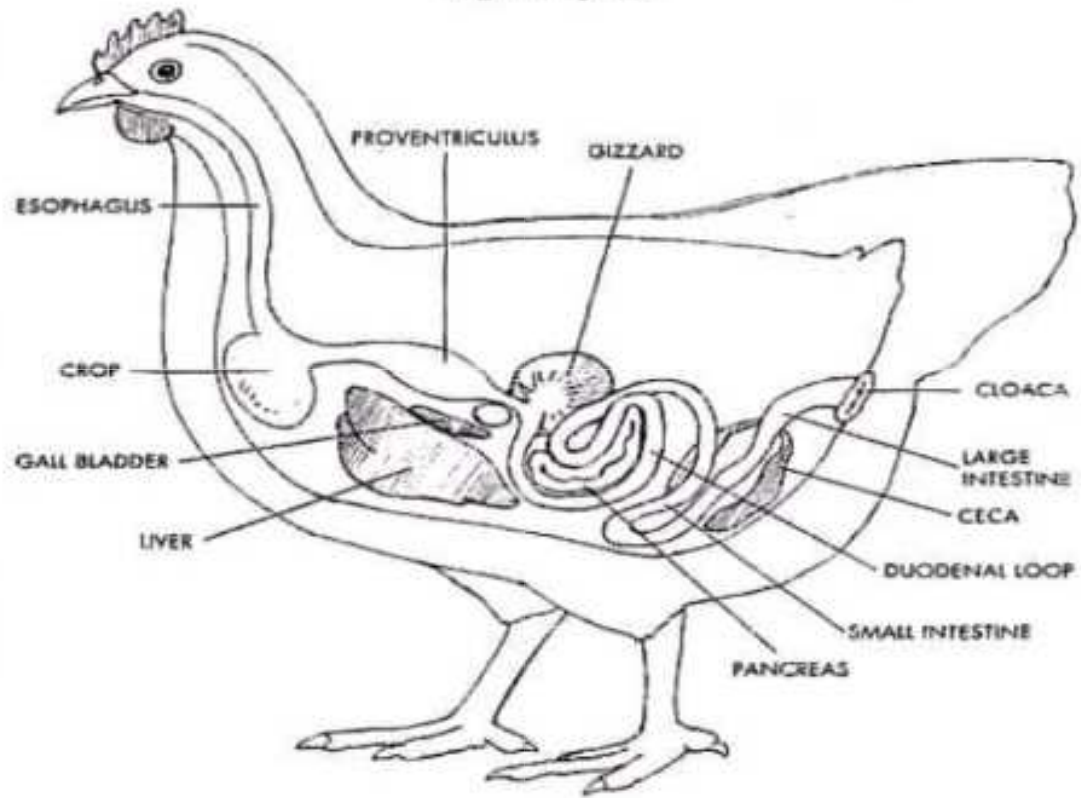


# Digestive System of birds

for BVSc & AH 1<sup>st</sup> year

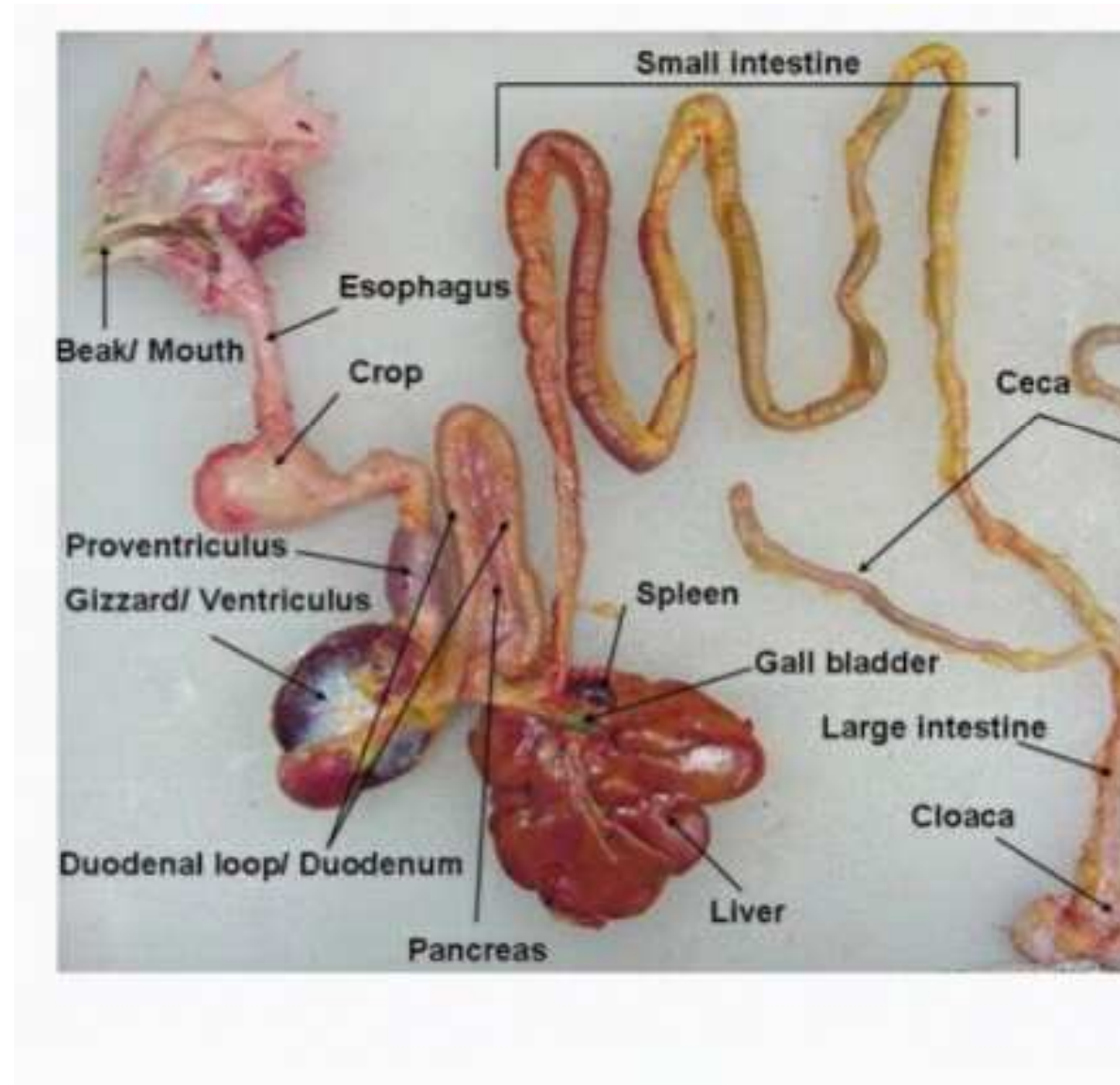
Prepared by: Dr. Jonali Devi

*Digestive System*



• **Digestive system of chicken :-**

1. Mouth
2. Pharynx
3. Esophagus/gullet
4. Crop
5. Proventriculus
6. Gizzard/ Ventriculus
7. Small intestine
8. Caeca
9. Large intestine
10. Cloaca
11. Vent



# Accessory Digestive Glands

1. Salivary glands
2. Liver
3. Pancreas

# Mouth:

- No teeth, functions performed by horny beak and gizzard
- Made up of upper and lower mandibles collectively known as **beak**
- Upper mandible is attached with skull and is immovable part of beak while as lower mandible is movable
- The roof of mouth : hard palate – cleft  
(that is divided by a long narrow slit in the center that is opened to the nasal passage)

- Soft palate is **absent** in birds except pigeon
- The base of mouth is made up of tongue and it has rough surface
- The base of tongue has papillae: very few numbers of taste buds

## PHARYNX

It is a common passageway for feed as well as for air and is divided into two parts

1. Esophagus
2. Larynx

## ESOPHAGUS

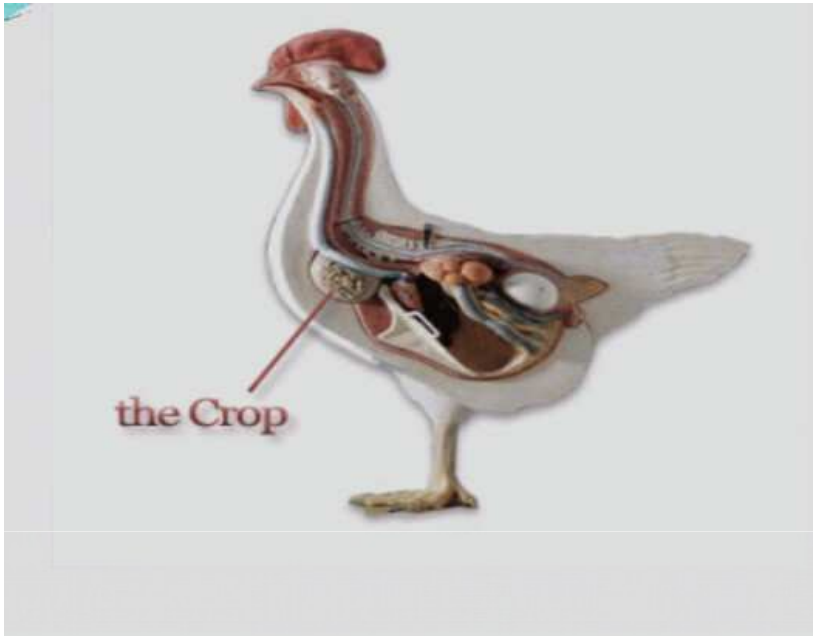
- It is a tube like structure that extends from mouth to proventriculus
- It helps to carry feed from mouth towards proventriculus
- Major secretion is mucous

# CROP

- It is the extension of esophagus located in the neck region
- Absent in insectivore birds and owl
- It is responsible for the **storage of feed** but when the proventriculus or gizzard is empty, the feed by pass the crop
- **Little digestion** : salivary amylase



- Starch is hydrolyzed within the crop where it can either be absorbed, converted to alcohol, lactic or other acids
- In pigeons and doves, CROP MILK is produced during the breeding season under the influence of prolactin
- Crop milk is **rich in proteins and essential fatty acids** and is devoid of carbohydrates and calcium



# PROVENTRICULUS

Or, glandular stomach or true stomach

- Secretion of enzymes and mucus
- Storage function in those birds lack crop/ fish eating birds

# GIZZARD

## Muscular Stomach or Ventriculus

- It is made up of two pairs of powerful muscles capable of **crushing and grinding the feed particles**; muscles absent in carnivore birds (hawks, owl) , stomach are similar to mammalian stomach
- This process is aided by the presence of grit in gizzard
- It performs **2-5 contractions per minute** according to the consistency of feed particles



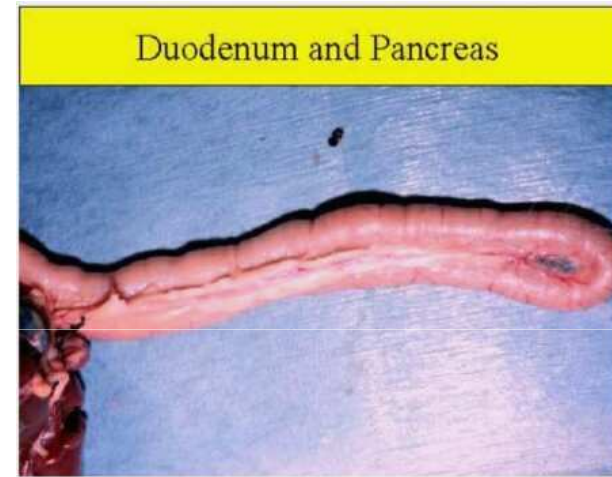
# SMALL INTESTINE

- It is 62 inches (1.5 metre) long in adult bird
- It has three parts
- No demarcation of jejunum and ileum, vestiges of yolk sac (**Mackle's diverticulum**) : may be found about middle of SI.

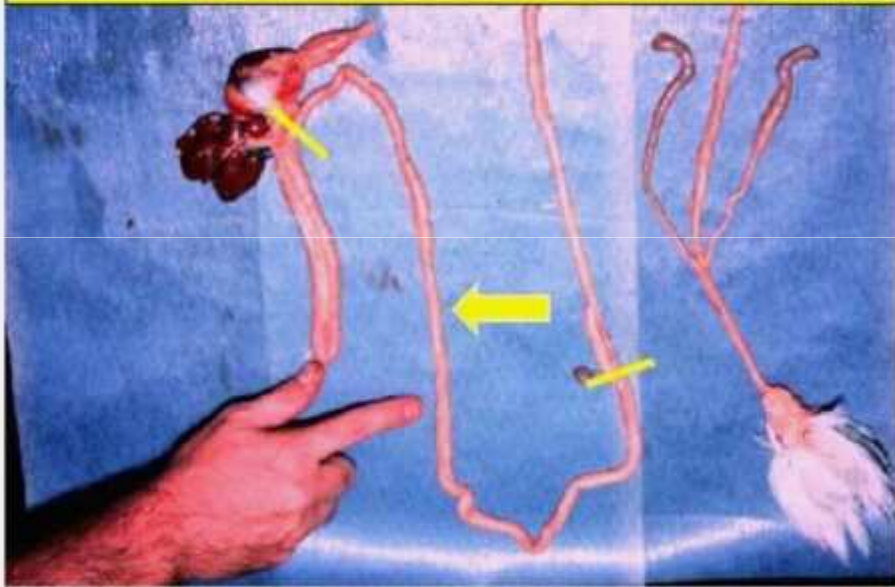
yolk sac is occluded by lymphocyte aggregation after 4 days of hatching: M.D: lymphopoietic tissue after 14 days and may become a site for extra-medullary haematopoiesis

- Duodenum makes the loop ---- **Duodenal loop** which contains the pancreas

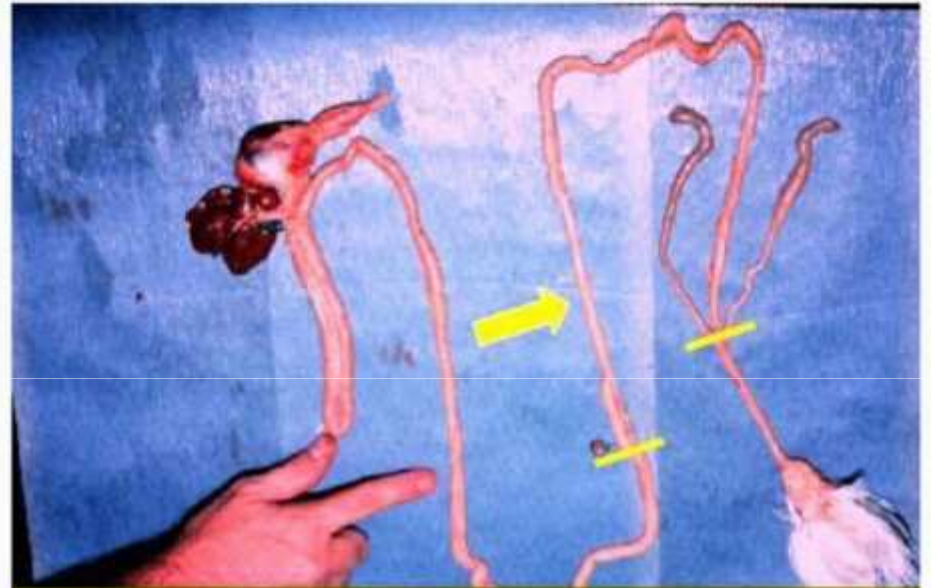
- Digestion of carbohydrates, proteins and fats takes place in small intestine with the help of intestinal juice, pancreatic juice and bile



Small Intestine (Jejunum)

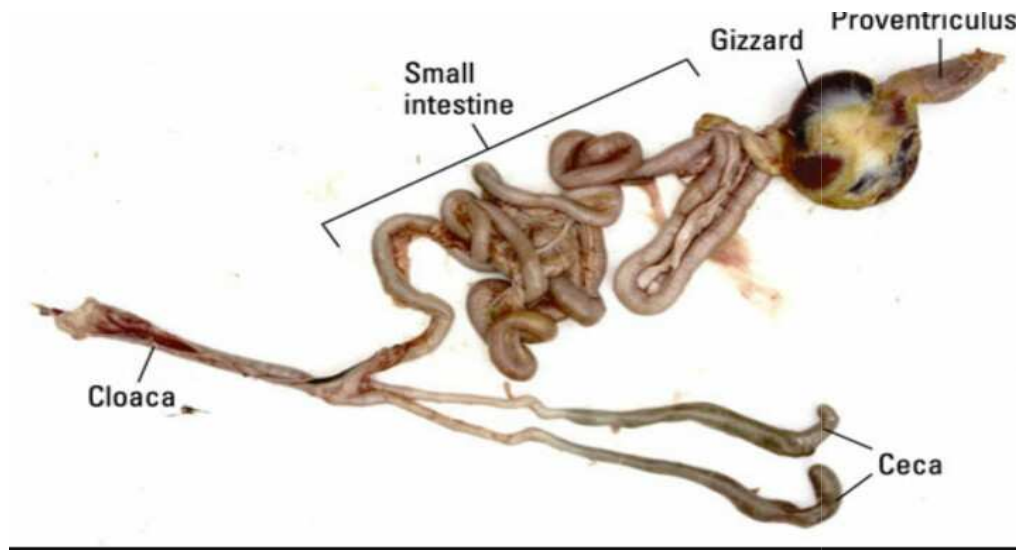


Small Intestine (Ileum)



# CAECA

- 2 blind pouches : located between the small intestine and large intestine : 6 inches (1.5 cm)
- Not present in hawks and song birds
- Helps in digestion of carbohydrates, proteins and crude fiber with the help of bacterial action





# LARGE INTESTINE

- It is much smaller as compared to small intestine and caecum
- Length is about 4 inches (10 cm)
- The diameter is twice the diameter of small intestine
- It extends from small intestine to cloaca
- **Helps to maintain water balance by water absorption**

# CLOACA AND VENT

- Enlarged area located at the end of large intestine
- Also known as common opening of digestive, reproductive and urinary system
- External opening of cloaca is known as **vent** and its size is variable depending upon the productivity of the bird

## Accessory glands: SALIVARY GLANDS

- production of saliva.
- **S. Amylase**

### Functions:-

1. Lubrication of feed
2. Salivary amylase or ptyalin: acts on starch and converts into maltose

- **buffer** (bicarbonate and other salts)
- Helps in **tasting** the feeds
- Protects the mucous membrane and keeps it moist

# PANCREAS

- Lies near the duodenal loop, 3 ducts
- pancreatic juice having a pH of 6.9 and is released in the distal end of the loop of duodenum
- Pancreatic juice is composed of four kinds of enzymes
  1. Proteolytic enzymes
  2. Lipolytic enzymes
  3. Carbohydrate splitting enzymes
  4. Nucleolytic enzymes

## Proteolytic Enzymes

- These are of five types
  1. Trypsinogen
  2. Chymotrypsinogen A
  3. Chymotrypsinogen B
  4. Procarboxy peptidase A
  5. Procarboxy peptidase B
- These enzymes are responsible for the break down of protein molecules into simpler units

# Lipolytic Enzymes

- These are of three types
  1. Phospholipase
  2. Pancreatic lipase
  3. Cholesterol esterase
- These are responsible for the break down of lipids
- Responsible for the esterification of cholesterol

# Carbohydrate splitting Enzymes

- These consist of
  1. Pancreatic amylase
  2. Invertase
- Pancreatic amylase acts on starch and converts it into simpler units while invertase acts on sucrose and converts it into simpler sugars



## Nucleolytic Enzymes

- These are of two types
  1. Ribonuclease
  2. Deoxyribonuclease
- Besides enzymes pancreatic juice also contains cations and anions
- Cations are  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{++}$ , etc.
- These act as buffer, cofactors and osmotic regulators
- Anions are  $\text{HCO}_3^-$
- These mainly act as buffer and osmotic regulators

# LIVER

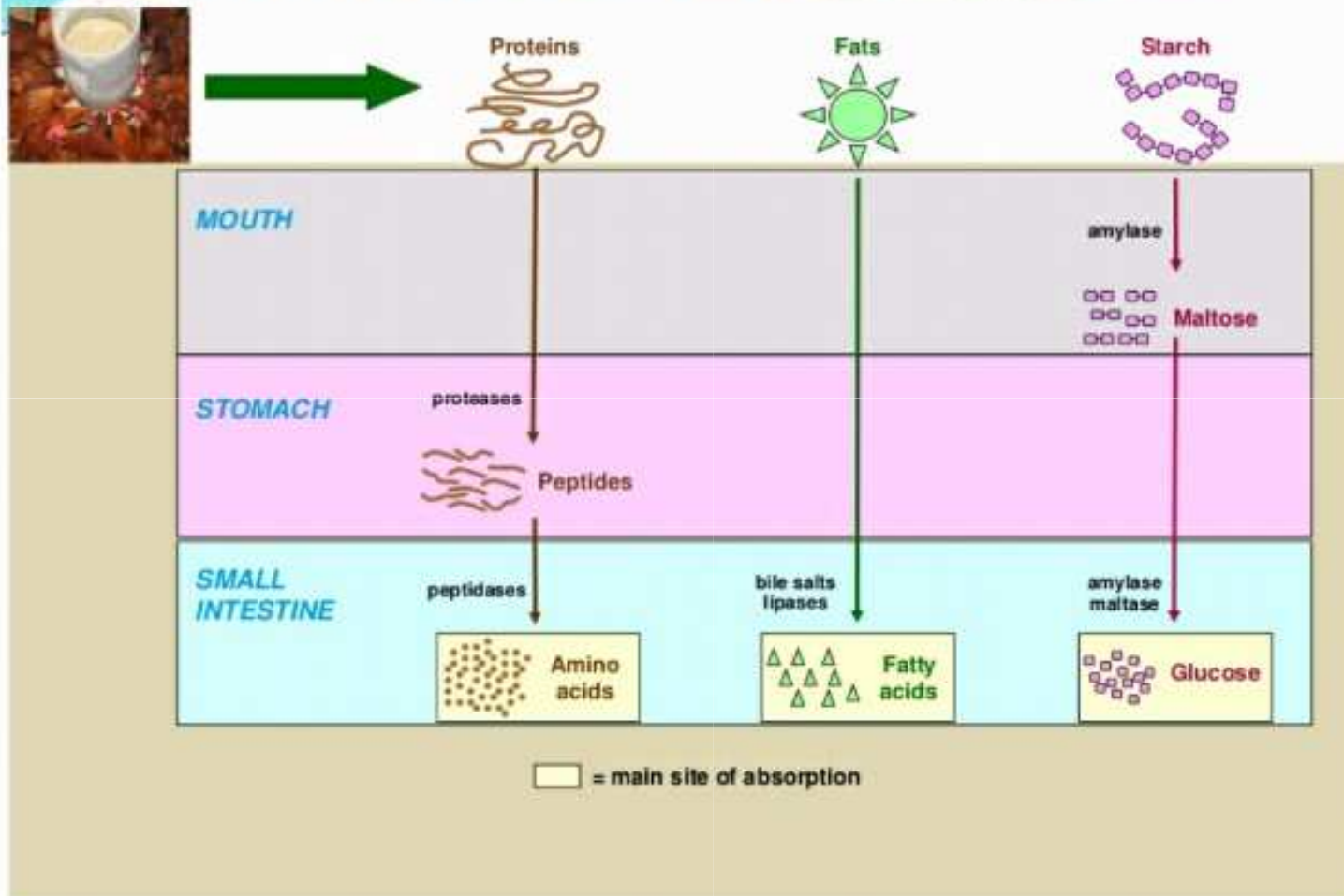
- Liver is a bilobed structure and it performs following functions
  1. After the digestion of feed, it is taken up by the villi of small intestine which then enters in the hepatic portal circulation and is mobilized towards the liver
  2. The feed is **detoxified** by the liver and then distributed in the whole body

- It acts as a **store house** for the vitamins and carbohydrates. The carbohydrates are stored in the form of glycogen
- It is responsible for the **formation of plasma proteins** like albumin and globulin
- It activates and inactivates the protein and peptide hormones
- It is the site for destruction of old RBC's which ultimately leads to the formation of bile

- Intestinal juice : amylase, invertase and trypsin
- bile : emulsification of fat which is then digested by enzymes

- end product of carbohydrate (glucose), protein (amino acid), fat (fatty acid) are absorbed by the finger like projections of small intestine known as villi
- These end products ultimately reach to liver via portal vein

# Digestive Process in Poultry



## Composition of Intestinal Juice

- Intestinal juice is composed of :-
  1. Peptidase (Erepsin)
  2. Sucrase (Invertase)
  3. Maltase
  4. Lactase
  5. Nucleotidase
  6. Polynucleotidase

# Mechanism of Enzyme Production and Activation

- The activities of GIT are controlled by
  1. Nervous system
  2. Endocrine system
- In case of nervous system, autonomic nervous system is responsible for controlling activity of GIT
- This system has two parts
  1. Parasympathetic nervous system
  2. Systemic nervous system



# Regulation of Feeding

- Different factors affect the regulation of feeding in birds
  1. Size
  2. Sex of bird
  3. Age of bird
  4. Body temperature and ambient temperature
    1. Activity
    2. Reproductive stage
    3. Appearance and taste of feed
    4. Energy content of feed

## Mechanism of Hunger

There are two systems or centers located in brain or liver that control feeding behavior of animals

1. Satiety center
2. Appetite center

- Stimulation of satiety center leads to cessation of feed intake and is activated by the elevated levels of glucose in blood

- This center is located in the liver of chicken while in other animals it is located in brain
- This center is also called as Gluco-satiety center
- Its stimulation leads to feed intake or hunger when glucose level in blood drops

THANK YOU

