observe ventral (flat) surfaces and heart's outer surface.

**8.** Incise and observe hepatic (portal) lymph nodes.

**9.** Open the bile duct (both directions) and observe its contents for flukes.

**10.** Observe and palpate liver's ventral surface.

**11.** Turn liver over, palpate renal impression, observe and palpate parietal (dorsal) surface.

**Table 2.1. Offal inspection**

| Organs | Inspection criteria |
|---|---|
| Stomach, intestines and spleen | They shall be free from hemorrhage, cysts and swellings, free from worms. |
| Liver | The surfaces and substance of the liver shall be inspected. The associated lymph nodes (hepatic) shall also be inspected and the bile ducts incised where necessary. They shall be free from hemorrhage, cysts and swellings, free from worms. |
| Kidneys | kidneys shall be exposed, and the surface inspected and, if necessary, the kidneys shall be split by incision and the substance inspected. They shall be free form swellings, free from kidney stones, free from hemorrhage, free from cysts and any discolorations. |
| Lungs | The lungs shall be inspected and, if obviously diseased, they shall be incised at the base. The associated lymph-nodes (bronchial and mediastinal) shall also be inspected and, unless. Obviously diseased, shall be incised. They shall be free from hemorrhage, cysts and swellings, free from worms. |
| Heart | The heart sac (pericardium) shall be opened, and the heart inspected and, if necessary, incised. It shall be free of abnormal swelling, hemorrhage, free of worms and cysts. |
| Poultry offal (liver, heart and gizzard) | Heart shall be free of abnormal swelling, hemorrhage, free of worms and cysts. Liver shall be free from gal, discoloration, contaminants and ulcerations, and worms. Gizzard shall be clean, shall be free of abnormal swelling, hemorrhage, free of worms and cysts. |
| Testicles and Penis | The outer surface and the substance of the testicles and penis and the superficial inguinal lymph-nodes shall be inspected routinely if meant for the consumption. They shall be free of abnormal swelling, hemorrhage, free of worms and cysts. |

## 2.2. Sources contamination and ways to avoid

The presence of microorganisms on post slaughter meat and meat product is thus blamed on contamination occurring immediately before, during and after slaughter. The major sources of contamination are the animal itself, tools and equipment used in slaughter, the workmen and the condition of the slaughterhouse environment.

Dirt, soil, body discharges and excreta from animals in holding pens or lairages are the primary sources of contamination of meat and meat product in the later stages of the operation. This happens irrespective of whether or not the animals are fit and have passed antemortem inspection. In some establishments, the animals are washed just before stunning and bleeding. This step has the added effect of cooling or calming down the animals which factor is of importance in securing good quality meat and meat by products.

It is advisable to avoid operations on the floor. Hoisting during sticking, skinning, evisceration, washing and inspection is recommended in even modest premises, including makeshift ones. This, in effect, necessitates the provision of adequate floor space with suitable assembly of equipment to handle the animal bodies. In this respect it is advisable to have only a few workmen on the floor specialized or experienced in the various steps to handle the operations separately with quick and rapid dispatch.

**The precautions that must be taken:**

**The knife** - should be cleaned after each animal is disposed of and rinsed in hot water. It is said that a contaminated knife can transmit bacteria into the animal tissues during the early stages of bleeding when the pumping action of the heart is strongest. If this should happen, deterioration in deep tissues can also result.

Accidental puncture of the stomach and intestines is a source of contamination on occasions, as is spillage from the rectum and esophagus. It has been estimated that the

mixed bacterial flora of the gastrointestinal tract may reach $10^{10}$ colony-forming units (cfu) per gram of contents.

**Washing:** offal carcasses should be washed with clean potable water under pressure if possible. If water is a problem as happens in some rural areas, dry slaughter by trained men should be resorted to as it is safer for carcasses to be dry clean than to contaminate them with water from polluted sources.

**Offal handling:** the various classes of edible offal, red, grey and should be cleaned separately. The red offal's can be washed on a separate line in the slaughter room after inspection, but grey offal's (stomach and intestines) must be moved to a chamber provided for them. Initially they should be emptied of their contents dry, then flushed with water. The dark variety (head, feet) should be singed, scraped and washed outside the premises.

**Byproducts:** delicate items such as glands and organs, if required, must be collected and conveyed from the plant by special methods as well as blood to be used for food or pharmaceutical purposes. Blood coagulates soon after it leaves the animal. Handling of this item as well as glands thus poses a problem hence unless the plant is a large one and previous arrangements have been made for their removal, collection should be avoided, more so in small rural premises.

**Discards and waste:** these are variable. Usually in developing countries they include the contents of the gut, blood and trimmings that cannot be used for food and therefore flushed into effluents. However, coagulated blood and other solids must be strained out before disposal.

**Personnel:** next to the animal, equipment and methods of operation, the personal hygiene of the workmen is the most singularly important factor in slaughter operations, the reason being that contamination of food and disease transmission thereby depend equally on the human element as well as on the tools and methods of operation. Individuals assigned to slaughter services must be of sound health and of good personal habits. People who are sick or with boils and sores must be barred from the

premises. All must be routinely examined for their health condition. Furthermore, persons who habitually exhibit unhygienic habits like spitting, nose-blowing and coughing must not be employed. It is important to allow only approved and scheduled workmen into the premises at the time of operation and these individuals must be identified by proper attire, e.g. clean blue overalls with long waterproof aprons over them. Boots must be worn with the trousers neatly tucked inside.

### 2.3. Zoonotic disease

Infections that are naturally transmitted from vertebrates' animals to humans and vice versa are classified as **zoonoses.** In the livestock sector the different types of farm animals are capable of carrying a wide range of zoonotic pathogens. Zoonoses can be transmitted to humans by several routes that include: consumption of infected raw blood, milk and meat; by direct contact with infected animals through handling abortions, slaughters, dystocia and parturitions; and indirectly from infected farm environments. However, most meat-borne zoonoses are acquired through the consumption of infected and under cooked blood and meat.

**i. Hydatid disease-** the organism which causes this disease is the small tapeworm *Echinococcus granulosus*. This parasite grows to maturity in dogs or dingoes, which spread infective eggs to the environment in their faeces. Grazing or foraging animals, such as sheep, cattle, pigs, wallabies and kangaroos, become intermediate hosts to the parasite when they ingest Echinococcus eggs.

Fluid-filled cysts form in the internal organs of these intermediate hosts. If a dog or dingo is allowed to feed on diseased internal organs (offal), tiny larval worms are liberated from the cysts and grow to maturity in the dog, perpetuating the cycle.

People can also develop cysts if they ingest Echinococcus eggs. This can readily occur when infected dogs are patted or contaminated surfaces are handled. The earlier diagram summarizes these aspects of the spread of hydatid disease. Sheep farmers and their families are especially at risk of contracting hydatidosis.

**People may also** develop cysts in a variety of organs, with the liver and lungs the most common sites. When infective eggs are ingested, the tiny larvae may form cysts. These cysts will normally continue to enlarge with time and may pose a risk to health because:

- ✓ They may interfere with the normal functioning of the organ in which they have lodged.
- ✓ They may rupture, either spontaneously or following an accident such as a fall. Following rupture of a cyst, the fluid liberated may cause anaphylactic shock or larvae released may form other cysts.

**ii. Taeniasis and cysticercosis** are diseases caused by the adult and larval stages of the cestode or tapeworm parasites *Taenia saginata* and *Taenia solium* in their definitive host (humans) and intermediate hosts (cattle, pigs, humans). These intestinal infections, termed taeniasis, normally produce only mild symptoms. Eggs passed in the feces of human carriers can cause further disease if ingested by cattle, pigs, or humans. In these intermediate hosts, the egg develops to the larval (*cysticercus)* stage, and the disease is termed ***cysticercosis***.

The *cysticerci* of *Tsaginata* and *Tsolium* are transmitted to humans through the ingestion of raw or inadequately cooked beef or pork and contaminated vegetables.

**iii. Q fever**- is an infection caused by the rickettsia *Coxiella burnetii.* The organism exists as a spore and can survive for up to 120 days under extreme conditions Animal reservoirs are sheep, goats and cattle. The most common mode of transmission is via droplet infection. Humans can also be infected through direct contact with infected meat products, carcasses and the products of conception, especially if the process involves significant splattering as when washing carcasses and handling viscera.

**iv. Ovine johne's disease**

Ovine Johne's Disease (OJD) is a chronic intestinal infection of sheep and goats and is caused by the bacterium *Mycobacterium avium subsp*. *paratuberculosis*.

***Transmission*** of *M. paratuberculosis* is primarily by the fecal-oral route. The bacteria enter through lymphoid tissue, called Peyer's Patches, in the small intestine and infect

the terminal ileum, caecum, colon and associated mesenteric lymph nodes and vessels. This results in inflammation and thickening of the bowel wall, which interferes with the normal absorption of energy and nutrients. This can lead to severe weight loss, emaciation and eventually death.

The disease is characterized by a long incubation period. Young lambs and kids appear to be more susceptible to infection, with transmission usually occurring from older infected adults to juveniles and neonates. Most animals, however, do not show clinical signs until two years of age. During this time, infection can be very difficult to detect and infected animals can shed bacteria, often intermittently, throughout the course of the disease and even before showing outward clinical signs of infection.

The characteristic features of clinical OJD include weight loss, emaciation and weakness, which progress ultimately to death due to malnutrition. In sheep, however, only about 10% of clinical cases show diarrhea in the end stage of the disease, unlike cattle where this is characteristic of the disease. Once clinical signs become apparent, animals may die within 2-6 months. Clinical cases of OJD are considered to be the “tip of the iceberg”. For every clinical case of OJD, it is likely that many other animals are infected, depending on the level of infection within the flock. Due to this long incubation period, when infection is first recognized, it is likely that transmission has occurred a few years earlier.

**Table 2.2. Common zoonotic diseases**

| Disease | Agent | Animal | Exposure |
|---|---|---|---|
| Anthrax | Bacteria | Goats, other herbivores | Handling hair, bone or other tissues |
| Brucellosis | Bacteria | Cattle, swine, goats, sheep | Contact with placenta and other contaminated tissues |
| Campylobacter | Bacteria | Poultry, cattle | Ingestion of contaminated food, water, milk |
| Cryptosporidiosis | Parasite | Poultry, cattle, sheep, small mammals | Ingestion of animal faeces |
| Leptospirosis | Bacteria | Wild animals, swine, cattle, dogs | Contaminated water on open skin |
| Psittacosis | Chlamydia | Parakeets, poultry, pigeons | Inhaled desiccated droppings |
| Q fever | Rickettsia | Cattle, goats, sheep | Inhaled dust from contaminated tissues |
| Salmonellosis | Bacteria | Poultry, swine, cattle | Ingestion of food from contaminated organisms |
| Tinea capitis | Fungus | Dogs, cats, cattle | Direct contact |
| Trichinosis | Roundworm | Swine, dogs, cats, horses | Eating poorly cooked flesh |
| Tuberculosis, bovine | Mycobacteria | Cattle, swine | Ingestion of unpasteurized milk; inhalation of airborne droplets |

| Self-check 2 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (5 point)

1. While inspecting Stomach, intestines and spleen they shall be free from
   a. hemorrhage
   b. cysts and swellings
   c. free from worms
   d. All
2. From the following one is not sources of primary contamination
   a. Chemical
   b. soil
   c. body discharges
   d. excreta
3. during inspecting the kidney what are the points they shall be free form.
   a. swellings
   b. hemorrhage
   c. cysts and any
   d. discolorations
   e. all
4. It has been estimated that the mixed bacterial flora of the gastrointestinal tract may reach ---------- colony-forming units (cfu) per gram of contents.
   a. $10^{10}$
   b. $10^{15}$
   c. $10^{20}$
   d. $10^{25}$
5. Which one is not the precautions area to reduce contamination?
   a. Personnel
   b. Handling offal
   c. Waste discarding
   d. All

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

**Information Sheet 3- Trimming connective tissue from Offal of considering OHS**

### 3.1. Occupational health and safety (OHS)

Workplace incidents and occupational diseases can be prevented through the implementation of an OHS program. An OHS program is a process for managing health and safety issues in the workplace. Its benefits extend to employers, supervisors, and workers including:

- safer and healthier work environments
- lower medical care costs
- lower insurance costs
- increased work productivity and efficiency
- increased profits
- fewer work-related tragedies

An OHS program also outlines the roles and responsibilities of employers, supervisors, and workers within the workplace. In addition to carrying responsibilities for workplace health and safety, we all have rights, including:

- the right to know about all the hazards to which we might be exposed
- the right to participate in protecting ourselves
- the right to refuse to work.

So, the worker will have the responsibility to wear personal protective equipment during carry out trimming offal's.

### 3.2. Trimmings and preparing offal

**Stomachs-** are first emptied and washed, and the fat and connective tissue is trimmed off. The pillars of the rumen (mountain chain) may be removed, trimmed, packaged and frozen for human consumption. The remaining material is cleaned in one stainless steel drum which operates rather like a cylindrical washing machine and then transferred to a second similar machine but on this occasion with a roughened interior which removes the external fat. The stomachs are then scalded in water containing washing soda, scraped and placed in cold water to clean them, and finally cooked for 3-3½ hours at a

temperature of 49–60 °C. The reticulum is the source of ‘honeycomb’ tripe. In some countries, the omasum is made into ‘bible’ tripe; in others, it is considered uneconomical because of the difficulty of removing the mucous membrane.

**Heart-** is the gateway offal. First, it's pure muscle not some biological filter or squishy part. Second, it is very clean tasting. Most will think they are eating a lean sirloin cut if they didn't know it was heart. Trimming a heart of fat and the connective tissue is the first step for just about any preparation. It's not difficult but it does require a bit care and patience. Begin by cutting the top off of the heart where all of the arteries and veins enter. Then trim the outer membrane off the heart using a small, sharp knife. Shave off a little bit at a time while not cutting too deeply into the muscle.

Once the exterior is pretty clean, cut into the heart to begin opening it up "butterfly" style or like a book. Basically, you're just trying to open up the chambers so you can trim the connective tissue inside. Trim the stringy, connective tissue inside the chambers using the same technique as shaving the outside. Continue opening up the heart as you trim so it will eventually "unroll" and lay relatively flat or in pieces. Once the heart is trimmed you will have pieces of very clean looking, lean muscle. Now you're ready for the next steps in whatever recipe you choose.

**Livers-**livers from all species, except horse due to their high cadmium contents, may be prepared for human food. The gall bladder shall be removed from the liver but can be harvested separately as edible. Minor scar lesions on the surface of porcine livers (i.e. milk spots, parasitic scar lesions) can be left on the offal if this is acceptable to the buyer or otherwise betrimmed/ removed. Moreover, the following were trimmed or removed from the liver.

- Lymph nodes retained or removed
- Vena cava removed
- Ligament removed

The operator shall open the hepatic ducts longitudinally and examine them for the presence of liver flukes. Livers with defects such as parasites (e.g. flukes), lump, tumor, abscess (1 or more) shall not be harvested for human consumption.

**Kidneys-** are found next to the primal loin in the interior of the carcass. Kidneys are trimmed even to their surface of all blood vessels and excess fat.

| Self-check 3 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (3 point)

1. which one is use of occupation health and safety?
   a. Safer and healthier work environments
   b. Lower medical care costs
   c. Lower insurance costs
   d. increased work productivity and efficiency
   e. all
2. Trimming include the following points except one.
   a. Connective tissue
   b. Fat
   c. Un wanted tissue
   d. None
3. What part were trimmed or removed from the liver.
   a. Lymph nodes
   b. Vena cava
   c. Ligament
   d. Aorta

**Test II: Short Answer Questions (3 pts)**

List the employee rights

a. ----------

b. ----------

c. ----------

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

## Information Sheet 4- Placing trim in bin or chute

**Work place requirement-** Offal room should be a separate room and hanging space shall be provided for emptying and cleaning of stomachs and intestines. This room shall be provided with sufficient potable running water work tops. This room shall have a separate exit and sufficiently drained.

**Safety requirement-** adequate firefighting equipment and appliances shall be fixed in accordance with Occupation Safety and Health Act (OSHA). Adequate facilities for first-aid shall also be provided.

Formerly placing the trimmed offal in bin/chute it's advisable to undertaken the following points. Equipment(bin/chute) used for processing or otherwise handling offal must be of such material and construction to facilitate thorough cleaning and to ensure that their use will not cause the adulteration of product during processing, handling, or storage. Bin/chute must be maintained in sanitary condition so as not to adulterate offal.

Equipment(bin/chute) over which edible products pass or come in contact (product contact surfaces) must be cleaned and sanitized every four hours and be rinsed with hot water every two hours during processing. This is usually accomplished during break periods. This takes advantage of the "lag phase" in the growth of bacteria. All equipment should be rinsed with hot water prior to resumptions of operations to remove any dust, dirt that may have collected on it during the night.

Moreover, the trimmed and cleaned offal is placed in clean and sanitized bin or chute.

| Self-check 4 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Short Answer Questions**

1. List the point we take care prior to place trimmed offal in bin/chute. (4 pts)

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

## Information Sheet 5- Identifying types and sources of contamination

### 5.1. Contamination

There are a number of reasons that can lead to contamination. However, meat and meat product contamination fall under four different categories which are:

- Biological contamination
- Chemical contamination
- Physical contamination
- Cross-contamination

### 4.1.1. Biological Contamination

Contamination of meat and meat by product items by other living organisms is known as biological food contamination. During biological contamination, the harmful bacteria spread on foods that you consume. Even a single bacterium can multiply very quickly when they find ideal growth conditions. Not just bacteria, but also their process of multiplying can be quite harmful to humans.

The contaminating bacteria on the knife soon will be found in meat and meat by product in various parts of the carcass, carried by blood and lymph. The exterior of the animal harbors large numbers of microorganisms from soil, water, feed and manure.

The hides of beef and the fleece of sheep are major sources of carcass contamination. The spread of pathogens from beef hides to the carcass, operatives and surfaces in the abattoir is demonstrated. Efforts to clean the hide of cattle and the fleece of sheep are outlined, with reference to the success of these treatments in reducing contamination.

### 4.1.2. Physical Contamination

When harmful objects contaminate the meat and meat by product it leads to physical contamination. At times, meat and its by product can have both physical and biological contamination. Contaminated Knives, cloths and hands, clothing of the workers can serve as an intermediate source of contaminants.

### 4.1.3. Chemical Contamination

Chemical contaminants are one of the serious sources of contamination. These contaminants can also lead to food poisoning. Pesticides present in fruits and vegetables are one of the main sources of contamination and animals may also be exposed to pesticides by ingestion of contaminated soil while grazing. Pesticides can be taken up by livestock in their feed or water and may be incompletely eliminated at the time of slaughter. In addition, kitchen cleaning agents, meat containers made of non-safe plastic, pest control products also lead to meat and meat by product contamination. The presence of drug residues in animal and its associated harmful health effects on humans similarly effluents usually contain elevated levels of heavy metals.

### 4.2. Cross-Contamination

Many of us are not aware of cross-contamination; however, this type of contamination can lead to a number of health problems. Cross-contamination takes place when pathogens are transported from any object that you use. Dirty clothes, unclean utensils, pests, raw meat and meat by product storage can lead to cross-contamination.

| Self-check 5 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (2 point)

1. From the following which one is not cause biological contamination?
   a. Bacteria
   b. Virus
   c. Fungus
   d. none
2. Except one all are cause chemical contamination
   a. pesticide
   b. herbicide
   c. fungicide
   d. none

**Test II: Short Answer Questions (5 pts)**

1. what are types of contamination? List them.

2. What do we mean while we are saying cross-contamination?

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

| LG #48 | LO #2- Further process tripe |
|---|---|

**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Selecting, inspecting and placing tripe in equipment
- Processing tripe
- Inspecting further processed tripe to ensure customer specifications.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**:

- Select, inspect and place tripe in equipment
- Process tripe
- Inspect further processed tripe to ensure customer specifications

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets”,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

## Information Sheet 1- Selecting, inspecting and placing tripe in equipment

### 1.1. Introduction

**Tripe i**s produced from the first stomach or rumen (also known as the paunch or plain tripe) and second stomach the reticulum (also known as the honeycomb and pocket tripe) of the cattle.

After the cattle are eviscerated in the slaughter hall, the tripe and intestines are sent to the gut room after inspection. Care must be taken in the slaughter hall to ensure the paunch is not punctured or damaged as this will cause contamination of the chute to the gut room. The gut room is a “dirty area” of the plant and care must be taken to ensure that none of the other associated areas such as tripe and hoof preparation rooms are contaminated by the gut cleaning process as this would cause serious food safety problems

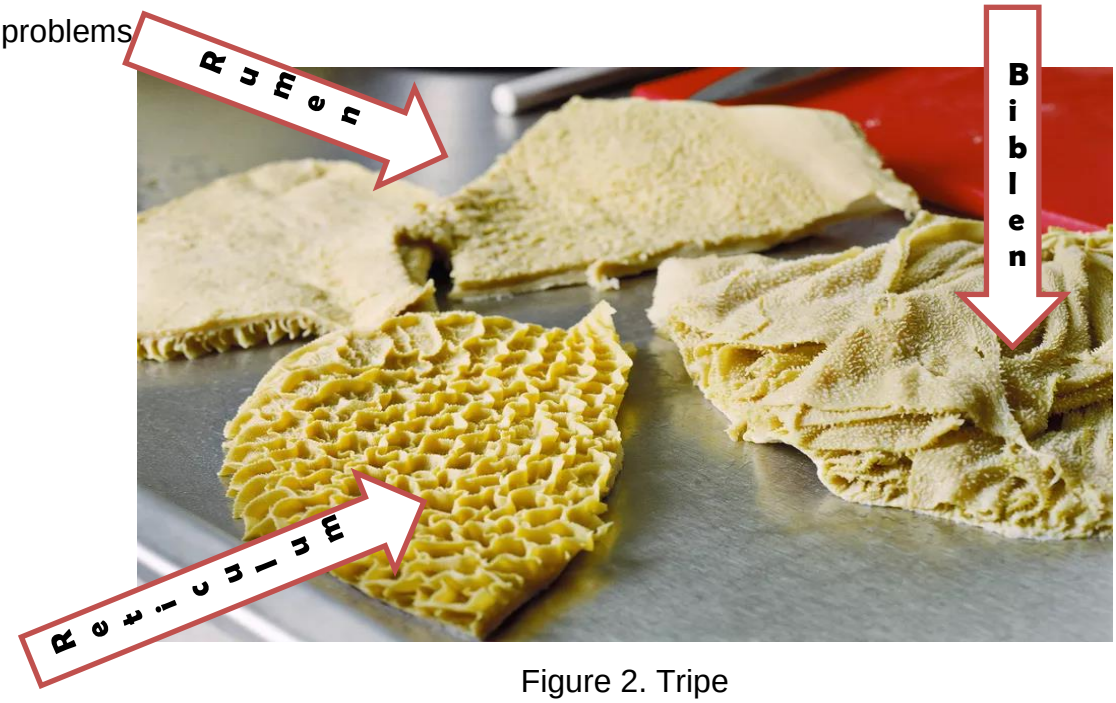


Figure 2. Tripe

### 1.2. Inspecting tripe

- Tripe inspection is part of the wider process of screening tripe for fitness for human consumption.
- The observed offal may be passed, partially condemned and/ or rejected for different pathological lesions. Usually the organs are condemned due to emaciation/ low

quality, pathological lesions such as pneumonia, distoma, abscess, fasciolosis, cysticercus, inflammations, bruising, hydatidosis etc.

- Similarly, sanitary measures of inspection have been kept.

In general, offal inspection covers the inspection of the tripe and parts of offal used for human consumption. Inspecting occurs in whole process and ends at the step where the tripe is placed in the cooler/ appropriate equipments.

Table 1.1. Microbiological limits for offal

| **Micro-organism** | **Red offal** | **Green/white offal** | | |
|---|---|---|---|---|
| | Heart, liver kidney, spleen, lungs, trachea, testicles, tongue | Stomach, esophagus, gizzard | Small intestine | Large intestine |
| Aerobic colony count – cfu/g | $10^6$ | $10^6$ | $10^6$ | $10^8$ |
| *E. coli* per g | $10^2$ | $10^3$ | $10^3$ | $10^4$ |
| *Coagulase positive Staphylococcus aureus*, per g | $10^3$ | $10^3$ | $10^3$ | $10^4$ |
| *Clostridium perfringenes* | Absent in 25 g | Absent in 25 g | Absent in 25 g | Absent in 25 g |
| *Salmonella species* | Absent in 25 g | Absent in 25 g | Absent in 25 g | Absent in 25 g |
| *listeria monocytogenes* | Absent in 25 g | Absent in 25 g | Absent in 25 g | Absent in 25 g |

| Self-check 1 | Written test |
|---|---|

Name…… ID…… Date…….
**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test II: matching (4 pts)**

| A. | B |
|---|---|
| 1. omasum | a. Bible |
| 2. rumen | b. True stomach |
| 3. reticulum | c. Honeycomb |
| 4. abomasum | d. Punch/plain |
| | e. None |

**Test I: short answer** (4 point)

1. List some microorganism that may occur in tripe. (3 pts)

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

## Information Sheet 2- Processing tripe

Processing of tripe starts from washing and next refining, alkaline rehydration up to packaging depending on customer specification. Figure below figure illustrate about the part of digestive tract of animal namely rumen, reticulum, omasum and abomasum.

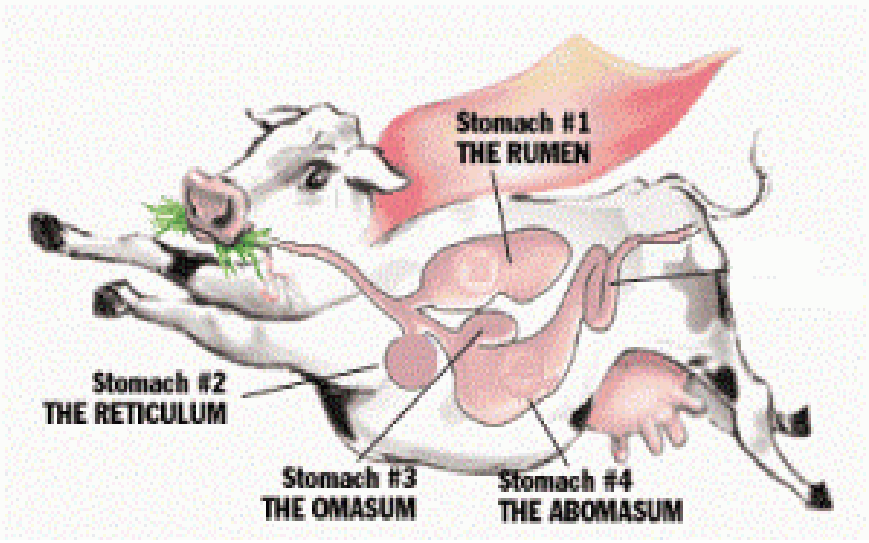


Figure 2.1. Part of stomach

### 2.1. Washing Process

The washing process is performed to remove any soil left on tripe after its contents have been emptied and may be performed in a washer apparatus. Tripe may be washed with water at a temperature of at least 120 $^{0}$ F. to effectively stop the on-going activity of digestive acids in the rumen stomach. When desired, the washing process time may be no more than 10 minutes. For example, in some embodiments, tripe may be washed with water at a temperature of about 130$^{0}$ F. to 170 $^{0}$ F. for about 3 to 6 minutes. In other embodiments, tripe may be washed with water at a temperature of about 143 $^{0}$ F. to 150 $^{0}$ F. for about 4 minutes. In yet other embodiments, tripe may be washed with water at a temperature or about 148 $^{0}$ F. for 4 minutes, or with water at a temperature or about 151 $^{0}$ F. for about 3 minutes and 30 seconds. It is understood that the type or washing equipment employed, size or the equipment, and amount or tripe being treated can affect the temperature or the wash water and the duration of the wash cycle. As such,

persons or skill in the art can modify the aforementioned parameters to suitably wash the tripe tissue.

### 2.2. Refining Process

After the washing process, tripe is subjected to a refining process where it is bleached. The refining process may be performed in an apparatus called a refiner. When appropriate, tripe may be treated in a single tripe processing apparatus functioning as both washer and refiner.

In refining process, tripe may be contacted with at least one bleaching agent and one alkaline material for a period of lime sufficient to bleach the tripe to desired whiteness.

In some embodiments, tripe may be contacted with bleaching agent(s) and alkaline material(s) at a temperature of about 120 $^{o}$ F. to 145 $^{0}$ F for about 2 to 7 minutes. For example, in some embodiments, tripe may be contacted with bleaching agent(s) and alkaline material(s) at a temperature of about 130 $^{0}$ F. to 138 $^{0}$ F. for about 4 minutes. In other embodiments, tripe may be contacted with hydrogen peroxide and at least one alkaline material at a temperature of about 130 $^{0}$ F. to 135 $^{0}$ F. for about 4 minutes. It is understood that the type of refining equipment employed, size of the equipment, and amount of tripe being treated can affect the temperature of the water and the duration of the refining cycle. As such, persons of skill in the art can modify the aforementioned parameters to suitably refine the tripe tissue.

When more than one alkaline material is used, they may be pre-mixed and then added to a refiner for tripe refining. Alternatively, the alkaline material agents may be added separately and individually to tripe in the refiner. In some embodiments, the alkaline material may be added to tripe first, followed by the bleaching agent.

In some embodiments, the alkaline material may be added first to tripe in the refiner and allowed to contact with tripe for about I minute before the bleaching agent may be added. Then, tripe may be allowed to contact with both the bleaching agent and alkaline material for about 4 to 5 minutes.

The dosage of bleaching agent may vary depending on several factors including, but are not limited to, the concentration of the bleaching agent and the degree of tripe whiteness desired. In some embodiments, the bleaching agent used during refining process may be about 0.1% to about 0.5% on an active available oxygen basis relative to the weight of tripe. In other embodiments, the bleaching agent used during refining process may be about 0.2% to about 0.3% on an active available oxygen basis relative to the weight of tripe.

Various non-toxic bleaching agents may be used, provided they do not damage tripe or impart any object able taste or color to tripe. Any United States Department of Agriculture Food Safety Inspection Service (FSIS) approved bleaching agent may be used. Examples of the bleaching agents may include, but are not limited to, hydrogen peroxide, per sulfate, or the like.

The amount or the alkaline material used for the refining process may be about 0.05% to about 0.2% alkaline material reported as equivalent to $Na_2O$ active basis relative to the weight of tripe.

Any alkaline materials may be used, provided they do not damage tripe. Non-limiting examples or the alkaline materials may include sodium hydroxide (caustic soda), potassium hydroxide (caustic potash), calcium hydroxide (lime), magnesium hydroxide (magnesia), trisodium phosphate, sodium metasilicate. After the refining process, tripe may be washed with .water to remove residual chemicals (e.g., soaps, surfactants) before further tripe processing.

### 2.3. Alkaline rehydration process

After the refining process, tripe is subjected to an alkaline wash process by washing with a solution comprising an alkaline builder to raise the surface pH of tripe to from about 12.2 to about 12.8 at a temperature of about 110 $^0$F to 160 $^0$F In one particular embodiment, the alkaline wash process may be performed at a temperature of about 130 $^0$F to 135 $^0$F for about 1 to 2 minutes. The alkaline builder may include any alkaline compound including, but not limited to, sodium hydroxide (caustic soda), potassium

hydroxide (caustic potash), calcium hydroxide (lime), magnesium hydroxide (magnesia), trisodium phosphate, sodium metasilicate, or combinations thereof.

### 2.4. Post-rehydration rinse process

After the alkaline rehydration wash process tripe may be chilled by rinsing with cold water, may be about 1 to 2 minutes, and then packaged without dry spin cycle.

In some embodiments, the chill process may be performed as rapidly as possible, and tripe may be packaged and frozen before warming up to prevent the seeping out of water after the chill process. In some embodiments, the cold water used for the chill process may have a temperature of about 32 $^{0}$F. to 35 $^{0}$F. Other embodiments may use cold water having a temperature of less than about 40 $^{0}$F.

The methods of processing tripe may be applied to tripe derived from any chamber of the cattle stomach. In some embodiments, the methods may be used for processing scalded tripe and honeycomb tripe. The disclosed methods of processing tripe may not only minimize the shrinkage of tripe during processing, but may also rehydrate tripe and thereby increase tripe yield. Therefore, the disclosed method of processing tripe may offer an enhanced tripe yield and, consequently, an increased profit margin to meat packing plants.

A short alkaline wash step can raise the surface pH of the tripe to about 12.5 for 1 to 5 minutes to cause the tripe tissue to swell and absorb water. This is followed by a cold-water rinse step colder than the tap water temperature available in most plants (e.g., 32 to 35 $^{0}$F). This rapid chill step closes the porosity of the protein tissue and retains the water that caused the swelling to take place. The tripe is rapidly chilled and then packaged into a blast freezer before it has a chance to warm up and purge water after the chilling process.

As with all offal, tripe has to be rapidly chilled to 3°C or less before it leaves the plant. Chilling is essential to ensure a good shelf life and a safe food product. If it is packed warm there is a risk of spoilage and fermentation may occur. The washed tripe is either emptied into a bath of cold water or hung on an “A” frame which is put in the chiller. In

both cases the tripes are left to cool overnight. The advantages of using the “A” frame is that it needs less storage space and uses less cold water, however the disadvantage is that between 5 -10% more weight is lost during the chilling cycle. Most exported edible tripe is supplied in frozen form and is normally packed in 25 kg boxes prior to freezing. If one can want to transport/export to other place the processed and packed carcass and offal have been chilled for 24 hrs. at 0-4 $^{0}$c and relative humidity of 90-95 % and PH: 5-8. and then transported to airport maintaining cold chain.

**Table 3. Recording tripe and other offal’s sheet**

| No | **Species of animal** ***Example, Beef Offal*** | Estimated weight per item |
|---|---|---|
| 1 | Tripe | |
| 2 | Spleen | |
| 3 | Head meat | |
| 4 | Hearts | |
| 5 | Kidneys | |
| 6 | Lips (Papillae) | |
| 7 | Livers | |
| 8 | Lungs | |
| 9 | Skirt membrane | |
| 10 | Skirt pieces | |

| Self-check 2 | Written test |
|---|---|

Name…… ID……. Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: True or false (3 point)**

1. Tripe may be washed with water at a temperature of at least 120 $^{0}$ F.
2. After the washing process, tripe is subjected to a rehydrating process.
3. The dosage of bleaching agent may vary depending on degree of tripe whiteness desired.

**Test II: choose questions (2 pts)**

1. As, tripe has to be chilled to ----------°C or less before it leaves the plant.
   a. 6
   b. 8
   c. 3
   d. 12

2. -----is a process when tripe contacted with at least one bleaching agent and one alkaline material.
   a. Refining
   b. Washing
   c. Hydrating
   d. Chilling

**Test III**: **Short Answer questions (6 pts)**

1. list at least 3 tripe bleaching agents.
2. Write the washing options of tripe.

***Note:*** **Satisfactory rating - 8 points** **Unsatisfactory - below 8 points**

## Information Sheet 3- Inspecting further processed tripe to ensure customer specifications

**A Customer Specification** is a document that describes the requirements of a desired system from the customer's or user's point of view. It contains the results of the customer's requirements analysis and is therefore a wish list that a contractor should implement. Customer specification as "the totality of the requirements specified by the customer for the supplies and services of a contractor within an order".

**A Customer Specification has the following characteristics:**

- it is drafted from the client's point of view
- it focuses on the user and his requirements
- it describes the "what" and calls the "why".

So, during processing tripe we should have taken the customer specification. The type of tripe being processed, the age of the cattle, time lag between emptying the tripe and the first wash, the time of year, the temperature of the process water and the process time can all influence the yield. One mistake many operators make is to run their processes at a higher temperature in the belief that they will produce a satisfactory product with shorter process times. This can often result in an under washed and over cooked tripe. It is important to understand that apart from defects such as dark areas of processed tripe indicating undercooking, there are other quality defects that need to be inspected. These are, cutting lines between honeycomb and plain, excessive fat not sufficiently trimmed and black edges.

Customers have also got different standards of the feel of the product. Some want a product that has not been washed for too long or at too high a temperature; while others require a product, which has been "shrunk". These parameters are controlled by measuring the yield.

Therefore, it is important to develop visual inspection standards and rework guidelines to ensure the customer is satisfied with the final product. While processing one can also

consider the storage mechanism of fresh tripe because tripe is very perishable and should not be refrigerated more than one day. Pickled tripe may be refrigerated two to three days. Canned tripe is shelf-stable for up to one year. Nutritive Food Values of tripe is a good source of protein.

**Types of beef tripe products available include the following**:

- **Tripe cooked**: Scalded tripe, cooled, drained, and then cooked to increase firmness.
- **Tripe cooked and bleached**: Cooked tripe that is bleached and neutralized.
- **Mountain chain beef tripe**: Dark cream-colored, muscular pillars from mature cattle that is scalded or treated with additives.

**Types of pork stomach available include the following:**

- **Whole un scalded:** Light to medium brown, inverted, cleaned, and trimmed; the lining might be removed.
- **Scalded form:** Cream to light brown, inverted, cleaned and trimmed, and scalded; the lining might also be removed.

Precooked tripe requires additional salt-water cooking and is often served with sauces or dressings or used in meat casseroles, stews, or pies. Because tripe is delicately flavored, it is often combined with tomato sauce, buttered and broiled, covered with dressing and baked, dipped in butter and sautéed, or combined with a thick soup.

| Self-check 3 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: True or false** (4 **point)**

1. A Customer Specification describes the requirements of a desired system from the customer's or user's point of view.
2. Customers have got different standards of the feel of the product.
3. Nutritive food values of tripe are a good source of protein.

**Test II: Short Answer Questions**

1. List characteristics and customer specification.

a.----------

b……

c……

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

| Operation sheet-1 | Processing tripe (video) |
|---|---|

**Manual Washing tripe**

**Part I. Removing the Excess**

1. Rinse the tripe. Run the tripe through cold water to remove any loose waste products attached to it.


Figure 1.1. rinse tripe

2. Remove the fat. To find excess fat, you'll need to inspect the non-textured side of the tripe.
   - If you see any fat, pull it up and slice it off with the knife. Fat will look noticeably different to the tripe, being more-pale and feeling more like rubber. Tripe is a low-fat meat so you shouldn't have too much fat to remove.
   - Other unnecessary parts such as remnants of food from the animal's stomach will be removed by other processes during the cleaning.
   - Do not cut the tripe into strips or sections yet.

Figure 1.2. Remove the fat from tripe

3. Rub the tripe with rock salt and rinse it with vinegar. This process will loosen any unwanted waste products and make the surface smooth without damaging the tripe itself.
    - Vinegar is acidic and is therefore useful at getting deep into the layers of the tripe and effectively cleaning it.
    - Next, use the rock salt again and rub it across the tripe the same way you just did. The goal here is to clean the tripe as effectively as possible.
    - Keep repeating the process until the tripe looks and feels like it's both smooth and clean.

Figure1.3. Rub the tripe with rock salt

4. Scrape the surface. Using the spine of a sharp knife, scrape the surface of the tripe to remove any imperfections. Honeycomb tripe can be hard to sufficiently clean with a knife due to its relative lack of flatness. For this you can use a toothbrush instead.

Figure 1.4. Scrape the surface tripe

5. Rinse the tripe again. Gently rinse the tripe under cold water again for a few minutes to remove any remaining grit from the meat.
   - While bleached tripe will already be free from grit, it's a good idea for you to rinse it to get rid of the smell.
   - The chlorine on bleached tripe can also get into the other foods you are cooking, which could make the whole meal smell like bleach.

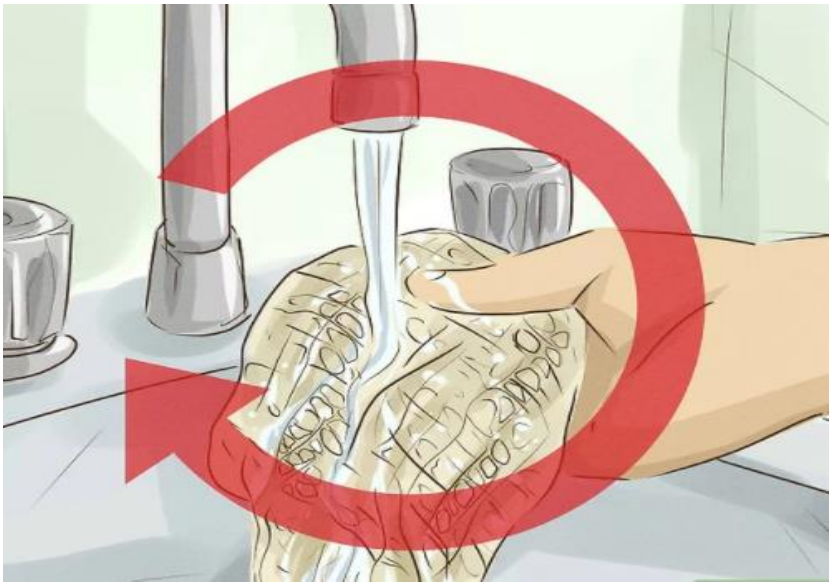

Figure 1.5. Rinse the tripe again

**Part II. Boiling the Tripe**

1. Steep the tripe in a bowl of water for 1 hour. Make sure that the tripe is completely covered by the water. This ensures that all of the tripe is being sufficiently soaked.

Figure 1.6. Steep the tripe in a bowl of water

2. Place the tripe in a large pot. Pour some cold water into the pot and bring it to the boil.
   - Allow the tripe to boil for between 30 and 45 minutes.
   - Add a tablespoon of salt for every liter of water in the pot.

- Boiling the tripe is important as it removes any dangerous bacteria from the tripe.

It also makes the tripe easier to cut and slice later, as well as reducing the cooking time when preparing the meal.


Figure 1.7. Place the tripe in a large pot

3. Drain the pot and rinse the tripe again. Use cold water to wash the tripe. Rigorously and repeatedly rinsing the tripe is very important to ensuring the tripe is as clean as it can be.

Figure 1.8. Drain the pot and rinse the tripe

4. Refill the pot and allow it to simmer. Then place the tripe back in the pot. Allow the tripe to simmer in the pot for 2 to 3 hours. The water will slowly evaporate so remember to occasionally add water into the pot to keep the tripe covered.

Figure 1.9. Refill the pot

**Part II. Cutting the Tripe**

1. Place the tripe on the cutting board. Lay the smoother side down and as flat as possible. The tripe is now at its easiest to cut after the boiling and simmering.

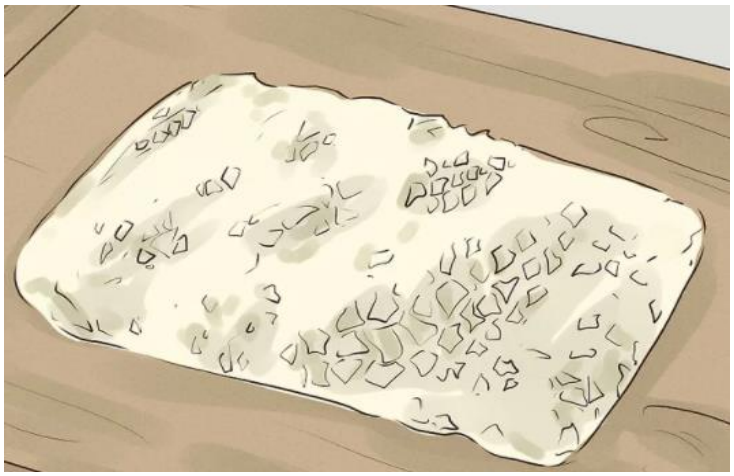

Figure 1. 10. Place the tripe on the cutting board

2. Inspect the tripe for unnecessary parts. Now that the tripe has been thoroughly cleaned, have a look at it once more to see if there is any fat or grit that needs to be sliced off. Chop off anything you see that shouldn't be there.

Figure 1.11. Inspect the tripe for unnecessary parts

3. Cut the tripe in half. Using a sharp knife, slice the tripe in half from top to bottom, splitting it into two separate pieces.
   - It is easiest to cut the tripe at this stage of the process as the boiling has hardened it.
   - If you try to cut the tripe before this stage, it will be far too tender and it will be very difficult to accurately and cleanly cut it.


Figure 1. 12. Cut the tripe in half.

4. Cube the tripe. Take one of the tripe pieces you have and slice it into long, thin strips. Then take a single strip and cut it into 2 inches by 2-inch cubes. Repeat the process for the rest of the tripe.
    - Now your tripe is ready to be used in whichever way you desire. Tripe can be used in a variety of ways, from grilling to making tripe soup. It can also be used in a whole host of different dishes, including Asian and Mexican meals among others.

Figure 1.13. Cube the tripe.

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 6 hours.

**Task 1**. Remove the Excess from tripe

**Task 2**. Boil the Tripe

**Task 3**. Cut the Tripe

| LG #49 | LO #3- Process bibles |
|---|---|

**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Trimming bibles
- Identifying defects in bibles including disease and incorrect cutting lines.
- Identifying and meting occupational Health and Safety (OHS)
- Placing trimmed in appropriate bin or chute
- Identifying types and sources of contamination and cross-contamination.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**:

- Trim Bibles according to workplace requirements and specifications.
- Identified defects in bibles including disease and incorrect cutting
- Identify and met Occupational Health and Safety (OHS) requirements
- Place trim in appropriate bin or chute according to workplace requirements.
- Identify types and sources of contamination and cross-contamination.

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following

“Operation sheets”,

8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

## Information Sheet 1- Trimming bibles

### 1.1. Introduction

Bible Tripe is taken from the third chamber of the ruminant's stomach, which is also called the omasum. The reason for calling this kind of tripe 'Bible' or 'Book' Tripe is because it comprises a number of folds that give it the appearance of a book.

Figure 1.1. Bible/omasum

The third stomach or omasum (bible/book/leaf tripe) is also processed for human consumption (being of most value for producers to be made into sausage, stew or soup). However, it is difficult to clean, as it needs a lot of water and agitation to clean between the flaps. It also deteriorates if not processed, chilled and packed quickly. There is a very small market for the fourth stomach or abomasum (the reed) and as a result this tends not to be processed unless the plant has an established market.

**Trimming –** washing bibles almost similar with tripe but because of different partition is occur care must be given while washing. The tripe, there are cleaned and un wanted tissue, fat, contaminated part if any is trimmed off. It is then boiled and bleached, giving it the white color more commonly associated with tripe as seen on market stalls and in

butchers' shops. The task of dressing the bibles is usually carried out by a professional bible dresser. The object of bible trimming is to remove all damaged or contaminated parts and to standardize the presentation of bibles. Specifications will differ in detail for different authorities. Inspection of bible can only be carried out by qualified personnel. Where signs of disease or damage are found, the entire omasum may be condemned and must not enter the food chain, but more often the inspector personnel will require that certain parts, for instance those where abscesses are present, be removed and destroyed.

Bible Tripe is relatively less tender than honeycomb tripe but is equally as flavorful if prepared using the right techniques. It has come to be used in many delicacies all over the world like Honeycomb Tripe, Bible Tripe is sold in the market washed, cleaned and half-cooked since these jobs are difficult to carry out at home. The fact that it has already been partially cooked softens this offal portion considerably but does not tenderize it all the way. The best way to use tripe in cooking is to subject it to slow-cooking methods by soaking it in some type of liquid. For this reason, it does not come as a surprise that most of the famous tripe dishes across the world are soups and stews. Fresh omasum of the highest quality is bright or dark grey and has a slight hypertrophy of fatty tissue. The tissue is elastic and cohesive. On the walls there are characteristic and typical tabs. Omasum is a rich source of collagen, vitamin $B_2$, calcium and iron.

| Self-check 1 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (2 point)

**1.** ---------is tripe is taken from the third chamber of the ruminant stomach

a. Omasum
b. Bible
c. Rumen
d. None

2. Omasum is a rich source of.

a. Collagen
b. vitamin $B_2$
c. calcium
d. iron
e. All

**Test II: Short Answer Questions**

1. Describe trimming of bibles. (3 pts).

***Note:*** **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

## Information Sheet 2- Identifying defects in bibles including disease and incorrect cutting lines.

As you have been learned above in **LG #1 information sheet 3** about visceral inspection, routine inspection of a bible should be carried out as soon as possible after the completion of dressing in order to detect any abnormalities so that products only conditionally fit for human consumption are not passed as food. Bibles portions should be kept for inspection before they are going for further processing.

Inspection should provide necessary information for the scientific evaluation of pathological lesions pertinent to the wholesomeness of bible. Professional and technical knowledge must be fully utilized by:

- Viewing, incision, palpation and olfaction techniques.
- Classifying the lesions into one of two major categories - acute or chronic.
- Establishing whether the condition is localized or generalized, and the extent of systemic changes in other organs or tissues.
- Determine the significance of primary and systemic pathological lesions and their relevance to major organs and systems, particularly the liver, kidneys, heart, spleen and lymphatic system.
- Coordinating all the components of antemortem and postmortem findings to make a final diagnosis.
- Submitting the samples to the laboratory for diagnostic support
- Inspect if there is not appropriate line cutting
- Inspect for hygiene and sanitation

So, depending on the above inspection result the tripe/bible is rejected or used for further processing.

| Self-check 2 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: True or False (3 point**)

1. Inspection should provide necessary information for the scientific evaluation of pathological lesions pertinent to the wholesomeness of bible.
2. Bibles portions should be inspected before they are going for further processing.
3. Inspection result assure the tripe/bible weather we used or not for further processing.

**Test II: Short Answer Questions**

1. What are the point professional and technical knowledge must be fully utilized during inspection? (3 pts)

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

## Information Sheet 3- Identifying and meting occupational Health and Safety (OHS)

Occupational safety and health (OSH), also commonly referred to as occupational health and safety (OHS), occupational health or occupational safety, is a multidisciplinary field concerned with the safety, health, and welfare of people at occupation. These terms also refer to the goals of this field, so their use in the sense of this article was originally an abbreviation of occupational safety and health program/department etc.

The goal of an occupational safety and health program is to foster a safe and healthy occupational environment. OSH also protects all the general public who may be affected by the occupational environment.

Gut room workers are exposed to various types of hazards in the course of their work, which could lead to health problems of varying severity. To reduce the risks, occur during work they should wear **PPE** clothes includes: Aprons, Footwear, Gloves, Hairnets, Over Coats. Apron may be plate link or preferably chain mail aprons if there is a risk of injury to the abdomen or chest, for example using knives or choppers in trimming and cutting work or other work where the knife is pulled with the point towards the body.

Aprons should be sufficiently long enough to provide adequate protection depending on the nature of the work that usually covering the body area from mid breast bone to mid-thigh. The weight of the apron should be borne by the wearer's shoulders and not the neck, and be adjustable so it sits neatly against the body without sagging. For certain operations, a tunic covering the shoulders and upper torso may be required which reaching upwards to work on hanging meat in pre trimming or using pullers/liberators.

Table 4. Potential hazards

| Process Step | Potential Hazards | Frequently Used Controls |
|---|---|---|
| Variety meats or edible offal processing | Biological-Pathogens (Salmonella) from cross contamination or outgrowth; outgrowth of Clostridium spp. during cooling of offal that receives a heat treatment (e.g., scalding of tripe) | -Minimize cross contamination through sanitary dressing procedures; Sanitation SOPs.<br>-Cooling times should be sufficient to prevent outgrowth of pathogens.<br>-Procedures for the removal, segregation and disposition. |
| | Chemical- Inappropriate use of antimicrobial if used | Procedures to address the preparation, application and monitoring of antimicrobial use to ensure appropriate use. |
| | Physical- Metal (e.g., hardware in intestinal tract) | Visual examination of parts. |

| Self-check 3 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (4 point)

1. To reduce the risks, occur during work they should wear PPE clothes includes:
   a. Aprons
   b. Footwear
   c. Gloves
   d. Hairnets
   e. Over Coats
   f. All
2. What are the frequently used controls of potential hazards?
   a. Minimize cross contamination
   b. Cooling times should be sufficient
   c. segregation and disposition
   d. all

**Test II: Short Answer Questions (3 pts)**

1. write potential hazard occur during processing offal.

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

## Information Sheet 4- Placing trimmed in appropriate bin or chute

Before placing the trimmed bible/omasum in bin/chute it's advisable to undertaken the following points. Equipment(bin/chute) used for processing or otherwise handling omasum must be of such material and construction to facilitate thorough cleaning and to ensure that their use will not cause the adulteration of product during processing, handling, or storage. Bin/chute must be maintained in sanitary condition so as not to adulterate omasum.

Equipment(bin/chute) over which edible products pass or come in contact (product contact surfaces) must be cleaned and sanitized every four hours and be rinsed with hot water every two hours during processing. This is usually accomplished during break periods. This takes advantage of the "lag phase" in the growth of bacteria. All equipment should be rinsed with hot water prior to resumptions of operations to remove any dust, dirt that may have collected on it during the night.

Moreover, the trimmed and cleaned bible/omasum is placed in clean and sanitized bin or chute.

| Self-check 4 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: True or False** (6 point)

1. All equipment should be rinsed with hot water prior to resumptions of operations to remove any dust, dirt.
2. Trimmed bible/omasum is placed in bin or chute before clean and sanitize it.
3. Bin/chute must be maintained in sanitary condition so as not to adulterate omasum.

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

**Information Sheet 5- Identifying types and sources of contamination and cross-contamination.**

## 4.1. Cross-contamination

Cross-contamination is the unintentional transfer of microorganisms, chemical contaminants including (allergens) or any foreign substance from food/meat and meat by products, person, or object to another food/ meat and meat by products.

The following are the primary sources and routes of microorganisms to fresh meats and meat by product.

**Knifes**- If the knife is not sterile, organisms can transfer from knife to the offal.

**Gastrointestinal tract**. By way of punctures, intestinal contents along with the usual heavy load of microorganisms may be deposited onto the surface of freshly dressed carcasses. Especially important in this regard is the paunch or rumen of ruminant animals, which typically contain ~ $10^{10}$ bacteria/g.

**Hands of handlers.** This is a source of human pathogens to freshly slaughtered meats and meat by products. Even when gloves are worn, organisms from one carcass can be passed on to other carcasses.

**Containers.** Bibles that are placed in nonsterile containers may be expected to become contaminated with the organisms in the container.

**Lymph nodes.** In the case of red meats, lymph nodes that are usually embedded in fat often contain large numbers of organisms, especially bacteria. If they are cut through or added to portions that are ground, one may expect this biota to become prominent.

## 4.2. Hygiene requirements

The premises of the processing plant must be adequately separated from other processing establishments such as meat plants. Premises for the processing of high-risk material must not be on the same site as meat plants, unless in a completely separate part of a building. Only authorized personnel should be allowed access.

The establishment should have a clean and an unclean section, which must be clearly separated. The unclean section must have a covered area to receive the animal waste and must be constructed so that it is easy to clean and disinfect. Floors must be laid to facilitate the draining of liquids. The plant must have adequate lavatories, changing rooms and washbasins for staff. In the unclean section, where required, there must be adequate facilities for de-skinning or de-hairing of animals and a storage room for hides.

The establishment should be of sufficient size and have enough hot water and steam to process hygienically the waste received. The unclean section must, if appropriate, contain equipment to reduce the size of animal waste and equipment for loading the crushed animal waste into the processing unit.

A closed processing installation is required in which to process the waste, and where heat treatment is required, this installation must be equipped with measuring equipment to check temperature and, if necessary, pressure at critical points, recording devices to record continuously the results of measurements and an adequate safety system to prevent insufficient heating.

To ensure that there is no cross-contamination of finished processed material by incoming raw material, there must be clear separation between the area of the plant where the incoming raw material is unloaded and processed and the areas set aside for further processing of the heated material and the storage of the finished processed product.

There must be adequate facilities for cleaning and disinfecting the containers in which animal by-product is received and the vehicles in which it is transported. The wheels of the vehicles carrying high-risk material must be disinfected before departure or before leaving the unclean section of the processing plant.

Containers, equipment and vehicles used for the transport of animal by-product must be cleaned, washed and disinfected after use. Personnel Working in the unclean section must not enter the clean section without changing their clothes and footwear. Equipment and utensils must not be taken from the unclean to the clean area. Waste

water originating in the unclean section must be treated to ensure no pathogens remain. There must be a systematic method to prevent the ingress of birds, rodents, insects or other vermin.

| Self-check 5 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: True or False** (6 point)

1. Containers, equipment and vehicles used for the transport of animal by-product must be cleaned, washed and disinfected after use.
2. The plant must have adequate lavatories, changing rooms and washbasins for staff.
3. In the case of red meats, lymph nodes that are usually embedded in fat often contain large numbers of organisms.

**Test II: Short Answer Questions (2 pts)**

1. Define Cross-contamination

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

| Operation sheet-1 | Trimming bible |
|---|---|

**Processing Beef Omasum Cleaned, salted, pressed to dry and frozen omasum**

**Step 1**. Omasum is cut in boat shape

**Step 2.** Inverted on the other side

**Step 3.** The circular size omasum is being cut to clean the omasum

**Step 4.** Fat from the bottom part is being removed

**Step 5.** Omasum are put into salt, each leaf in salt, kept for 1 day.

**Step 6.** The salty water coming from omasum is being stored

**Step 7.** Omasum are cleaned from salt

**Step 8.** They are washed in water from point 6.

**Step 9.** Pressed to dry

**Step 10**. Stored in cold place.

**As per customer requirement.**

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 2 hour.

**Task 1.** Process Beef Omasum.

| LG #50 | LO #4- Recover and store blood |
|---|---|

**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Recovering blood hygienically and safely
- Recovering blood safely according (OHS) requirements.
- Storing blood prior to processing

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**:

- Recover blood hygienically and according to work instructions and relevant Standard Operating Procedures (SOPs).
- Recover blood safely according to workplace and Occupational Health and Safety (OHS) requirements.
- Store blood prior to processing according to workplace requirements.

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets”.
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

## Information Sheet 1- Recovering blood hygienically

### 1.1. OHS requirements

People can come in contact with animals in in work places. This includes at abattoirs and during inspecting, slaughtering. Thankfully, there are things you can do to protect yourself from zoonotic diseases.

**a. Cleaning Equipment.**

You should:

- check all equipment regularly to make sure it works
- only use each piece of equipment for a single
- limit the movement of equipment between clean and unclean
- wash and disinfect equipment, especially if you're moving it between clean and unclean sectors
- use caustic decontamination for equipment

**b. Keep hands clean**

**c. Selecting and using PPE**

If you use personal protective equipment (PPE) to minimize a risk to health and safety. When selected and used properly, PPE forms part of a worker's risk management approach to managing infection risks from exposure to hazards. PPE when used on its own tends to be the least effective way to manage risks. It should be used to supplement higher level control measures.

**Types of PPE**

- Gloves
- Eye and face protection
- Protective clothing
- Respiratory protective equipment (RPE)
- Protective footwear

**Table 2.1. Issues to consider when selecting PPE**

| Issue | For consideration |
|---|---|
| Human health risks | • The level of contact with blood and body fluids and other sources of infection. |
| Biosecurity risks | • The potential for infection to spread between animals and off the property. |
| Infectious agent | • Pathogenicity.<br>• Virulence.<br>• Mode of transmission.<br>• Transmissibility. |
| Task | • The nature, duration and physical requirements of the task.<br>• Concurrent exposure to other hazards (e.g. hazardous chemicals). |
| Work environment | • Climate (e.g. heat, humidity, rain).<br>• Physical conditions (e.g. slippery or uneven surfaces). |
| Worker | • Individual factors (e.g. size).<br>• Medical conditions (e.g. latex allergy). |
| PPE performance | • Properties (e.g. reusable/disposable, fluid resistance, tensile strength, ease of decontamination, level of protection).<br>• Compatibility between items of PPE when worn as an ensemble.<br>• Compliance with Australian Standards.<br>• How it performs in the environmental conditions in which you work. |

## 1.1. Blood

Blood is a red fluid, which is made up of water, cells, enzymes, proteins, and other organic and inorganic substances that can be separated into two fractions, the cellular fraction and plasma. The cellular fraction corresponds to 30% to 40% of blood wet weight and is dispersed within the liquid fraction, which is known as the plasma (which comprises up to 60%).

Bleeding should be carried out by an incision made with a sharp knife in the jugular furrow at the base of the neck, the knife being directed towards the entrance of the chest to sever all the major blood vessels arising from the heart (Figure 1.2). In the interest of good hygiene two knives should be used, the first to open the skin and the second to sever the blood vessels. This procedure is often referred to as 'sticking'.

To prevent the risk of recovery, animals must be bled as soon as possible after stunning, ideally whilst still in the tonic (rigid) phase. Bleeding involves severing the carotid arteries and jugular veins, or the blood vessels from which they arise. The animal then dies from loss of blood. It is important that all major blood vessels are severed. If only one carotid artery is cut the animal may take over a minute to die.

Figure 1.1. Bleeding cattle

Before the collection day, the containers, stirring material and any other material that will be in contact with the blood must be sterilized in the oven over 24 hours before been used. Blood now must be checked for microbial contamination.

Harvesting, for human consumption, fresh blood from animals slaughtered at approved slaughterhouses can be permitted, provided a number of basic food hygiene principles are observed:

- This activity has been authorized, in advance, by the supervising agency; and
- Collection and storage are done hygienically

It is important to recognize that blood does provide an excellent medium in which bacteria can grow. After slaughter, the acidity of blood remains relatively stable (blood does not undergo the protective increase in acidity that muscle experiences). Therefore, due to the greater opportunity for bacteria to grow in blood, even relatively low levels of contamination can be a problem. Excellent hygiene, specifically prevention of contamination and temperature control, are essential for the successful harvesting, storage and handling of safe, high quality fresh blood.

Blood is collected from the cattle with a hollow knife, hose and pump to direct the blood away from the stick wound straight into a covered stainless-steel container. Between each batch, all parts in contact with the blood are sanitized. It is also possible to make a batch-wise collection of blood with full traceability to allow post-mortem inspection.

Figure 1.2 a. Hallow knife

figure 1.2 b. Collecting blood

The main source of the blood is from the bovine (buffalo and cattle). The plasma fraction contains the blood proteins and it has excellent technological properties like gelatin, emulsification, foaming agent and used in food industry as dietary supplement. For example, due to their gelatin and excellent emulsification properties fractionated plasma protein like serum albumin, fibrinogen and immunoglobulin may be added to food and feed ingredients.

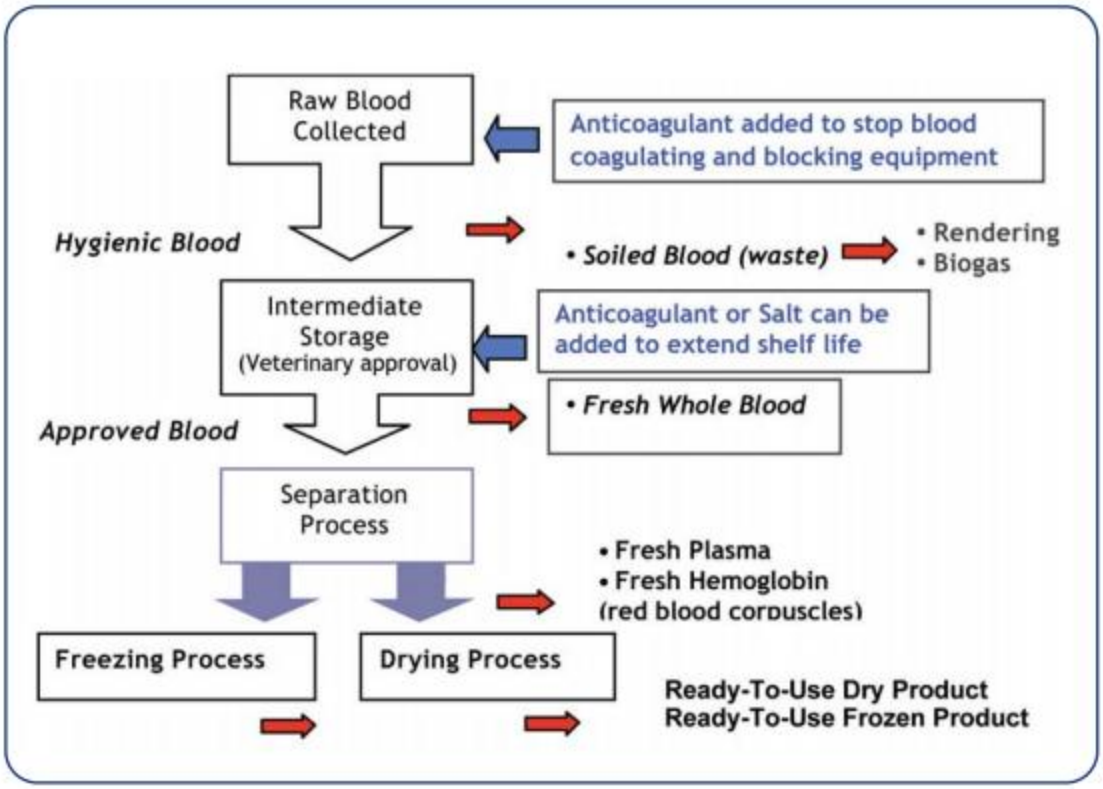


Figure 1.3. Processing of blood for human consumption

Blood is an inevitable by-product of the meat industry representing up to 4% of the live animal weight or 6% to 7% of the lean meat content of the carcass. Blood contains a number of compounds, which have potential commercial value and represents a valuable source of protein. Tons of blood are collected in abattoirs each year, that is either processed into blood meal and sold as low-value animal food and fertilizer or discarded as effluent. Animal blood produced in slaughterhouses represents a problematic by-product of the meat industry due to the high volumes generated and its very high pollutant load when discarded directly into the environment.

| Self-check 1 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (4 point)

1. ---- red fluid, which is made up of water, cells, enzymes, proteins, and other organic and inorganic substances.
   a. Blood
   b. Water
   c. Saliva
   d. None
2. Bleeding should be carried out by an incision made with a sharp knife in the --------- jugular vein at the base of the neck
   a. Jugular
   b. Aorta
   c. Pulmonary
   d. None

**Test II: Short Answer Questions (4 pts)**

2. Blood is collected from the cattle with a ----------knife.
3. Blood is an inevitable by-product of the meat industry representing up to ----------% of the live animal weight or %-------- to---------- % of the lean meat content of the carcass.

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

## Information Sheet 2- Recovering blood safely according to OHS requirements

### 3.1. Introduction

The use of blood and its derivatives in various industries has been explored to some extent. However, issues surrounding the **biological safety of blood** collected from slaughtered animals (for example, the transmission of spongiform encephalopathies) have been raised. Religious constraints as well as negative consumer perception of blood for direct consumption have also contributed to its limited use in food applications. This has resulted in a search for alternative ways to use slaughterhouse blood, including the extraction of bioactive peptides.

In a typical blood meal plant separation of the plasma and cell fractions is accomplished in the high-speed centrifuge or separator. After separation, the plasma is frozen or spray-dried at low temperature in order to maintain its solubility and binding properties. The red cells can be used for black sausages or blood puddings or dried into blood meal. It is important to prevent hemolysis or rupture of the red cell membranes during processing. Hemolysis will occur if the red cells come into contact with solutions of lower osmotic pressure, causing the absorption of water and bursting of the corpuscles, and the presence of fat, which will dissolve cell membranes, bringing about hemolysis. The same problem can be caused by sudden variations of temperature, freezing and damage through rough handling.

**The first biosafety step** in the production process of SDP (sprayed dried plasma) starts with the collection of the raw material. Blood from healthy animals, passed as fit for slaughter for human consumption, is collected at abattoirs under inspection by competent authorities. Blood is collected in a stainless-steel pan with anticoagulants added to prevent blood clotting. Sodium citrate or sodium tripolyphosphate are anticoagulants typically used for SDP (sprayed dried plasma) production. The collection and mixture of the blood from multiple animals contain inherent neutralizing antibodies against numerous habitual pathogens. These inherent neutralizing antibodies may

reduce infectivity potential even before further processing steps are done and contribute to the biosafety of the final product.

To produce SDP, blood is only collected while the carcass is entire, thus minimizing exposure to other tissues. In addition, the blood collection system is separate from the rest of the carcass processing chain. The entire manufacturing process from the time that the blood is collected to the final packaged product is done using a closed system and avoids the possibility of cross contamination with other tissues or from the external environment.

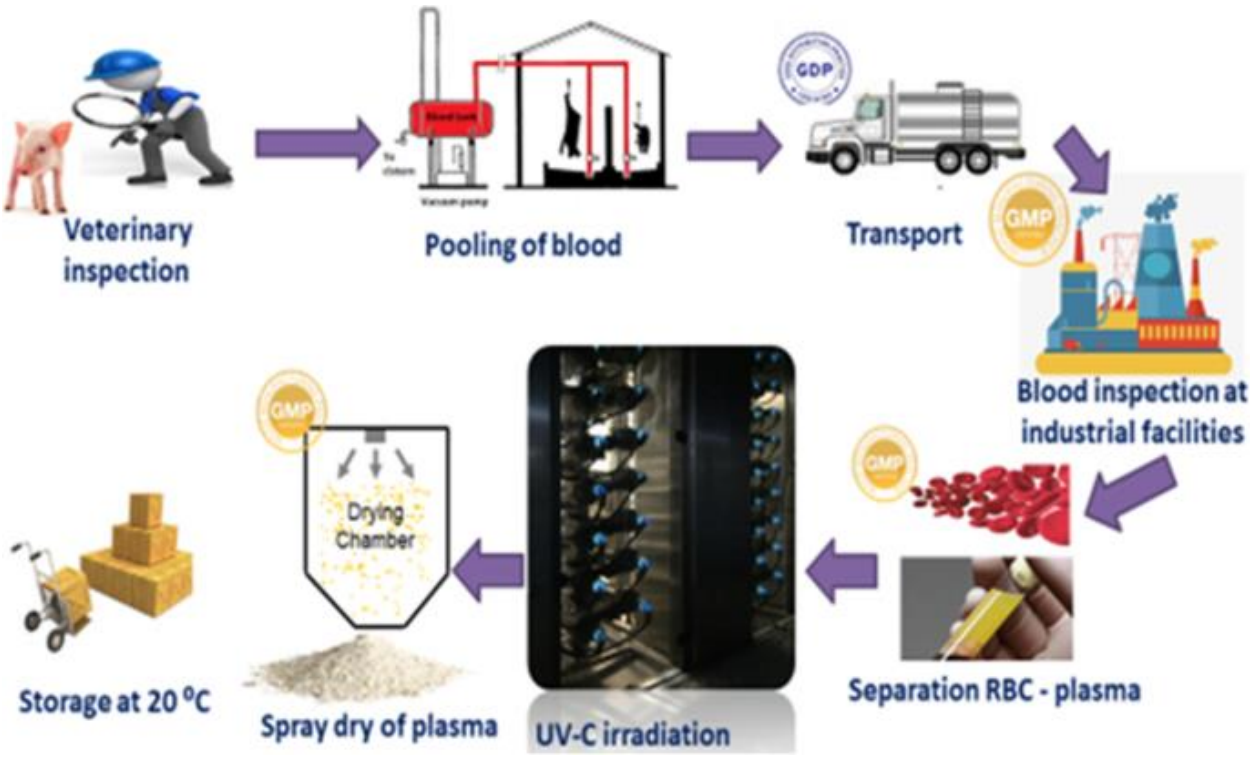


Figure 2.1. Manufacturing process of spray-dried plasma and its biosafety steps

| Self-check 3 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (2 point)

1. What are the anticoagulants added to the blood?
   a. Sodium citrate
   b. sodium tripolyphosphate
   c. A and B
   d. None

2. If you use personal protective equipment (PPE) to minimize a risk to health and safety.
   a. True
   b. False

**Test II: Short Answer Questions (4 pts)**

1. What are the OHS requirements?
   a……
   b……
   c…….

2. Write Manufacturing process of spray-dried plasma and its biosafety steps .

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

## Information Sheet 3- Storing blood prior to processing

With the right collection procedures, this blood component can be used as raw material for products for human consumption as well as for technical products. Rigorous control of the temperature of the raw blood and plasma is necessary in order to ensure an end product that meets the exceptionally stringent requirements associated with food-quality ingredients. Many companies provide specialized equipment and systems for separating blood into high-grade plasma and hemoglobin, as well as specialized equipment for turning blood into feed protein products. Edible proteins must be processed with the utmost care if they are to be sold as a high-value item. Such processing must be configured to ensure gentle treatment that minimizes any shear effects that might rupture the red blood cells and contaminate plasma. Fresh blood should be stored hygienically at a temperature of 3 °C or less.

Table 2.1 Average yield of blood/animal

| Species | Yield |
|---|---|
| Buffalo/cattle | 10-12 kg |
| Goat/ sheep | 1-1.5 kg |
| Pigs | 2-3 kg |
| Poultry | 30-50 g |
| Calves | 1.5 kg |

The amount of blood yielded

- The yield of blood meal is about 1/5th of the initial weight of blood.
- It is an excellent source of essential amino acids, lysine being 6-8%.

**The simple principle in the manufacture of blood meal is as follows:**

**Storage and transport**

- Whole blood may be properly mixed with equal amount of rice bran, which will absorb it.
- Such a mass can be transported in gunny bags in rainy or low sun season, whereas it can be dried in summer or hot sun on a concrete plat form to nearly 10-12 % moisture.
- To whole blood, 1% quick lime is added by weight, which will give it a black rubber like consistency.
- This mass will not adhere to the transport containers, keep well for 24 hours and it will not attract flies.
- Addition of lime also increases the calcium of the end product.
- Alternatively, common salt can be added 20% of the blood by weight to increase its storage life and enable safe transport to the plant.

**Coagulation by heating**

- The blood should not be charred.
- The blood will turn black. It should be boiled for 15 to 20 minutes to destroy pathogenic organisms.
- Injecting live steam may coagulate the blood.

**Pressing**

- Blood mass is collected in Hessian bags or any other porous bags, hung and 40 to 45% of moisture from blood can be squeezed out simply by pressing.
- This reduces the time and expense of drying.

**Drying**

- Blood can be dried in the sun on concrete floors.
- Many methods of mechanical driers can be also employed.
- Up to this process it should be done quickly to avoid nutrient or quality loss.

**Drying is done in two methods**

Sun drying**-** In hot and dry climate, pressed blood mass can be dried by spreading in shallow trays.

Cabinet drying**-** In pilot plant, a cabinet drier with steam coils at the bottom and exhaust fan at the top can accommodate many trays at a time and remove the moisture efficiently.

**Cooling**- Sun dried blood can be milled immediately. But blood dried by other methods should be allowed to cool.

**Milling -** For preparing stock feed, the blood is milled. Any hammer mill can be used.
If preservation is done, 3% salt is to be added. Rapid chilling is required.
**Fumigation -** Blood meal can be disinfected with methyl bromide and ethylene oxide for long-term storage.
**Packaging-** Blood meal is packed in polyethylene bags or airtight containers. It is advised to avoid undue exposure to high temperature and moisture during storage. Lime treated blood meal has a storage life of several months.

**Table 2.1. Uses of blood in the food and pharmaceutical industry**

| **Blood ingredients** | **Uses** | |
|---|---|---|
| Whole Blood | Black pudding, Soup | |
| | Petfood | Increased water content |
| Blood Plasma | Sausages, black pudding, hotdogs, hamburgers | Replace other protein additives Increased protein content |
| | Meat stretcher | Improved sensorics values (taste, juice, texture and bite) 0.5 to 2% limit otherwise it can negatively impact color and flavor |
| | Gelling agent | Better binding of MDM (Mechanically de-boned meat) |
| | Soya substitute | Soy-free labelled products (non-allergenic) GMO free additive Spray-dried plasma |
| Hemoglobin | Petfood (feed ingredient for piglets, fish farms, chicken or minks) | |
| | Biogas | |
| | Coloring agent | |
| Pharmaceuticals | Vaccines, antibodies | Mammalian cell culture media |
| Plasma | Serum Albumin, Globulins | |

| Self-check 3 | Written test |
|---|---|

Name…… ID…… Date…….

**Directions:** Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

**Test I: Choose the best answer** (4 point)

3. The yield of blood meal is about ----- of the initial weight of blood.
   a. ¼
   b. ½
   c. 1/5
   d. 1/10

4. common salt can be added --------% of the blood by weight to increase its storage life and enable safe transport to the plant.
   a. 20
   b. 30
   c. 25
   d. 35
5. ---------is a method of disinfecting blood meal with methyl bromide, ethylene oxide for long-term storage.

   a. Fumigation
   b. Milling
   c. Drying
   d. None

**Test II: Short Answer Questions**

| Species | Fill amount of **Yield** |
|---|---|
| **Buffalo/cattle** | |
| **Goat/ sheep** | |
| **Pigs** | |
| **Poultry** | |
| **Calves** | |

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

| Operation sheet-1 | Recovering blood hygienically and safely |
|---|---|

**Note:** Stunning and killing must comply with animal welfare requirements.

**; -**

**Steps 1:** The hollow handled knife, the tube and the collection container must be cleaned and sanitized before use.

**Steps 2:** Attach one end of the connecting tube to the attachment on the hollow handled knife and attach the other end to the collecting container.

**Steps 3:** Ensure that the sticking site is clean.

**Steps 4:** Use a clean, sanitized knife to cut through the skin at the sticking site.

**Steps 5:** Insert the broad blade of the hollow handled knife into the jugular vein and push towards the heart

**Steps 6:** Blood collection should be efficient and rapid.

**Steps 7:** After a batch of blood has been collected, it should be refrigerated immediately and labelled with the date of collection, the batch number and the 'use-by' date.

**Steps 8:** If the batch contains blood from more than one animal, it must be held until all animals from which the blood has originated have passed post-mortem meat inspection.

**Steps 9:** Fresh blood should be stored hygienically at a temperature of 3 °C or less.

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 1:30 hour.

**Task 1:** Collect Blood

## Reference Materials

**Book:**


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**WEB ADDRESSES**


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