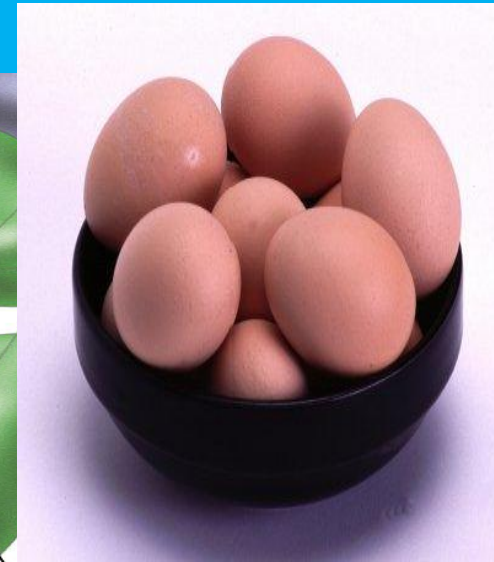
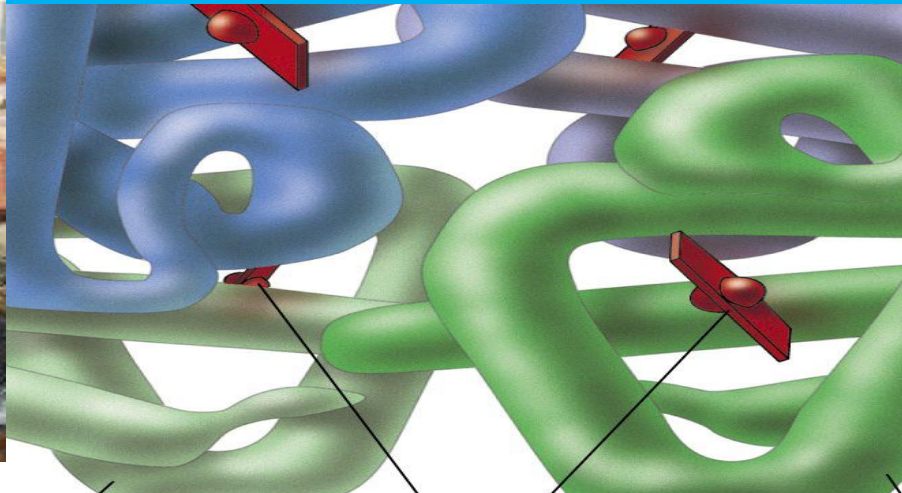


# AMINO ACIDS & PROTEINS

## 211 Chem



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# *PROTEIN DIGESTION*

- **In the mouth:**

No digestion of protein takes place

- **In the stomach:**

**Gastrin** stimulates secretion of gastric hydrochloric acid

# *PROTEIN DIGESTION*

- Gastric hydrochloric acid activates pepsin (converts **pepsinogen** to **pepsin**)
- **Pepsin** breaks the protein down into peptides of various lengths and some amino acids
- Pepsin completes ~ 10-20% of digestion

# *PROTEIN DIGESTION*

## **In the small intestine:**

- Pancreas makes **zymogens**; trypsinogen and chymotrypsinogen (proenzymes) in response to protein in the small intestine
- They will be activated to trypsin and chymotrypsin (now called **proteases**)
- **Proteases** break down polypeptides into smaller peptides (very few peptides have been broken down to amino acids at this stage)

# *PROTEIN DIGESTION and ABSORPTION*

- The intestinal wall produces **peptidases** which continue to split the remaining polypeptides into tripeptides, dipeptides, and some amino acids
- These smaller units are transported into the **enterocytes**

# *PROTEIN ABSORPTION*

- In the enterocyte, **other peptidases** immediately digest everything into single amino acids which are absorbed into the bloodstream
- Some amino acids share the same transport system, so if you take in a large amount of one particular amino acid, you may be inhibiting the absorption of others

# Amino Acids in the Liver

Once amino acids reach the liver, one of three events occurs:

1. • Conversion to glucose (glucogenic amino acids)
2. • Conversion to fat (ketogenic amino acids)
3. • Direct release into the bloodstream as plasma proteins, such as albumin, or as free amino acids

# PROTEINS in the BODY

- **Amino Acid Pool** – amino acids that are available throughout the body (tissues and fluids) for use when needed
- **Protein Turnover** – of the ~ 300 grams of protein synthesized by the body each day, 200 grams are made from recycled amino acids



# NITROGEN EXCRETION

- Amino acid breakdown yields an amino group (containing nitrogen)
- This molecule is unstable and is converted to ammonia
- Ammonia is toxic, so it is excreted from the cells and sent to the liver, where it is converted to urea and water
- The urea is transported to the kidney, where it is filtered from the blood and finally sent to the bladder for excretion in the urine
- Nitrogen is also lost through hair, skin, GI cells mucus, nails, and body fluids like sweat

# NITROGEN BALANCE

The rate of protein synthesis equals the rate of breakdown and loss

- **Positive nitrogen balance** – synthesis exceeds breakdown (normal in children and tissue repair)
- **Negative nitrogen balance** – breakdown exceeds synthesis (e.g., stress, burns, infection, or injury)