

ASC 406/606

Lecture [19]

Protein and Amino Acids

Digestion & Absorption of Protein in Non-Ruminants

Site of digestion:

- 1)
- 2)

Enzymes from 3 sources:

- 1)
- 2)
- 3)

Handout: The proteolytic enzymes, their production site, and specificity of action

Digestion of Protein

Enzyme activity:

- All enzymes are secreted inactive (zymogens):
The active center of the enzyme is covered with a peptide
- Activation of the enzyme means the removal of the peptide (by an enzyme)

Example:



MW = 42,000

(MW = 34,500) (MW = 7,500)

Digestion of Protein

In the small intestine:

Substrates:

- 1) Proteins resistant to the action of pepsin in the stomach
- 2) Large polypeptides resistant to digestion in acidic medium

The medium is

The enzymes from pancreas release:

- 1) small peptides ()
- 2) considerable amount of

Digestion of Protein

In the small intestine:

The brush border membrane has two functions:

- 1) Absorption of
- 2) Hydrolysis of

Handout: Scheme of AA absorption

Absorption

Active transport:

- -dependent
- Vitamin enhances the process

Three different transport systems:

One for each AA group:

Acidic AA

Basic AA

Neutral AA

Three carriers (one for each group of AA)

Result: pass to the portal vein to the liver

Factors Affecting Protein Digestion

1)

- Secretion & activity of pancreatic enzymes are regulated by the presence of protein in the small intestine

Example:

- Swine diets - increasing protein from increased chymotrypsin activity by

Factors Affecting Protein Digestion

2)

Protease inhibitors (e.g., trypsin inhibitor): small proteins in soybeans and other beans (e.g., kidney beans)

Negative effects:

- a decrease in activity of trypsin & chymotrypsin
- a decrease in digestibility of protein & energy
- a hypertrophy of pancreas
- a decrease in growth & diarrhea

Do not feed raw soybeans to non-ruminants

Ruminants are unaffected (WHY?)

destroys () trypsin inhibitors

Factors Affecting Protein Digestion

3) (Maillard or browning reaction)

Formation:

- Amino group (from an AA, a peptide or a protein) reacts with an aldehyde group from a reducing sugar
- Condensation
- Polymerization (products of)

Extent of reaction depends on &

These products are resistant to enzymatic digestion (animals or microbes)

Negative effects: a decrease in protein digestibility & a decrease in availability of specific AA (Lysine)

Fate of Absorbed Amino Acids

1)

2)

(gluconeogenesis)

3)
