

ANIQUEST – LPT CHAPTER 4.5. (SLAUGHTER HOUSE BY-PRODUCTS TECHNOLOGY)

SANTHOSH V R, M.V.Sc., (ICAR-IVRI)

ANIMAL BYPRODUCTS

Animal byproducts may be defined as everything from the abattoir or slaughter house or butcher shop that are not directly sold as food for human consumption.

'**Offal**' refers to meat-slaughter by-products that includes all of the animal which is not a part of the carcass.

'**Variety meats**' are the wholesale edible by-products that are segregated, chilled and processed under sanitary conditions and which are inspected by the Meat Inspection Service.

Classification of animal byproducts:

1. According to use as food:

- a. **Edible byproducts:** Those that are used for human consumption. Eg. Liver, kidney, heart, brain, etc.,
- b. **Inedible byproducts:** Animals which die at slaughter house before slaughter or those parts which failed to pass meat inspection. Eg. Skin, ears, lips, horns etc

2. According to origin:

- a. **Principal (Primary) by-product:** Those that are directly harvested from the animals immediately after slaughter. Eg. Skin, horn and hooves, blood etc
- b. **Secondary byproduct:** Those that are derived from the principal byproducts. Eg. Blood meal, plasma, serum, leather, shoes etc

3. According to the end use:

- a. **Agricultural byproduct:** Meat meal, bone meal, fertilizer.
- b. **Industrial byproduct:** Gelatin, glue and casings.
- c. **Pharmaceutical byproducts:** Insulin, pepsin and hormones.

BLOOD

- 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%.
- During bleeding around 50% blood is collected, remaining retained in capillary system
- Improperly bled animal carcass discolors quickly and keeping quality reduces.
- For human utilization blood is collected through a hollow knife, in sterilized container.
- If clotting of blood is not needed anticoagulant is used viz., sodium citrate, citric acid, sodium or potassium oxalate etc.
- Collected blood stored between 0-2° C temp.

Table

5.1. Blood yield from different species.

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

Food	Emulsifier, stabilizer, clarifier, color additive, nutritional component
Feed	Lysine supplement, milk substitute
Fertilizer	Seed coating, soil pH stabilizer, mineral components
Laboratory	Tissue culture media, blood agar, albumin, globulin
Medicine	Immunoglobulin, blood clotting factors, fibrinogen, serotonin, plasma extender
Industry	Adhesive, finisher for leather & textile, egg albumin substitute, foam fire extinguisher, ceramic, plastic

Table 5.2. Uses of blood

UTILIZATION OF BONE

- Bone constitutes almost 15 of the weight of dressed carcass
- In bone organic and inorganic matter remain in 1: 2 ratio
- Bone collagen is main organic constituent of bone
- Major inorganic matter contains

Calcium - 33%

Phosphorus - 15%

TYPES OF BONE

Green bone:

- Freshly acquired bone from slaughter house
- Heavy and contains high moisture, fat and protein
- Composition

Moisture: 50%

Bone marrow: 15%

Organic matter: 12%

Inorganic matter: 23%

Desert bone:

- Decomposed bone
- Exposed to bacterial and other atmospheric action for long time
- Devoid of meat, fat and tendon
- Light in weight and contains dried ossein, and lesser minerals

BONE MEAL

- Contains bone pieces less than 2 mm diameter
- Good source of phosphorus supplement to livestock
- Conversion of desert bone to bone meal is economically viable

- Yield of bone meal is 1:3
- Quality depends upon the Ca: P ratio which should be 2:1.

GELATIN AND GLUE

(Chemically no difference, lower grade gelatin called glue)

- It is derived from albuminoid class of protein
- Pure form is amorphous and transparent
- It can absorb water 5-10 times
- Brittle when dry, softens when heated then decomposes
- Hide skin trimming, ear pieces, tendon use for glue preparation, called glue stock

Use

- Gelatin used in ice cream, jellies, chocolate as foaming agent, capsule coating, binders in tablets, blood extender etc.
- Sizing agent in leather and textile industry
- Glue is used as adhesive for plywood, furniture etc.

UTILIZATION OF HOOFS (SHIN BONE)

- Shin bone separated from hoof can be used for neat foot oil (NFO) preparation
- Pure NFO is pale yellow liquid substance
- Does not solidify and dry at freezing temperature

Use

- Lubricant for delicate machinery in aeroplane, ship, watch etc.

UTILIZATION OF HORN

- Good source of gelatin
- Production of meal mixing with bone
- Articles like buttons, comb, handles, decorative pieces

Hoof and horn meal

- In rendering unit, it is prepared

- Excellent nitrogenous fertilizer (never used as animal feed, its digestibility is very less)

UTILIZATION OF INTESTINE

Intestines of sheep, goat, pigs or cattle are a four layered structure:

- a. Serous coat – outermost layer
- b. Muscular coat – longitudinal and circular
- c. Submucous coat (Tela submucosa) – composed of dense connective tissue (collagen)
used for casing preparation
- d. Mucous coat – innermost soft layer

Casings can be classified as one of the general types.

- Natural
- Artificial and
- Reconstituted collagen.

Natural

Edible use: Alimentary tract of sheep, goat, cattle and pigs, sometimes urinary bladder when used as food containers are called as Casings.

- The casings are prepared from the sub mucous layer of the small intestines of cattle, sheep, pigs.
- The other three coats of intestines are removed.
- Casings are grouped and sorted on the basis of length, diameter and quality (holes, workmanship, and strength).
- Natural casings have the advantages of being edible, allowing greater smoke penetrations and conforming to the size of the sausage during cooking and drying.

Non edible use: this may be in the form of catgut, strings for racket and musical instruments.

Artificial Casings

- Cellulose
- Inedible collagen
- Edible collagens and
- Plastic.

Steps in casings preparation

The essential steps in preparation of casings are associated with the removal of the intestinal tract at the slaughtering plant are:

- a. Removal of intestines,
- b. Running or pulling – Detachment of intestines from loose mesentery
- c. Chilling at 10°C,
- d. Stripping – Squeezing out of intestinal contents,
- e. Flushing with water
- f. Fattening – fat removal,
- g. Fermentation for 1-2 days by immersion at 20°C,
- h. Turning – For cattle and buffalo only,
- i. Sliming – Removal of tissue layers with sliming stick or plastic knife at an angle of 30°,

Casings	Generally, refers to sheep and goat intestine alone
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- j. Measuring
- k. Inspection and grading
- l. Preservation

Table. 5.3. Different terminologies of casings

Rounds	Casings from small intestine mainly of cattle but also from sheep, goat or pig
Runner	Casings from small intestine of cattle
Middle	Casings from large intestine of cattle or sometimes pig
Weasand	Casings from oesophagus of all species
Bung	Casings from the caecum
Bladder	Casings from urinary bladder of cattle or pig
Maws or stomachs	Casings from cleaned pig stomach
Chitterlings	Casings from part of large intestine of pigs
Hank	Set of sheep, goat, hog casing 91.4 m long
Bundle	Set of beef casing of 18 m long

Table 5.4. Factors effecting casing quality

Cleanliness	Clean & sound, stain free, devoid of fat, parasite nodules, ulcer, defects
Strength	Strong enough to withstand pressure during filling, stuffing & processing
Length	Standardized (sheep & hog-91.4 m, beef round-18 m)
Caliber (thickness)	Sheep-14 mm, hog-35 mm, beef- 35 mm
Curing	Two types, salted & cleaned, some time it may be dried
Packaging	Mainly wooden and plastic container

Table 5.5. Comparison of different casings from different sources

Characteristics of casings	Natural	Collagen	Cellulose
Refrigeration storage	Yes	Yes	No

Degree of tenderness	Most tender	Less tender	Peeled
Break during processing	Most likely	Less likely	Least likely
Casing preparation cost	Most expensive	None	None
Soaking and flushing before use	Yes	No	Sometime Soaking
Ease of penetration	Most	Less	Least
Cost of stuffing	Most	Less	Least
Best machinability	Least	Less	Best
Best product yield	Least	Less	Best
Smoke product penetration	Best	Very good	Good
Finished product uniformity	Less	Good	Good
Cost of casing removal	None	None	Most
Printability	None	Limited	Best
Old-world appearance	Best	Less	None
Ease of plant storage	Least storage	Less storage	Best storage
Shelf life without overwrap	3-4 days	6-8 days	7-10 days

RENDERING

The term rendering refers to extraction of fat or oil by heat. (Or) It is the process of extraction of fat from animal tissues by the action of heat, which causes the cells to burst and release the melted fat to run out.

It involves two classes:

Edible rendering: to provide materials suitable for human consumption.

Inedible rendering: to provide materials suitable for animal feed and other inedible purposes.

Rendering methods:

1. Wet rendering
2. Semi-continuous wet rendering
3. Dry rendering
4. Low temperature rendering (LTR system)

Yield of the product:

- Higher the moisture content lower will be the yield
- Moisture should not exceed 7 percent

The factors that influence the yield are:

1. Type of rendering
2. Speed of operation
3. Pressure used
4. Human factor

In general, the yield in Dry rendering process is **3:1**

Wet rendering process is **4:1**

Blood meal preparation is **5:1**

Hide and skin

- Most valuable animal by products. Constitute around **4-11%** of live animal weight. In tannery hide and skin are converted into leather.
- **'Skin'** is the term used for small hides, and in cattle these are those weighing less than 13.62 kg (30 lb) after curing.
- The surface of hides and skins contains the hair and oil glands and is known as the grain side. The flesh side of the hide or skin is much thicker and softer.
- A **'Colorado'** or **'Texas hide'** indicates that the hide is branded on the butt or on the side and a **'native'** refers to an unbranded hide.
- **'Big-packer hides'** refers to hides that were removed from the carcass by skilled labour and **'country'** or **'small-packer hides'** indicates that the hides were removed by less-skilled labour.
- A **'renderer'** or **'murrain hide'** means that the hide was removed from an animal that died from some cause other than slaughter.

FLAYING

- Removal of skin or hide
- Skinning operation performed by skilled workers following a uniform pattern
- Done on pritch plate: Steel plate (diameter 20 cm, 120 cm length, 60 cm with), Anchored with bolt to floor

- Enough watering at antemortem facilitates flaying
- Hoisting of animal improves bleeding, good keeping quality of hide

Types:

- **Knife skinning**
 - With conventional skinning knives
 - Air driven reciprocating skinning knives
- **Hide pulling** - Using hide puller
- **Hide separation**- Pumping compressed air into carcass

CHARACTERS OF WELL FLAYED HIDE

- Rounded rump
- Equal width from center line of back to belly
- edge on each side
- Medium length in the shank
- Regular dewlap
- Square outline

TANNING

- Tanning is the process of converting raw hides or skins into leather.
- Hides and skins have the ability to absorb tannic acid and other chemical substances that prevent them from decaying, make them resistant to wetting, and keep them supple and durable.
- Tanning is essentially the reaction of collagen fibers in the hide with tannins, chromium, alum, or other chemical agents. The most common tanning agents used are trivalent chromium and vegetable tannins extracted from specific tree barks.
- Alum, syntans (man-made chemicals), formaldehyde, glutaraldehyde, and heavy oils are other tanning agents.
- The three types of hides and skins most often used in leather manufacture are from cattle, sheep and goat.

TANNING PROCESS

- i. **Warehousing and sorting:** In the raw material area the skins are preserved in salt, stored in controlled cool rooms and before processing, presorted for quality and weight.
- ii. **Soaking:** The skin is soaked to water for removal of dirt and salt.
- iii. **De-fleshing:** During this process tissue, flesh and fat remnants are removed by a roller mounted knife.
- iv. **Liming:** By adding lime and sulphur compound, the hair is removed from the skin.
- v. **Bating, pickling, tanning:** During bating and pickling the skins are treated with acid and salt as preparation for tanning. During tanning the skin fibres absorb the tanning agents. That's when the skin becomes leather.
- vi. **Samming:** During this process water is removed.
- vii. **Splitting:** In order to achieve an even specified thickness the leather is reduced in substance. The resulting split-leather can then be processed further.
- viii. **Skiving:** The grain leather is brought to an even thickness. Irregularities are removed from the reverse side and the leather is separated into colour batches.
- ix. **Sorting:** The leather is sorted into various quality grades.
- x. **Neutralizing, dyeing and greasing:** The acid resulting from the tanning process is neutralized, then dyeing takes place, where anilin-dye-stuffs are used. The greasing procedure will finally achieve the correct softness.
- xi. **Drying:** Two methods are used to dry leather. The vacuum process during which moisture is removed by suction and the hanging process, when leather is hung and taken through ovens.
- xii. **Staking:** Following drying the leather is mechanically staked in order to soften it. Further processes take place in preparation for finishing.
- xiii. **Finishing:** Here the leather is given its final surface treatment and look. Through processes of base coat, coloring, embossing, ironing the leather become attractive.

COLLAGEN

- Collagen is the dominant protein in connective tissue and it is found in various forms in tissues of all species of multicellular organisms
- Collagen can easily be derived from slaughter by products
- The main sources of collagen in slaughterhouse byproducts are the skin, tendons, cartilage and bones

- The nutritional value of collagen is very low because it lacks of essential amino acids but, on the other hand, collagen is very useful as a source of bioactive peptides.
- Collagen typically contains about 35 % glycine (Gly) 21% Proline (Pro) and Hydroxyproline (Hyp) and 11% Alanine (ALA)
- The large amount of hydroxyproline in collagen is a unique feature of this protein and is generally found to be about 14% of the dry weight of collagen. Therefore, chemical methods for the detection of collagen are conveniently based on the determination of protein bound hydroxyproline in the tissues.

Uses

There is great demand in the food industry for collagen and gelatin because of their;

- High protein content
- Functional properties, such as water absorption capacity gel formation and the ability to form and stabilize emulsions
- Source of bioactive compounds with antimicrobial, antioxidant and antihypertensive properties.

EXTRACTION OF COLLAGEN

- Acid or alkali pretreatment
- Chemical hydrolysis and enzymatic hydrolysis. Commonly used chemical methods are
 - Salting out method,
 - Acid hydrolysis,
 - Alkaline hydrolysis

BYPRODUCTS OF GLANDULAR SOURCES

- Constitutes Approx. 0.28% of animal's live weight and used in medicine for healing power
- Potent sources of antidiabetics, endocrines, adrenaline & sympathmimetics. Enzymes, food supplements, biological chemicals & vitamins are obtained.
- Can be consume directly (pancreas)

Gland collection

- Collected from healthy animals and excised from animal within 15-20 mins where it should be chilled immediately in metal container
- Fat & connective tissue is trimmed off and contact with water is avoided and frozen at -18 to -20°C
- Immediately packed devoid of air whereas acetone dried powder may be alternative way of storage

Table 5.6. Some glandular byproducts.

S.No.	Primary Byproducts	Secondary Byproducts
1	Pancreas	Insulin, Glucagon
2	Lung	Heparin
3	Calf stomach	Rennin
4	Adrenal gland	Adrenalin
5	Pig stomach	Pepsin
6	Brain	Cholesterol
7	Thymus	Deoxyribonucleic acid
8	Thyroid gland	Thyroxine
9	Parathyroid gland	Parathormone
10	Testes	Hyaluronidase enzyme, Androgen
11	Ovaries	Estrogen, Progesterone and relaxin
12	Gall	Cholic acid , deoxycholic acid

References:

1. **Animal By-Products Processing – H. W. Ockerman & C. L. Hansen**
2. **Outlines of meat science and technology – B.D. Sharma**

QUESTION BANK

ANIQUEST – LPT CHAPTER 4.5. (SLAUGHTER HOUSE BY-PRODUCTS TECHNOLOGY)

SANTHOSH V R, M.V.Sc., (ICAR-IVRI)

1. refers to meat-slaughter by-products that includes all of the animal which is not a part of the carcass whereas are the wholesale edible by-products that are segregated, chilled and processed under sanitary conditions and which are inspected by the Meat Inspection Service.
2. The yield of edible by-products from meat animals ranges from(sometimes higher for fat animals) of the live weight for beef, pork and lamb and fromof the live weight for chickens.
3. The left side of the carcass is termed theside and usually contains less kidney suet (fat) than the right side (.....) that contains an elliptical kidney which is fixed to the abdomen.
4. Choose the correct statements:
 - a) Sweetbreads are obtained from calves, lambs and young cattle.

- b) Three different tissue locations (cervical, thorax and gut) in these animals are sometimes labelled 'sweetbreads'.
- c) Different names are neck sweetbread (cervical), heart sweetbread (thorax) and gut sweetbread (pancreas)
- d) Low in color values and high in collagen content.
- i) A, b, c are correct ii) Only b & d are correct
- ii) All statements are correct iv) Only a & b are correct
5. is produced from the first (rumen) and second stomachs (reticulum) of cattle.
6. The ash obtained by complete burning of bones with free access to air at 600 - 800° C for 4-5 hours is called
7. Which byproduct is produced through the hydrolysis of animal collagen?
- a) Tallow b) Keratin c) Gelatin d) Elastin
8. Which process involves the extraction of fats from animal byproducts?
- a) Coagulation b) Emulsification c) Rendering d) Hydrolysis
9. A) Poultry giblets include the heart, liver and gizzard
- B) It can be stored in parchment paper or aluminium foil.
- a) Both A & B are wrong b) Both A & B are Correct
- c) A is wrong & B is correct d) A is correct & B is wrong
10. A) Proteinaceous by-products would yield nitrogen fertilizer
- B) Bone produce phosphate fertilizer.
- a) Both A & B are wrong b) Both A & B are Correct
- c) A is wrong & B is correct d) A is correct & B is wrong
11. A) Tallow is referred to as the rendered fat of cattle and sheep
- B) Lard is the rendered fat of the hog.
- a) Both A & B are wrong b) Both A & B are Correct
- c) A is wrong & B is correct d) A is correct & B is wrong
12. refers to the softness or hardness of animal fats expressed as the temperature at which the free fatty acids of the given fat solidify.
13. The quality of animal fat both edible and inedible is judged by
- a) Titre b) free fatty acid (FFA)
- c) FAC colour or Lovibond colour
- d) Moisture impurities (insoluble) and unsaponifiable matter (MIU)
- i) a, b, c are correct ii) Only b & d are correct

iii) All statements are correct iv) All statements are wrong

14. The amount ofin a tallow is an indication of the degree of spoilage which has taken

place.

15. a. Water in tallow is undesirable because it acts as a medium for the growth of bacteria and the action of fat-splitting enzymes.

b. Moisture is expressed as parts per centum (parts per hundred by weight).

c. Moisture levels around 0.2% are desired.

i) a, b, c are correct

ii) Only b & c are correct

iii) Only a & b are correct

iv) All statements are wrong

16. a. the bleach test is a good indication of the temperatures and handling condition to which a tallow has been subjected.

b. The bleach test is a colour test using an activated clay and a Lovibond tintometer.

c. Only red readings are used because there is a direct relationship between red and yellow readings.

i) a, b, c are correct

ii) Only b & c are correct

iii) Only a & b are correct

iv) All statements are wrong

17. Fresh fats have a peroxide value of....., whereas rancid fats have a peroxide value of

18. has a direct relationship with FFA and is the temperature to which the fat may be heated before it begins to smoke.

19. A major use of inedible tallow and grease (higher titre) of animal origin is as a high-energy additive to.....

20. Edible tallow and lard are used in

a) oleomargarine (margarine) b) shortenings c) cooking fats d) All the above

21. In continuous rendering system, size reduction is accomplished with rotating knives called or with rotating hammer devices called

22. The modern continuous wet- rendering system is referred to as

23. Dry-rendered meal has a fat content of compared with meal from LTR systems where the fat level is

24. What is the proportion of hide in the weight of the live animal?

a) 4-11% b) 4-6% c) 4-15% d) 4-25%

25. What is the term used for small hides, and in cattle these are those weighing less than 13.62 kg (30 lb) after curing?

a) Packer hide b) Skin c) Pelt d) All the above

26. is the skin of an animal with the fur or hair still on it.

a) Hide b) Skin c) Pelt d) All the above

27. The hide which is branded on the butt or on the side

a) Colorado hide b) Texas hide c) Both a & b d) None of the above

28. The hide which is unbranded is called as

a) Country hide b) Native hide c) Both a & b d) None of the above

29. The hides that were removed from the carcass by skilled labour is

a) Colorado hide b) Small packer hide c) Murrain hide d) Big packer hide

30. The hides that were removed from the carcass by unskilled labour is

a) Small packer hide b) Country hide c) Both a & b d) None of the above

31. The hides that were removed from the carcass of dead animal is

a) Renderer hide b) Murrain hide c) Both a & b d) b only

32. The hides that were removed from unborn calf is

a) Pelt b) Bush hide c) Murrain hide d) Slunk

33. In bovine animals the hair root extends about, but in swine the hair follicle

34. Hair is composed almost entirely of the protein, which normally accounts forof the total hide protein.

35. It takes knifemen approximately seconds to remove one cattle hide manually.

36. Hide pulling technique increases carcass yield in cattle of approximately% when compared to the knife-skinning.

a) 2% b) 4% c) 6% d) 8%

37. Find the odd one out with regards to advantages of hide pulling technique:

a) less-skilled labour and less hide damage

b) lower manpower

c) higher carcass contamination risk

d) increase in carcass yield

38. After hide removal from any animal, the hide should be quicklyin order to arrest bacterial and enzymatic decomposition or spoilage.

39. is the most common method of curing hides today

40. The term used for removal of hide is.....

- a) Rodding b) Evisceration c) Flaying d) Bunging

41. Choose the correct statement:

a) Glue and gelatine are physically and chemically similar.

b) The major difference is that gelatine is made from fresh, federally inspected raw materials in a sanitary manner which allows the product to remain in an edible condition

i) Both a & b are wrong ii) Both a & b are correct

iii) a only iv) b only

42. Crude form of gelatine is

- a) collagen b) glue c) gelatin d) ossein

43. Pure protein from collagen is

- a) Isinglass b) glue c) gelatin d) ossein

44. Gelatine obtained from fish bladder is

- a) Isinglass b) glue c) gelatin d) ossein

45. Demineralized bone is

- a) Isinglass b) glue c) gelatin d) ossein

46. The quantity of and amino acids is often used as an index of the quantity of collagen in a protein mixture.

- a) Proline and glycine
- b) Proline and hydroxyproline
- c) Glycine and hydroxyproline
- d) Glycine and tryptophan

47. The process of conversion of collagen to glue and gelatin consists of:

a) removal of non-collagenous compounds from the new material with as little alteration

to the collagen as possible

b) controlled hydrolysis of collagen to gelatine

c) the recovery and drying of the finished product

- i) a, b, c are correct
- ii) Only b & c are correct
- iii) Only a & b are correct
- iv) All statements are wrong

48. Complete hydrolysis of collagen yields whereas partial hydrolysis of collagen yields

49. Choose the correct statement:

a) The most widely used commercial system for the processing of collagen into glue and

gelatine is the alkaline hydrolysis system.

b) The most widely used commercial system for the processing of collagen into glue and

gelatine is the acid hydrolysis system.

c) Alkaline hydrolysis produces type B gelatin

d) Acid hydrolysis produces type A gelatin

i) a, b, c are correct b) a, b, d are correct c) a, c, d are correct d) b, c, d are correct

50. Uses of gelatine are

a) food thickening agent and emulsifying agent

b) Manufacturing pharmaceutical capsules

c) Moisturizing agent, gelatine foam powder and plasma extender

d) Photography and Smokeless gunpowder

i) a, b, c are correct b) a, b, c, d are correct c) a, c, d are correct d) b, c, d are correct

51. Choose the correct statement.

a) An acid-treated precursor (type A) which has an isoelectric point between pH 7 and 9.5

b) An alkali-treated precursor (type B) which has an isoelectric point between 4.7 and 5.5

c) The molecular size of gelatin does not influence their physical properties.

i) a, b, c are correct ii) a & b only iii) b & c only iv) a & c only

52. For human consumption, the USDA limits the calcium level of mechanically separated red meat to%

a) 0.25 b) 0.50 c) 0.75 d) 1.00

53. The dicalcium phosphate yield is approximately% of the raw-bone weight and is used in animal feed.

a) 25 b) 50 c) 75 d) 100

54. Which is the ideal raw material for preparation of bone char?

a) Bone meal b) Bone sinews c) Bone grits d) None of the above

55. Blood meal is rich in

a) Methionine b) Lysine c) Leucine d) Proline and hydroxyproline

56. Choose the correct statement.

A) The bones obtained from freshly killed animals which still contain a high percentage of moisture, fat and proteins.

B) The bones obtained from fresh animals which are exposed to bacteria, atmosphere and insect action for long time and contain only calcium, phosphorus and dried ossein.

a) A only b) B only c) Both A & B d) None of the above

57. Technical fat is used for making.....

a) Edible oil b) Candle c) Petrol d) Soap

58. Heparin can be produced from

a) Lungs b) Liver c) Intestinal mucosa d) All the above

59. Abomasum of milk fed and un-weaned large ruminants is source of

A) Rennet B) Rennin C) Renin D) Pepsin

- a) A, B, C, D are correct b) A & B are correct c) A& C are correct d) B only

60. The enzyme extracted from mucosa of hog stomach is

- a) Rennet b) Rennin c) Hcl d) Pepsin

61. Glands constitutes approx.% of animal's live weight and excised from animal within Mins

- a) 0.28 & 15-20 b) 0.28 & 5-10 c) 0.58 & 5-10 d) 0.58 & 15-20

62. The alternate way of storing glands is

- a) Glycerol dried powder b) Acetone dried powder
c) Formalin dried powder d) Freeze dried powder

63. is the process of converting raw hides or skins into leather.

64. The most common tanning agents used are and extracted from specific tree barks.

- a) Trivalent chromium and vegetable tannins b) Trivalent chromium and alum
c) Trivalent chromium and syntans d) Vegetable tannins and formaldehyde

65. In casing preparation, 'Turning' step is carried out in which species?

- A) Cattle B) Buffalo C) Sheep D) Goat
a) A & C only b) B & C only c) A & D only d) A & B only

66. Casings are obtained from which layer of intestine?

- a) Serosa b) Sub-Mucosa c) Mucosa d) Muscular

67. The term used for squeezing the intestine to force out the contents is

- a) Flushing b) Stripping c) Pulling d) Fattening

68. The removal of tissue layers with the help of plastic knife or shells is called as and is done with knife kept at an angle of.....

- a) Sliming & 30° b) Sliming & 45° c) Stripping & 30° d) Stripping & 45°

69. The standard length of sheep and hog casings is meters per hank
a) 91.4 m b) 91.8 m c) 91.2 m d) 91.6 m
70. The standard length of beef rounds is meters per bundle
a) 12 m b) 14 m c) 16 m d) 18 m
71. Casings obtained from cleaning pig stomach is
- a) Chitterlings b) Maws c) Bung d) Weasand
72. Casings obtained from caecum is
- a) Chitterlings b) Maws c) Bung d) Weasand
73. Casings obtained from oesophagus of all species is
- a) Chitterlings b) Maws c) Bung d) Weasand
74. Chitterlings and middles are the obtained from large intestines of and species respectively.
a) Cattle & Pig b) Sheep and Cattle c) Cattle and Sheep d) Pig and Cattle
75. is an important by-product obtained from cattle feet and by the process of
- a) Neets foot oil & Wet rendering b) Neets foot oil & Dry rendering
c) Button & Wet rendering d) Button & Dry rendering
76. The process of extraction of fat or oil from animal tissues by the application of heat is.....
77. The yield in dry rendering process is
- a) 2:1 b) 3:1 c) 4:1 d) 5:1
78. The yield in wet rendering process is
- a) 2:1 b) 3:1 c) 4:1 d) 5:1
79. The yield in bone meal preparation is
- a) 2:1 b) 3:1 c) 4:1 d) 5:1

80. is obtained by complete burning of granular bones without air at 600 - 800° C.

- a) Bone sinews b) Bone Char c) Bone ash d) Bone china

81. Match the following:

Table – I

- 1) Pluck
- 2) Giblet
- 3) Maws
- 4) Skirt

Table – II

- a) Diaphragm
- b) Lungs, trachea & heart
- c) Gizzard, liver & heart
- d) Stomach

82. Match the following:

Table – I

- 1) Rumen
- 2) Reticulum
- 3) Omasum
- 4) Abomasum

Table – II

- a) Honeycomb
- b) Bible
- c) Reed Tripe
- d) Paunch

83. Match the following:

Table – I

- 1) Tallow
- 2) Lard
- 3) Technical fat
- 4) Neets foot oil

Table – II

- a) Pig fat
- b) Delicate machinery
- c) Cattle fat
- d) Soap industry

84. Match the following:

Table – I

- 1) Heparin
- 2) Rennin
- 3) Pepsin

Table – II

- a) Calf stomach
- b) Pig stomach
- c) Testes

- 4) Hyaluronidase d) Lungs

85. Match the following:

Table – I

- 1) Casings
- 2) Maws
- 3) Weasand
- 4) Bung

Table – II

- a) Oesophagus
- b) Caecum
- c) Stomach
- d) Sausage container

86. Match the following:

Table – I

- 1) Gelatin
- 2) Collagen hydrolysate
- 3) Type A gelatin
- 4) Type B gelatin

Table – II

- a) Alkali treatment
- b) Acid treatment
- c) Partial hydrolysis of collagen
- d) Complete hydrolysis of collagen

87. Match the following:

Table – I

(Temperature of extraction)

- 1) 55-60 °C
- 2) 65-70 °C
- 3) 80 °C
- 4) 100 °C

Table – II

(Gelatin quality)

- a) Low quality gelatin
- b) Good quality gelatin
- c) Glue
- d) Medium quality gelatin

88. Match the following:

Table – I

- 1) Glue
- 2) Gelatin
- 3) Ossein
- 4) Isinglass

Table – II

- a) Fish bladder gelatine
- b) Crude form of gelatine
- c) Pure protein from collagen
- d) Demineralized bone

89. Match the following:

Table – I

- 1) Bone grits
- 2) Bone meal
- 3) Bone sinews
- 4) Bone char

Table – II

- a) Bone grits
- b) Resting on 2.5mm sieve
- c) Passes the 2.5mm sieve
- d) Fibrinous & tendinous portion

90. Match the following:

Table – I

- 1) Green bones
- 2) Dessert bones
- 3) Tanning
- 4) Bush hide

Table – II

- a) Hide from fallen animals
- b) Leather
- c) Bones from fallen animals
- d) Bones from freshly killed animals

91. Match the following:

Table – I

- 1) Hide
- 2) Skin
- 3) Grain side
- 4) Flesh side

Table – II

- a) Hairy side
- b) Thick and softer side
- c) Cattle
- d) Sheep, Goat & Calf

92. Match the following:

Table – I

- 1) Fleshing
- 2) Bating
- 3) Sammying
- 4) Fat liquoring

Table – II

- a) Proteolytic enzymes
- b) To adjust firmness or softness
- c) To remove excess moisture
- d) To remove excess flesh

93. Match the following:

Table – I

- 1) Bone ash
- 2) Bone char

Table – II

- a) 3-4 hrs
- b) 1.5-2 hrs

- 3) Wet rendering
- 4) Dry rendering
- c) Presence of air
- d) Absence of air

94. Match the following:

Table – I

- 1) Raw bone meal
- 2) Meat meal
- 3) Meat cum bone meal
- 4) Blood meal

Table – II (Protein content)

- a) less than 55%
- b) 26%
- c) more than 80%
- d) not less than 50%

95. Match the following:

Table – I

- 1) Hide
- 2) Bristles
- 3) Horns
- 4) Hoofs

Table – II

- a) Brushes
- b) Neat's foot oil
- c) Leather
- d) Artifacts

96. Match the following:

Table – I

- 1) Wool
- 2) Intestine
- 3) Pancreas
- 4) Edible offal

Table – II

- a) Insulin
- b) Lanolin
- c) Pet foods
- d) Casings

97. Match the following:

Table – I

- 1) Adrenal gland
- 2) Brain
- 3) Thymus
- 4) Skin trimmings

Table – II

- a) Cholesterol
- b) Adrenalin
- c) Glue
- d) Deoxyribonucleic acid

98. Match the following:

Table – I

- 1) Caul fat
- 2) Leaf fat
- 3) Suet
- 4) Cutting fat

Table – II

- a) Kidney fat
- b) Back fat
- c) Peritoneal fat
- d) Omental fat

99. Match the following:

Table – I

- 1) Sweetbread
- 2) Tripe
- 3) Chitlings
- 4) Fries

Table – II

- a) Testicles
- b) Thymus
- c) Intestines
- d) Stomach

100. Match the following:

Table – I

- 1) Principal byproduct
- 2) Secondary byproduct
- 3) Industrial byproduct
- 4) Pharmaceutical byproduct

Table – II

- a) Fibrin
- b) Blood
- c) Pepsin
- d) Casings

ANSWERS:

- 1) **Offal & Variety meats**
- 2) **20 to 30% & 5 to 6%**
- 3) **'raison' or 'open' & 'closed'**
- 4) **ii. All statements are correct**
- 5) **Tripe**
- 6) **Bone ash**
- 7) **c) Gelatin**
- 8) **c) Rendering**
- 9) **b) Both A & B are Correct**
- 10) **b) Both A & B are Correct**
- 11) **b) Both A & B are Correct**
- 12) **Titre**
- 13) **iii) All statements are correct**
- 14) **FFA (free fatty acid)**
- 15) **i) a, b, c are correct**

- 16) i) a, b, c are correct
- 17) 1-2 & 15-20
- 18) Smoke point
- 19) livestock and poultry feed
- 20) d) All the above
- 21) 'hogors' & 'hammer mills'
- 22) low-temperature or mechanical rendering
- 23) 10-16% & 3-8%
- 24) a) 4-11%
- 25) b) Skin
- 26) c) Pelt
- 27) c) Both a & b
- 28) b) Native hide
- 29) d) Big packer hide
- 30) c) Both a & b
- 31) c) Both a & b
- 32) d) Slunk
- 33) one-third the depth of the corium & penetrates the corium and extends down into the subcutis
- 34) Keratin & 6-10 %
- 35) 3-5 & 120
- 36) a) 2%
- 37) c) higher carcass contamination risk
- 38) Cured
- 39) Raceway curing
- 40) c) Flaying
- 41) ii) Both a & b are correct
- 42) b) glue
- 43) c) gelatin
- 44) a) Isinglass
- 45) d) ossein
- 46) b) Proline and hydroxyproline
- 47) i) a, b, c are correct
- 48) collagen hydrolysate & gelatin
- 49) c) a, c, d are correct
- 50) b) a, b, c, d are correct
- 51) ii) a & b only
- 52) c) 0.75 %
- 53) a) 25 %
- 54) c) Bone grits
- 55) b) Lysine
- 56) a) A only
- 57) d) Soap
- 58) d) All the above
- 59) b) A & B are correct
- 60) d) Pepsin

- 61) a) 0.28 & 15-20
- 62) b) Acetone dried powder
- 63) Tanning
- 64) a) Trivalent chromium and vegetable tannins
- 65) d) A & B only
- 66) b) Sub-Mucosa
- 67) b) Stripping
- 68) a) Sliming & 30°
- 69) a) 91.4 m
- 70) d) 18 m
- 71) b) Maws
- 72) c) Bung
- 73) d) Weasand
- 74) d) Pig and Cattle
- 75) a) Neets foot oil & Wet rendering
- 76) rendering
- 77) b) 3:1
- 78) c) 4:1
- 79) d) 5:1
- 80) b) Bone Char
- 81) b c d a
- 82) d a b c
- 83) c a d b
- 84) d a b c
- 85) d c a b
- 86) c d b a
- 87) b d a c
- 88) b c d a
- 89) b c d a
- 90) d c b a
- 91) c d a b
- 92) d a c b
- 93) c d a b
- 94) b d a c
- 95) c a d b
- 96) b d a c
- 97) b a d c
- 98) d c a b
- 99) b d c a
- 100) b a d c

