Chapter 1

1.Introduction

1.1.Materials used to construct the abattoirs should be:

- **Strong and Durable/long lasting and hard-wearing**
- **Building material or masonry and steel construction have verified to be the most acceptable**
- **Generally they must form a durable,**

Floors and Drains

- **All workroom floors must be coved and constructed with <u>hard impervious materials</u>**
- **Floor construction is a major consideration and must be <u>properly designed</u> to eliminate future problems**
- **An adequate number of <u>floor drains</u> must be provided in all areas of the establishment**

Cont'd...

- **The number and location of drains is determined by the design and volume of the operations**
- **Floors must slope/incline uniformly to drain inlets, with no low spots that could collect liquids**

Cont'd…

- **The number of drain inlets and their size should be increased in areas of high water usage to provide for constant removal of fluid wastes**
- **As a general rule, one drain inlet, 30cm x 30cm or equivalent, should be provided for each 40m2 of floor space**

❑ Walls and Ceilings must be:

- **Smooth, level, hard and consist of not influenced materials such as acceptable prefabricated panels/plate and be free from pitting or crack and gap**
- **Ceilings of rooms planed for livestock receiving, slaughtering and dressing should be at least 4.8m in height**

Cont'd...

- **Ceilings of interlocking, rust-resistant metal sheet, such as heavy weigh, galvanized steel ,stainless steel are acceptable if fastened to the metal infrastructure by acceptable means**
- **Examples of unacceptable materials include wood, plasterboard, porous/absorbent and acoustic/sound-type boards**

Cont'd…

- **To promote light reflection and sanitation, wall and ceiling surfaces should be neutral or light-colored**
- **Artificial light sources must not pass on illumination that alter the normal appearance of meat**
- **Materials that are absorbent/spongy**

❑ Stairs and lighting

- ✓ **All steps in product-handling rooms should be of impervious material with solid treads, dosed risers and curbed sides**
- ✓ **Meat products must be protected from contamination resulting from the breakage or shattering of light sources**

❑ Doorways and Doors

- ✓ **Doorways/entrance should be a minimum of 1.5m wide so that products transferred on rails, hand trucks or lifters do not come in contact with them**
- ✓ **Doors and doorjambs should be made of rust-resistant material and be self-closing**
- ✓ **All doors leading outside must be self-closing**

- **All areas of the plant must be properly lighted**
- **Adequate means must exist to provide sufficient exchange of air in all parts of the licensed establishment to keep air fresh, free of odors, steam and vapor**

Cont'd…

- **Fresh air intakes should not be located in an area lying face down to contamination sources such as odors, dust and smoke**
- **Air intakes must be equipped with effective filters, which prevent the entry of insects or dust**

Cont'd…

- **All equipment that produces heat, steam, vapor, smoke or odor must be properly vented**
- **Windows in operational rooms of meat plants must be put in such a manner that no contamination of meat products can occur**

❑ Water Supply

- **Hot and cold potable water, under adequate pressure, and in sufficient quantities, must be provided throughout the plant**
- **The operator is responsible for the water supply and must ensure the water is bacteriologically and chemically safe**

Hand Washing Facilities, Sanitizers and Hose Connections

- **Hot and cold water hand washing facilities must be easily accessible to all processing and slaughtering areas**
- **To facilitate room and equipment clean-up, an adequate number of hose connections must be provided throughout a licensed establishment**

Cont'd...

- To facilitate room and equipment clean-up, an adequate number of hose connections must be provided throughout a licensed establishment
- Hot water, of at least 82°C must be available at the point of discharge to sanitize equipment during slaughter processing operations

Cont'd...

- **For general clean-up operations, water be kept at a lower temperature, provided satisfactory cleaning and sanitizing agents are used**
- **These facilities must be serviced with dispensable soap and paper towels or polish**
- **The use of long hoses should be avoided**

❑ Refrigeration

- **Carcasses must be properly chilled and placed in adequately refrigerated and conveniently located rooms**
- **Unchilled carcasses must not be placed with those that have already been chilled**
- **To properly chill/freeze carcasses,**

❑ Waste Disposal

- **Sewage disposal systems, either municipal or private systems must be <u>provided</u>**
- **Separated room required in smaller operations to storage condemned and inedible products**

▪ Hide Storage and Catch Basin

- ✓ **Where hides are collected, a hide storage room must be maintained in <u>good sanitary condition</u>**
- ✓ **Hide pick-up arrangements are made for <u>removal</u> at the close of each day's kill**

Cont'd...

- ✓ **Catch basins/hand basin, grease/lubricant traps, interceptors and other means of separating organic matter from plant effluent/sewage should be located in the inedible section of the plant or outside**

❑ Rodent and Insect Control

- **Construction must be such that flies, insects, and rodents are prevented from entering the plant**
- **Examples of preventative measure can include items such as self closing, sealed doors, effective screens on all windows and other openings, and fly chaser**

❑ Sections Rooms and Pens

- **Livestock pens/corral, chutes/ waterfall and squeezes/holds must be provided at all slaughtering operations**
- **All floors, alleyways, and chutes/tube should be paved, properly drained**
- **As well, space must be provided to observe the animals in motion for the ante-mortem**

Cont'd...

- **Pens must have adequate lighting and ventilation and be constructed to permit daily washing**
- **Bleeding areas should be restricted and adequately placed to properly sized blood and wash-up drains in order to prevent blockage**

❑ Sanitation

- **The production of meat and meat products under hygienic conditions is risky, in ensuring a safe and wholesome product**
- **The contents of the sanitation program will vary between meat plants depending on plant functions and products produced but should include the following:**

Cont'd…

- ✓ **Cleaning and disinfecting all pieces of equipment is important**
- ✓ **General housekeeping practices: garbage or waste collection and waste disposal during and after operations is important**

Cont'd...

- ✓ **Steps to be taken during the pre-operational and the operational inspection, to ensure the product in a sanitary manner**
- ✓ **The proper storage and use of all ingredients with regard to freedom of any type of extraneous or inappropriate contamination is important**

Inspection Procedures and Standards

- **Daily pre-operational inspections of all rooms and areas in which animals and meat products are processed**
- **Ante-mortem inspections of animals**
- **Post-mortem inspections of animals**
- **Re-inspection of carcasses or meat products daily and frequent inspections of all aspects of the process during operations from killing to final dressing**

Chapter 2

Animal transport and handling before slaughter

- **Pre-slaughter handling involves all the activities and processes animals undergo prior to sticking**
- **Activities takes place on the farm, during transportation, marketing and at the slaughter plant**

Cont’d…

- **Animals could also suffer from pre-slaughter stresses arising from:**
- ✓ **Bruises/shiner,injuries,starvation/ malnourishment,tiredness,water and food deprivation,and loading and unloading onto vehicles**

Cont'd…

- **If animals are subjected to poor handling conditions before slaughtering:**
- ✓ **Their condition may change appreciably within few days prior to slaughter**
- ✓ **Reduce their weight,affect the meat quality and subsequently reduce profit**

Things to consider in handling animals

- **The animal type (species, breed, sex, or age) of being handling is essential in determining the extent to which the meat quality will be compromiseed**
- **Non ruminants(poultry and pigs) are more susceptible to stress compared to ruminants(sheep,cattle and goat)**
- **Females and young animals are also more susceptible to stress compared to males and older animals**

Cont'd…

- **Feeding system: significantly contributes to meat quality**
- **If higher feed consumption, then greater muscle and increase in live weight at slaughter**
- **Nutrition/grazing plays a major role in flavor intensity of meat and can intensify flavor, whereas withdrawal from grazing before slaughter can reduce flavor**

Cont'd…

- **Transportation:**
  - **Over speeding, sudden stops, rapid acceleration and long journey times without appropriate rest should be avoided as these will increase the meat quality defects**
- **Marketing**
  - **They can also be starved/hungry or dehydrated if feed and water is redrawn longer than recommended during marketing**
  - **Various degrees of bruising can occur on their skin at the market depending on the way they are handled**

Cont'd…

- **Feeding and watering: Animals shall not be left more than 24 hours without being fed and watered**
- **Feed and water during transportation or marketing is essential to prevent them from starvation and dehydration that can lead to depletion of muscle and reduction in weight**

Cont'd...

- **Lairaging :**

- **The lairage is also to provide animals with some amount of recovery from stress during transport**

- **Although lairageing is to enable animals to rest and to recover from transportation stress, it can be a major source of meat quality problems**

Cont’d…

- **Animals may suffer from different degree of bruising and injury as a result of fighting or overcrowding**
- **Exposure of animals to microbial contaminations will adversely have effect on the carcass and meat quality**

2.2. Effect of pre-slaughter handling on meat and carcass quality

- **Improper handling during farming, loading, transporting, marketing, unloading, lairaging and stunning have several effects on carcass and meat quality**
- **Notably among these are; mortality, reduction in the live weight and carcass yield, bloodsplash or watery, broken bones, skin blemishes/mark, contamination by pathogens**

Chapter 3

3.1. Methods of slaughter, Facilities required for slaughtering

- **Animal slaughter is the killing of non human animals for food in general, but being diseased and unsuitable for consumption**
- **Methods to ensure a rapid death with minimal pain are stunning and in the second stage animal is killed**

Cont'd…

- **Stunning:**

- **Stunning stand for rendering or exposing animals unconscious just before slaughtering**

- **Electrical stunning known as electronarcosis is applied either across the brain or the heart to render the animal unconscious before being killed**

Cont’d…

- **This method is used for swine, sheep, calves, cattle, and goats**
- **Mechanical method(Captive bolt pistol) instrument like a sharp knife that applied to the head of the animal to quickly render them unconscious before being killed**
- **This method can be used for sheep, swine, goats, calves, cattle, horses, mules, and other equines**

Cont'd

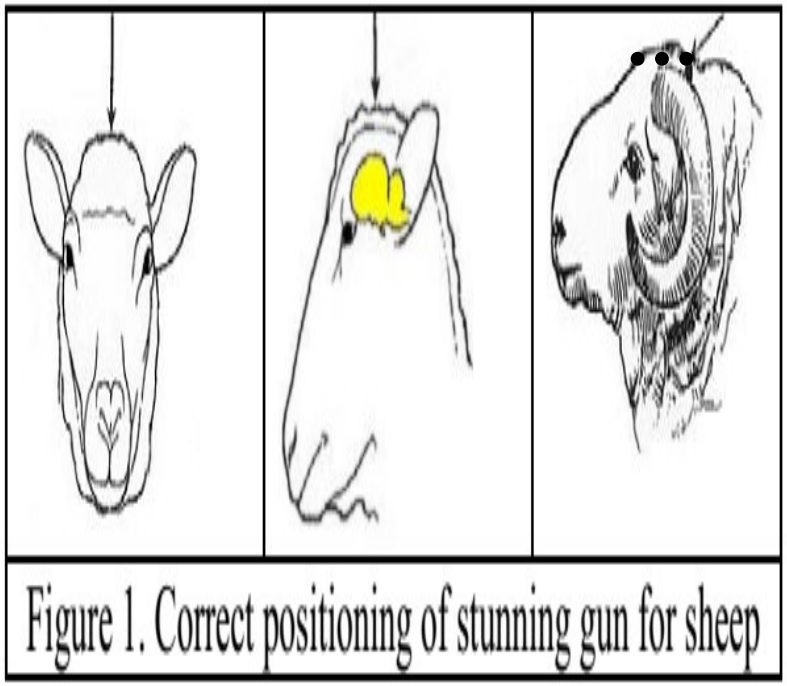


Figure 1.Mechanical stunning



Figure 2.Tongs or forceps for electrical stunning

Cont'd…

- **Killing: The animal either has its throat cut or has a chest stick inserted cutting**
- **In these methods, main veins and arteries are cut and allowed to bleed**
- **In slaughterhouses animals are received and kept around in stockyards and pens for 1 day**
- **The animals are then driven from the holding pens to the slaughtering area where the following activities take place:**

Cont’d…

- ✓ **Stunning**
- ✓ **Suspension from an overhead rail by the hind legs**
- ✓ **Sticking and bleeding over a collecting trough or gutter**
- ✓ **The collected blood may be sewered**
- ✓ **Hide removal (cattle) or scalding and rehiring**

Chapter 4

4.MEAT INSPECTIONS

- **The objectives of meat inspection programme are:**
  - **To make sure physiologically normal and that abnormal animals are separated and dealt with accordingly**
  - **To ensure that meat from animals is free from disease, wholesome and of no risk to human health**

Cont'd...

4.1 Antemortem Inspection

- **Some of the major objectives of antemortem inspection are:**

✓ **To screen all animals destined or chosen to slaughter**

✓ **To ensure animals clinical information,which will help in the disease diagnosis and judgment**

✓ **To reduce contamination on the killing floor by separating the dirty animals**

Cont'd…

- ✓ **To ensure that injured animals or those with pain and suffering receive emergency slaughter and that animals are treated humanely**
- ✓ **To identify sick animals and those treated with antibiotics, insecticides and pesticides**
- ✓ **To ensure the cleaning and disinfection of trucks used to transport livestock**

Cont'd…

- **The general animals behaviour, nutritional status, cleanliness, signs of diseases and abnormalities should be observed**
- **Abnormalities in respiration, behaviour, gait, conformation and color, which are checked on ante-mortem examination**

Cont'd…

- **Abnormalities in respiration commonly refer to frequency of respiration, different from normal**
- ***Abnormalities in behaviour* are:**
  - ✓ **walking in circles or show an abnormal gait**
  - ✓ **pushing its head against a wall**
  - ✓ **acting aggressively and showing a dull and anxious expression in the eyes**

Cont'd…

- **Abnormalities in structure or conformation are manifested by:**
  - ✓ **Swellings (abscesses) seen and enlarged joints**
  - ✓ **Umbilical swelling (hernia or omphalophlebitis)**
  - ✓ **Enlarged sensitive udder indicative of mastitis**
  - ✓ **Enlarged jaw ("lumpy jaw") and bloated abdomen**

4.2 Postmortem inspection

- **Carried out as soon as possible after the completion of dressing, the objective is**
- ✓ **To detect any abnormalities, so that products only conditionally fit for human consumption, are not passed as food**
- **Postmortem inspection should provide necessary information for**

4.3 Carcass judgement

- **Any portion of a carcass or a carcass that is abnormal or diseased shuld be judged**
- **Any portion of a carcass or a carcass that may be repulsive or disgusting to the consumer**
- **The circulatory system or lymph nodes of the carcass should be examined if pathological lesions are generalized**

Cont'd…

- **Some of the signs of a generalized disease are:**

- ✓ **Inflammation or swelling of lymph nodes of the carcass**
- ✓ **Inflammation of joints and lesions in different organs including liver, spleen kidneys and heart**
- ✓ **Presence of multiple abscesses or swelling in different portions of the carcass including the spine of ruminants**

Cont’d…

- **Viewing incision or cut and determing the significance of primary and systemic pathological lesions or wound and their relevance to major organs and systems, particularly the liver, kidneys, heart, spleen and lymphatic system**

4.4.SUPERVISION OF HYGIENIC DRESSING OF CARCASSES

1, During dressing the carcass is exposed to contamination from:

- ✓ **Abattoir environment including implements or equipment used, and the hands of the operators is exposed to contamination because variety of bacteria, fungi and yeasts are in the abattoir environment**

Cont'd…

- ✓ **Hides of the animals are heavily contaminated parts by bacteria**
- ✓ **Stomach and gastrointestinal contents have the heaviest load of microorganisms**

2, Therefore, during <u>meat inspection</u> it is an important <u>duty of the inspecting officer to ensure that</u>:

Cont’d…

- ✓ **During slaughtering, dressing and meat inspection are well sanitized**
- ✓ **During cutting into the hide and exposure of the carcass, the external surface of the hide does not contact the carcass meat**

Cont’d…

- ✓ **The <u>viscera or intestines</u> are not accidentally <u>opened</u> during the dressing**

3, If a carcass or part is <u>contaminated</u> with faeces or visceral contents such areas should be <u>trimmed off</u>

Chapter Five

5.Classificataion and sources of Hides and skins

5.1.Sources of Hides and skins

1.Major sources of hides and skins

- From domesticated animals:cattle hides and sheep and goat skins

2.Minor sources of hides and skins

- From domesticated animals: Horse, donkey, camel and domesticated pig

3.Other sources of hides and skins from non domesticated animals

- From reptiles (crocodiles,lizards, and snakes and fish,deer,rabbit,birds,elephant are also used
- These hides and skins are the end products of animal production,they are an important and valuable resources

5.2. General characteristics of hides and skins

Physical characteristics

- **Most hides and skins consist of three parts:**

(i) Epidermis

(ii) Dermis/Corium or true skin and

(iii) Hypodermis or adipose tissue

- ✓ The epidermis is a relatively thin layer(approximately 1% of the hide/skin thickness) which forms the upper boundary of the skin and serves to protect the dermis/corium which is the most important part of the skins.

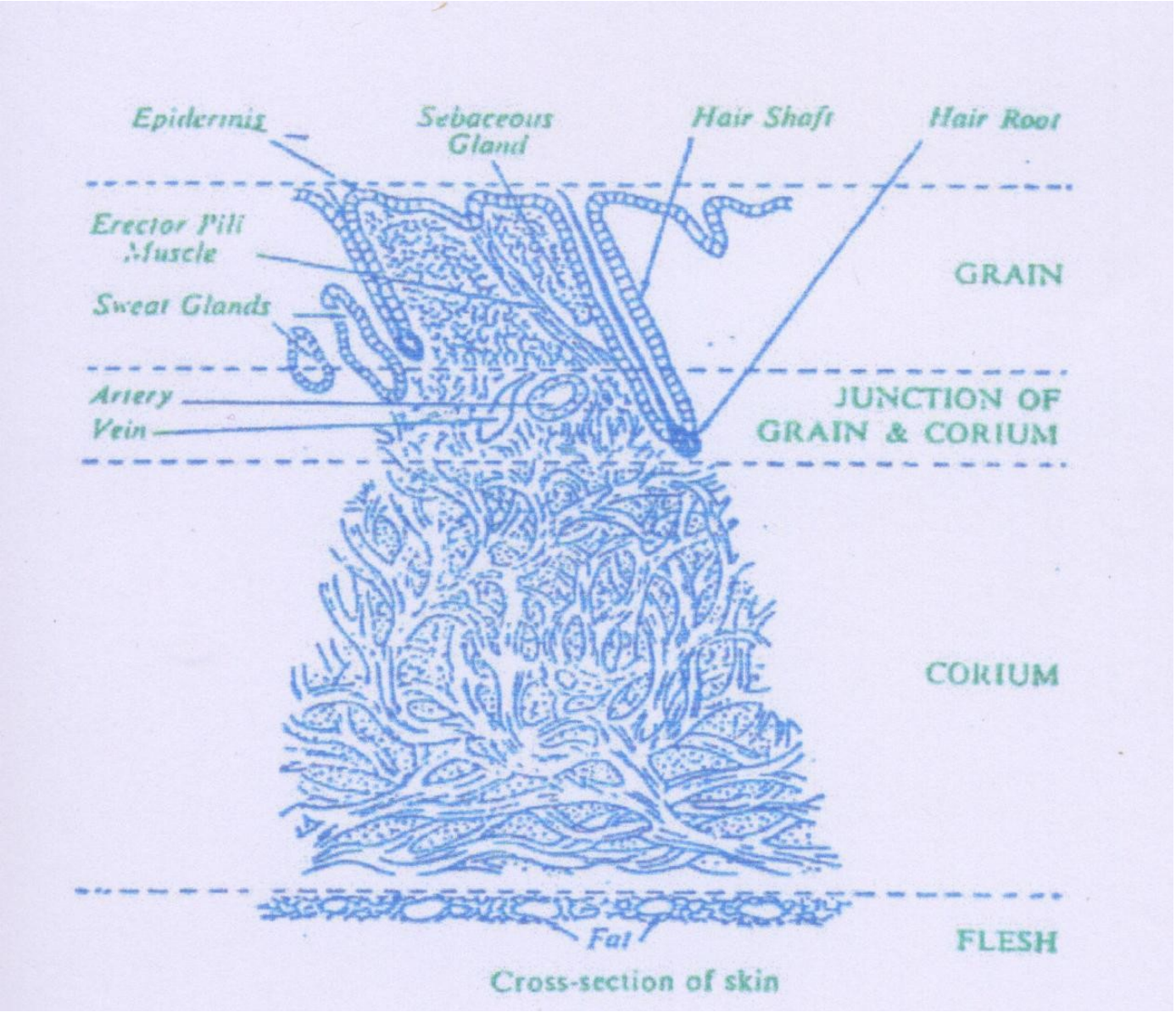
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- The Dermis/corium is a much thicker about 85% of hide thickness layer of connective and other tissues which constitute the true leather forming substance of the hides and skins
- The corium is divided into two distinct layers:Corium minor and major

Corium minor is 20% to 50% of the derma thickness,while as corium major is 50% to 80% of the derma thickness

Cont’d…

- To convert the raw hides and skins to leather, the epidermis layer is first removed and the remaining section, called derma is tanned
- Before tanning, appreciable amount of hypodermic layer also removed during fleshing of pre-tanning operation,leather is therefore made from derma only



Cross-section of skin

Chemical composition of hides & skins

- The chemical constituents of raw hides and skins can be divided into four main groups:

1. Water:60% -70%
2. Proteins: 19.2% - 32.7%
3. Fats: 1.5% - 12.25%
4. Mineral matters : 0.36% - 0.5%

5.3.Defects in Hides and Skins

Effect of different factors

- The production of good quality leather depends on the quality of the raw material
- In Ethiopia,the economic loss due to hides and skins defect is very high
- These defects are come across from the time the animal is born until the leather processing is completed
- It is practically impossible to find out perfect animal hide or skin

Cont’d…

- Defects come from carelessness in breeding, feeding, living condition, diseases, parasites, handling, slaughtering, preservation, storing and transportation

Pre-slaughter defects

- Most hides and skins are affected by the pre-slaughter defects accumulated during the life of the animal

Cont'd...

- **The commonly observed pre-slaughter defects**

1. Natural (poor nutrition, age and sex, breed and climatic effects)
2. Mechanical damage (brand marks, scratches, horn rakes, yoke marks etc)
3. Defects due to Diseases that can be viral like small-pox, rinder-pest, fungal like ring worm or parasitic like tick-damage

Cont'd…

- Poor nutrition causes an animal to be smaller, the skin thinner and of poorer substance,lack elasticity and feel dead
- Age and sex:the skins of the young animals have fine and compact structures and tight grain patterns, while the skins of older animals have harder and coarser grain surface

➢ The animal gets older,the skin also accumulates scars from brands,disease parasites,scratches, etc.

Cont'd...

- **Breed and climatic effects:**

- Bovine hides from North America and Europe normally yields flat hides of over 40sq.ft
- Zebu cross-breed from Africa often provides a hide below 25sqft
- Animals raised in warm climate have a short hair and the leather produced has superior substance, smoother and finer grain patterns
- Animals raised in cooler climate or higher altitudes grow longer wool or hair, and the leather made are of poorer substance and coarser grain patterns

Cont'd...

- These effects of climate, especially on substance is more pronounced on sheep and goat skins than on cattle hides
- **Mechanical damage:** These defects that lower the quality of hide and skin

➢ These include brands (used to differentiate or identify the animal on the range or sometimes in belief of curing the animals from diseases)

➢ Grain scratches and tears (which is the most common and economically battering damages of hides and skins made on living animals by sharp objects like barbed wire, nails goals and patch forks, thorns, cactus plants, horns etc)

Cont'd…



A) horn rakes



A) horn rakes



B ,brand mark

Figure.4 Skin problems on live cattle: A) horn rakes and B **,**brand mark

- **Defects due to diseases**

1.Viral disease

a. Lumpy skin disease:

- Is highly infectious skin disease of cattle caused by a herpes virus and is characterized by the sudden appearance of nodules on all parts of the skin
- During the carry out of the disease, the affected portion of the skin bec dry, and separates from the surroundi



Figure 5.Nodular swellings

Cont'd…

b.Smallpox:

- At first small red spots appears on the more tender parts of the skin such as the inner thigh, the abdomen and the sides, also develop in to blisters/wound and turn in to sores
- The animal is urged to scratches or rubs the sores on rough objects and secondary infection may develop
- Mostly sheep and goats suffer from the smallpox
- Grain surface of skins damaged by the smallpox hollow like tiny dots

c.Rinder-pest:- hides of rinder-pest affected animals are thin and poor in quality.

2. Fungal

a.Ring Worm:

- Is a fungus infection attacking the hair and its roots
- It appears on the hair side in the form of circular patches varying from 0.5 to 4cm in diameter
- The patches are usually covered with scabby matters and are partly or completely bald
- The scars are clearly visible to the tanner being shiny and circular in appearance.

Cont'd…

3. Parasitic

a.Tick-Damage

- They usually adhere to the inner part of the hide such as the dewlap and inner parts of the legs
- The defect has the shape of tiny holes or unhealed scars
- These holes can be seen on the grain surface of the finished leather resembling tiny spots and hollows
- Badly tick infested animals have poor health and provide hide with lack of substance

Cont'd…

b.Sheep Ked (melophagus Ovinus):

- Is a flat brown insect and is blood sucker which measure about 6mm in length and occurs on sheep in most part of the world
- It caused irritation with resulting scratching/graze and biting or cutting
- Heavy infestation causes skin blemishes/imperfection which reduce the marketable value of the skin

Cont'd...

c.Louse Infestation:

- These arises from attack by a wide range of louse or serious species on cattle, horse, sheep, goats and pigs
- These pests include biting example lignognathus,solenoptes, haematopinus spp.and sucking types example damalinia (bovicola)
- Irritation caused by the pests leads to scratching, rubbing and licking by the infested host.

Cont'd...

d.Manges:

- Are parasitic caused diseases of the animal skin which produce serious damage to the hides and skins, these mites multiply inside the dermis or the grain layer
- These damages caused by several varieties of scabies (follicular or demodectic, sarcoptic, psoroptic,etc)
- The affected hides and skins present defects like coarse/rough grain lesions and scratch scars and become totally unsuitable for the production of good quality leather

Cont’d…

- Invade and infest the hair follicles of the domestic animals but cattle and goats most severely attacked
- Goat skins by sarcoptic mange caused by mites (sarcopitic scabies) some are damaged during slaughter while relatively few are spoiled during preservation
- In some areas, cattle are seriously affected resulting considerable financial loss occurs through rejection of hide

Cont'd...

- **In general factors affecting** the quality of hides and skins can generally be categorized into two:

1. Ante mortem and
2. Postmortem defects/factors

1.Ante mortem factors (defects)

- Poor substances
- Sore mark, brand mark, goad mark, rub and yoke marks
- Barbed wire and thorn scratches
- Scabies / mange, ring worms, etc
- Rinderpest,Trypanosomiasis
- Pox,Scars,Injection puncture/deflate, shearing cuts
- Dung damage, Ticks, fleas, lice ,Warble- fly and Birds ('Chirri')

Cont’d…

2. Postmortem defects

- Flaying defects
- Hair slip and bacterial attack due to delayed and faulty curing
- Blisters in dried stock
- Grain crack in folds
- Contamination due to insect infestation
- Vulture marks
- Defective storage and transport
- Fouling with dung and blood
- Inadequate bleeding
- Inefficient fleshing and trimming
- Mechanical damage (flesh left over)
- Damage during preservation, welting, storing, packing and transportation

Chapter Six

❑ Methods of Processing and Meat Preservation

❖ Processed meat product

- The properties of fresh meat have been modified by the use of one or more procedures,such as grinding, adding of seasoning/flavor and heat treatment
- Processing method result in products which have long shelf life, for example salted and smoke meat is processed for flavor and it is also preserved by the presence of smoke and heat treatment

❖ Reasons for Processed Meat:

- To provide a product with desired or preferred texture, flavor and aroma
- To transforms raw meat to products with longer shelf life.Example is salted and smoked meat
- It allows incorporation/amalgamation of non-meat component into processed meat product thereby increasing the volume and improving other attractive qualities as color and flavor
- It allows the utilization of fat, other meat offals and water for the production of higher quality products
- Raw meat is processed into cooked and ready-to-eat product such as "kilishi" or seasoned and dried beef

❖ Principals Involved in Meat Processing

- There are interaction of protein, salt, water, smoke, heat and other chemicals in processing
- Salt solution of 2 to 10% insures extraction of protein,inhibits bacterial growth and has a desirable flavor at lower concentration
- About 0.5% polyphosphate in the final product ensures retention of water
- Meat protein extracted from gel or coagulate on heating and this gel encapsulates or sum up fat and other non-meat additives or fillers to form a uniform product

❖ Processed meat

- Is either cooked or uncooked and they could be grind or ungrind, whole-meat products

1.Uncooked grind products:

- These are fresh sausages
- Sausages is a food that is prepared from seasoned meat
- Contains grind meat, salt, sulphite as preservative, cereal as binder and some fat

2.Cooked grind Product:

- These are cooked sausage in which meat is grind in presence of salt, fat and other ingredients
- Usually the product is smoked to develop a desired flavor and color

Cont'd…

3.Uncooked whole Product:

- This is salted meat product in which nitrite is also in solution
- The meat is immersed in salt solution and the product takes several days to cure
- It is treated with mild/week smoke and sold in slab or in slices

4.Cooked whole Product:

- This product is usually cure, smoked and cooked
- Ham/animal protein and canned meat are examples of cooked whole product
- Fully smoked meats produced in the tropics fall into this category
- Most dry meats sold are not cured prior to smoking
- These products develop off-flavour in their interior where some microbial damage had occurred

❖ Seasonings used in processing meat:

- Seasoning is a term applied to any ingredient, which by itself or in combination adds flavor to processed meat product
- Seasoning allows for creation of a new product and provides variety in existing product
- Some seasoning such as clove, ginger, black pepper possess antioxidant properties while others like red pepper and ginger have bacteriostatic properties
- The common spices found in Africa are red pepper, ginger, garlic, clove, onion, black pepper and mugeno
- Salt and black pepper form the basis for sausage seasoning formula, all other ingredients are supplementary

❖ Extenders, Binders, and Fillers:

- These are non-meat products incorporated into sausage or grind meat
- They are included in sausage formulation for one or more of the following reasons:

✓ To improve emulsion stability

✓ To improve cooking yield

✓ To enhance flavor

✓ To improve slicing characteristics

✓ To reduce formulation cost

✓ To reduce shrinkage during cooking

Cont'd...

- Filler are starchy products, such as cereals, which are capable of binding several times their own weight in water
- Binder is different from filler in that it can emulsify fat in addition to binding water
- Binding function to retain water, cause fat emulsification, and cause meat chunks to adhere to one another
- Extender is non-specific term that refers to any non-meat product with the exception of water

❖ Smoking and heat processing in the tropics:

- Dried meats are important parts of diet in the tropics
- In some counties, fresh meat is for immediate consumption
- Processes meat products have been subjected to procedures such as heavy smoking, drying and in some cases with some salt to confer consideration shelf stability
- Ingredients used in sausage production could be employed in extending shelf-life of smoke meat

❖ Methods of meat Preservation

- There are several ways to preserve meat. Some of the most popular methods are as follows
- ✓ Storage and preservation are best accomplished by cold
- ✓ Also **smoking, curing(salting and**, drying),**salting** and **pickleing or preserving, canning and using sugar solutions, and** antibiotic treatment

Cont'd...

- Other methods of meat preservation that are used are:

1.Freezing

2.Cooking

3.Chemical treatment

4.Fermentation

5.Irradiation

1.Freezing

- Optimum temperature for freezing is zero degree Celsius or less
- When frozen the enzyme activity of the micro-organism is inactivated which result in inhibition of the meat spoilage
- Do not thaw/soften at room temperature; it will lead to spoilage of meat

Cont'd...

2.Cooking

- There are two types of cooking methods used to preserve meat, these are pasteurized cooking and sterilized cooking
- Pasteurized cooking:
  - ✓ Meat is cooked at 65.5 – 70.6°C, this kills most (not all) of the micro-organisms present in the meat
- Sterilised cooking:
  - ✓ Meat is cooked at 121°C under pressure, this kills all the micro-organisms present in the meat

3. Chemical treatment

- Chemical inhibit microbial growth in meat, Some of the chemicals used for such purpose are common salt, Sodium Nitrite and Sodium Lactate
- Other advantages of adding chemicals are – develops flavour, increase shelf life of product and impart pink cured meat colour

4. Fermentation

- In fermentation the sugar present in the meat is converted into acid, microbe involved are the lactic acid bacteria, that produces lactic acid, which reduces the pH in the meat and the microbial growth get inhibited preventing the meat

Chapter Seven

Factors affecting meat quality, Meat grading

Age of animals

- It is a well-established fact that the older an animal the tougher the meat, for this reason main stream livestock industries have established grades and/or names to account for the age of the animal
- They have also established means for determining the age of the animal, depending on the specie it may be by teeth development, degree of bone ossification or similar

Cont'd...

- **Farm Management**

- It is well known that range grazed cattle or sheep produce a different quality meat than their feedlot raised counterparts
- However, the main reason for the differences in meat quality, uniformity of carcass and taste is nutrition based as the diets fed vary significantly between the systems
- Most range grazed cattle or sheep these days will be fed vitamin and mineral supplement feeds which vary from a few vitamins and/or minerals to protein, energy and vitamin and mineral supplements that are balanced to match the estimated intake of the grazed material

Cont'd...

- The more intensive/concentrated the system, the greater the control of a balanced feed intake, therefore the greater degree of high meat quality predictability.
- The variations in carcases and meat quality are taken care of by the carcass and meat grading systems and yield grading systems in place for the relevant specie??

Cont’d…

❖Stress:

- It will affect meat quality by affecting meat characteristics
- Also trauma/shock or any accidents (farm design, fences, spaces, adverse/unfavorable bird handling and other stress related factors) may cause Oedema or "jelly" substance on heart, thigh or sternum which will affect carcass grad

Cont'd…

❖ **Vaccination program, antibiotics and hygiene:**

- Any evidence of disease symptoms in a carcass will affect its grade
- Observing proper withholding times after vaccination and antibiotic injections is important to avoid residue in meat after slaughtering
- Biosecurity and other techniques of preventive veterinary procedures are important to avoid diseases and parasites affecting meat quality

Cont'd...

- **Nutrition**

- The influence of Nutrition on meat quality is well documented and never disputed with all specie
- Advanced nutritionists will tell you that the basics of livestock nutrition are the same for all species
- Tenderness / softness, Aroma / smell, Colour and Uniformity are all affected by nutritional factors
- This improved technology is also known to decrease drip loss and to extend shelf life through control of color on oxidation/deterioration/decay, resulting in improved overall customer acceptance, to give significant commercial benefits

Cont'd

- Slow growing muscles will be less tender than an animal that grows muscles more quickly
- In all other production livestock specie an animal carrying white fat is recognized as being healthier and that it produces a better tasting meat
- Fat production and quality is totally controlled by diet
- Imbalanced rations affects the formation and degradation of minerals and vitamins in liver and kidney causing yellow fat, possible tainting of the meat and will also result in less acceptable quality offal

Cont'd...

- Other factors that "taint" or infect the meat are the use of certain ingredients in rations
- Example the use of fish meal in rations for slaughter animals can leave a "fishy" taste and
- it is well known that some animals like ostrich are sensitive to iron, so use of ingredients with high iron content can taint the meat to give a livery/uniform taste

- **Handling prior/post to Slaughter**:

- Minimising stress at all stages of production is continually emphasised and extremely important as it is associated with DFD (Dry Firm Dark) meat and long term stressed animals result in high pH levels in the meat

- However care needs to be taken to ensure that the method an animal has been raised has been taken into consideration as diet also impacts on both the consistency of the meat as well as the ability of an animal to handle stress

Cont'd...

- Every effort needs to be made to ensure as stress free transport as possible
- It is important that they have water available and protection from the elements
- It has been suggested that animals should stand for a few days to recover
- Factors that influence meat quality during the slaughter process are:

✓ Method of Stunning and/or Kill

✓ Handling of animals post stunning/kill

✓ Whether animal is Killed prior to Bleeding or stunned prior to bleeding

✓ Speed and degree of Bleed Out

✓ Muscle Stimulation post stunning (now believed to have a negative impact on quality)