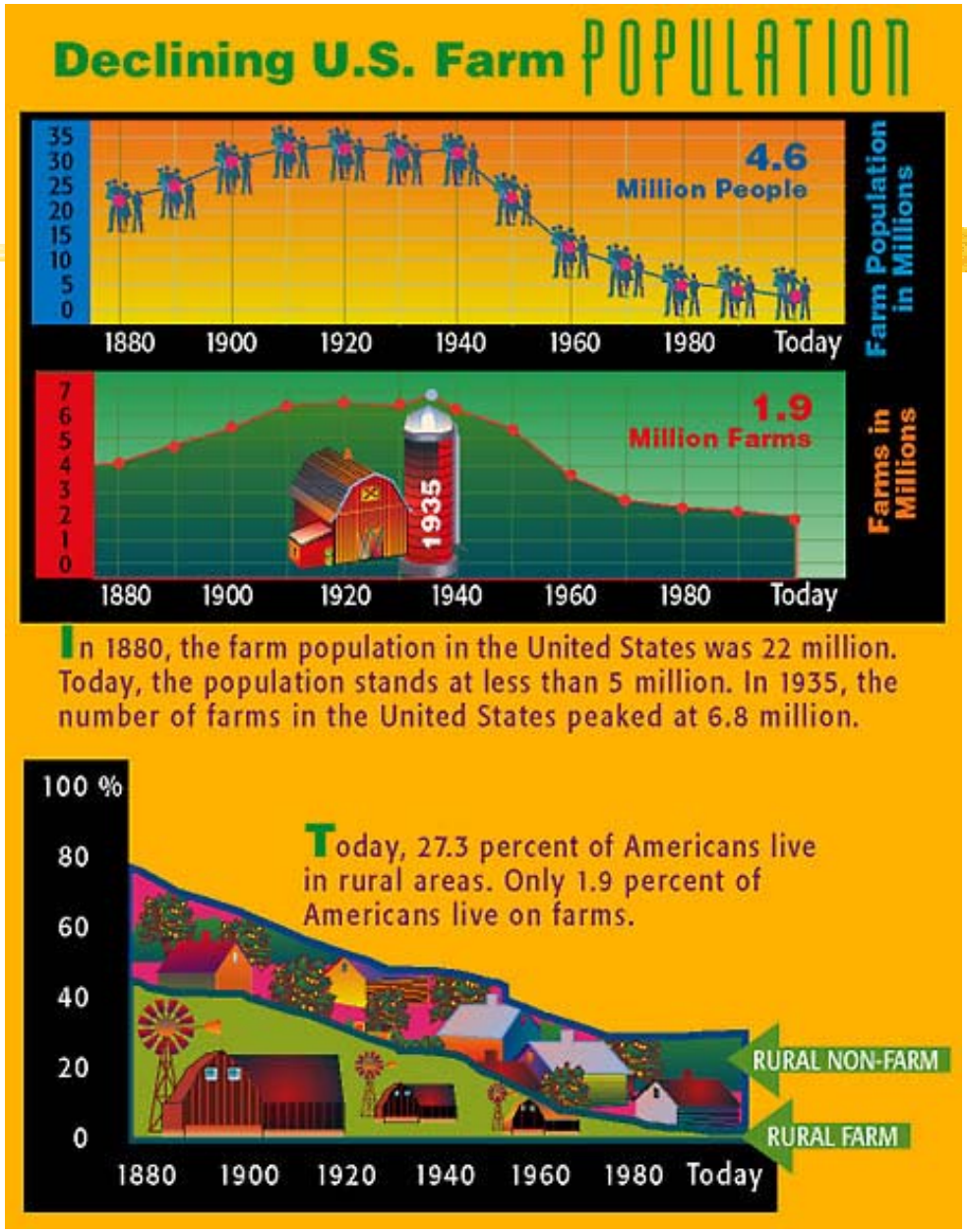
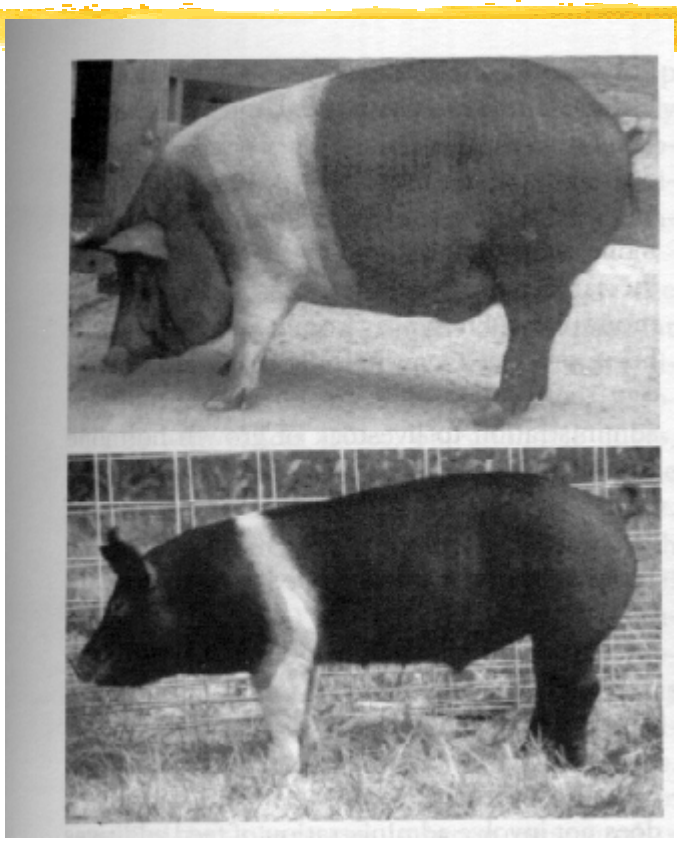
Why Study Nutrition?

AG 240



Less than 2% of the Population is involved in Agriculture

Source: American Farm Bureau Farm Facts



Genetic changes require different feeding regimes

Source: Contemporary Issues in Agriculture

Understand Feed Consumption

Feed Costs $$$$$$

- Comprise approximately 60% of annual cow costs in cow-calf operations
- 50-75% in other species

Should we feed cereal grains to people instead of animals?

Feed Grain Usage in U.S.

- Cattle consumed 19.1%
- Hogs consumed 23.1 %
- Poultry consumed 26.9%

Source: NCBA Cattle and Beef Handbook-1997

Justification?

- Livestock are efficient converters of grain to protein
- Livestock production and use of feed grains is not part of the world's hunger problem

Digestive Process

Types of diets

- Herbivore
- Carnivore
- Omnivore

Types of Digestive Systems

- Monogastric
- Ruminant

Digestion Definition

- Mechanical, chemical and enzymatic action necessary for food to be "usable" by body
  - "Usable" - Converting complex nutrients into forms that can be absorbed by animal

Digestive Steps

- Prehension
- Mastication
- Deglutition
- Regurgitation (ruminants only)

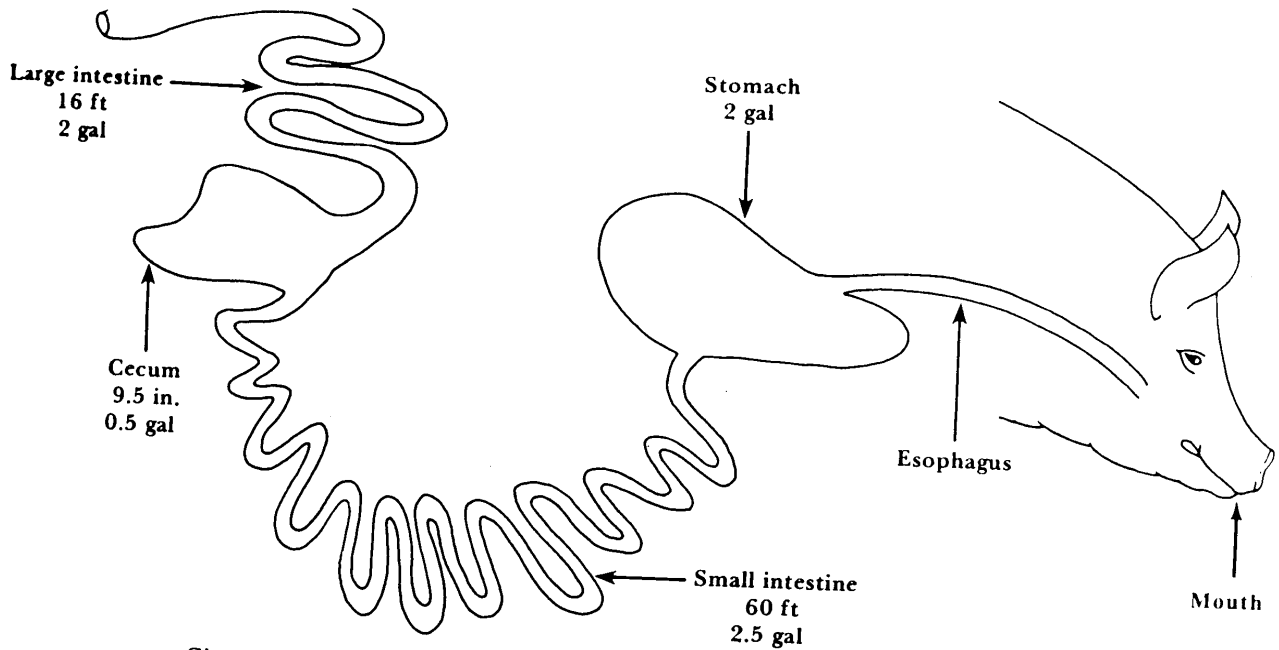
Digestive Steps con't

- Digestion
- Absorption
- Excretion

- Peristalsis

Monogastric Digestive System

- Simple stomach with one compartment



Simple digestive tract—14 × body length. Total capacity 7 gal. 44 teeth.

FIGURE 1–5. Digestive system of the pig.

Source: Animal Feeding and Nutrition (Jurgens)

Swine Structure

- Mouth
- Esophagus
- Glandular Stomach
- Small Intestine
- Large Intestine

Mouth and Esophagus

- Tongue
- Teeth
- Saliva (3 paired glands)
  - Water
  - Mucin
  - Bicarbonate salts
  - Amylase
- Esophagus connects mouth to stomach
- Sphincter Valve (cardiac)

Glandular Stomach Regions

- Esophageal
- Cardiac
- Fundic
- Pyloric

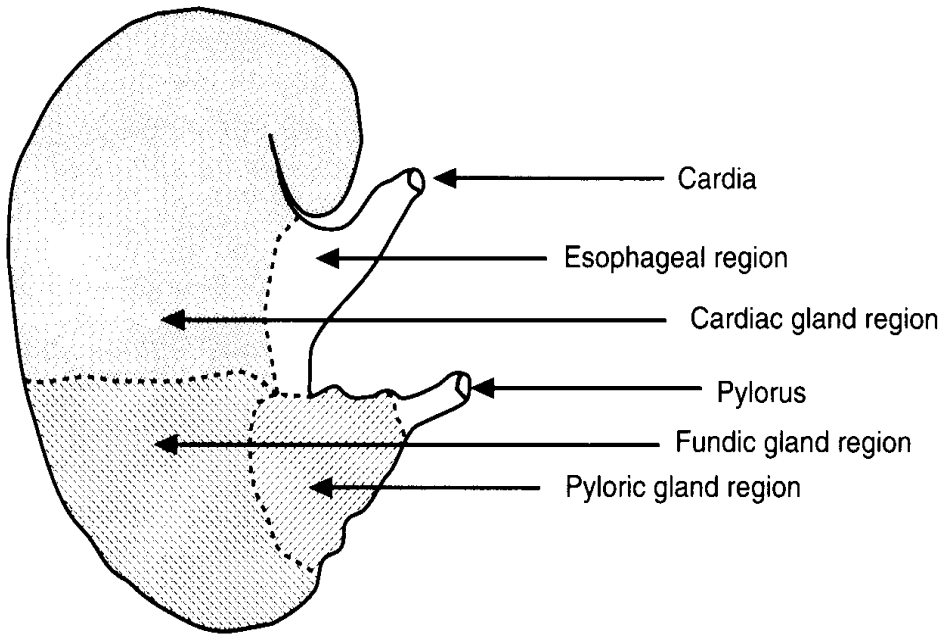
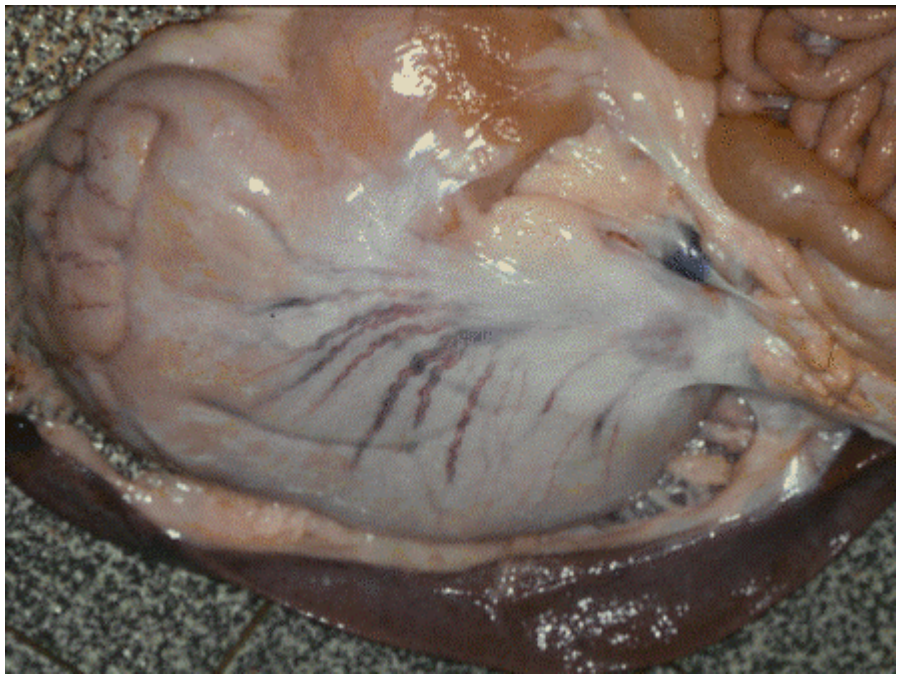


FIGURE 1–6. Swine stomach.

Chemical Digestion

- HCL
- Mucin
  - Coats the lining of the stomach
- Pepsinogen
  - Converts to Pepsin when food is present
- Rennin
- Lipase

Swine Stomach



Source: University of Guelph, Canada

Final notes on Swine Stomach

- pH of 2
  - Very acidic
  - Denatures proteins
- Chyme
  - Partially digested food leaving stomach
- Pylorus Sphincter
  - Separates stomach and small intestine

Swine Small Intestine

Source: University of Guelph, Canada

- Primary site of enzymatic digestion
- Walls lined with villi
- pH is 6 to 7
- Muscular contractions move food

Sections of Small Intestine

- Duodenum
  - Active site of Enzymatic digestion
  - Bile
    - Neutralizes pH of chyme
    - Produced by liver and stored in gall bladder
    - Emulsifies fats
  - Pancreatic enzymes

Sections of Small Intestine con't

- Jejunum
- Ileum

Primary site for nutrient absorption

Walls lined with villi

Large Intestine Functions

- Absorption of water
- Form solid waste
- Some microbial fermentation

Large Intestine Sections

- Cecum
  - Microbial digestion; very little in pig
- Colon
  - Largest part
  - Water absorption
- Rectum
  - Elimination of indigestible food

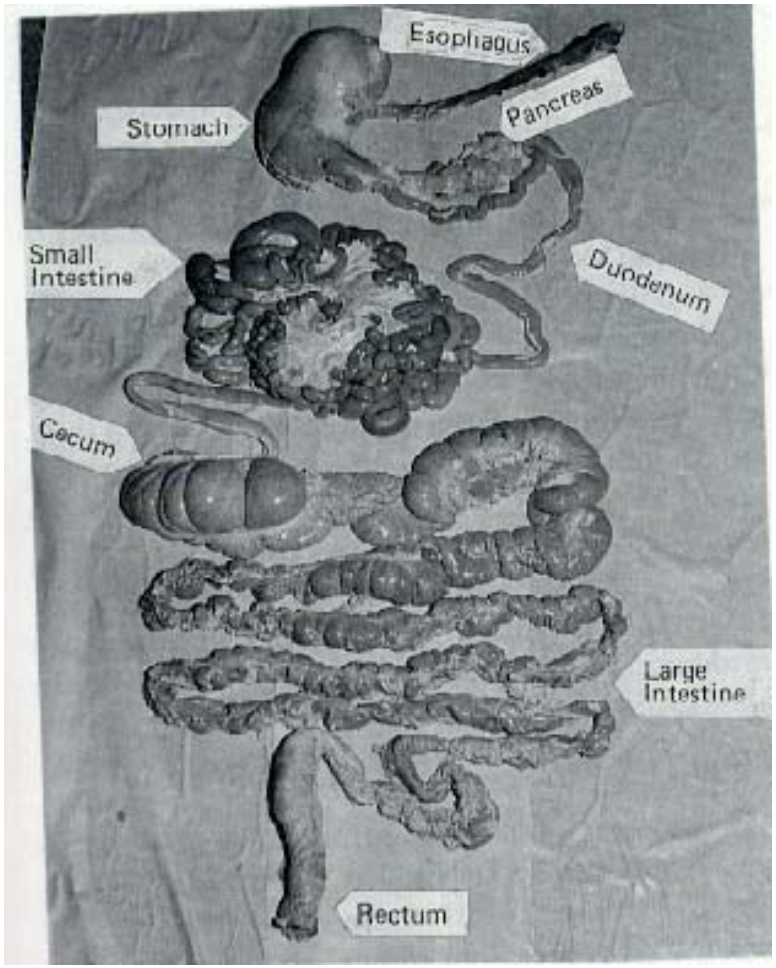
Swine Cecum

Source: University of Guelph, Canada

Functions of GI Tract

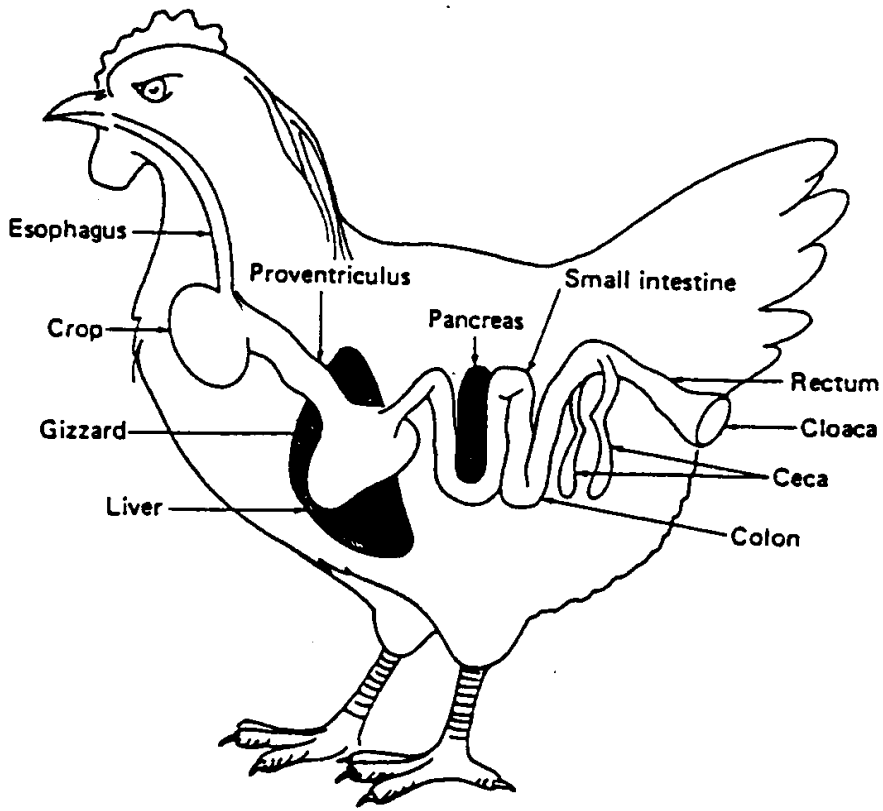
- Digestion
- Absorption
- Excretion of elements
- Synthesis of nutrients by micro-organisms
  - Copraphagy
    - Consuming own feces
    - Primarily in rabbits and rats

Swine Digestive System



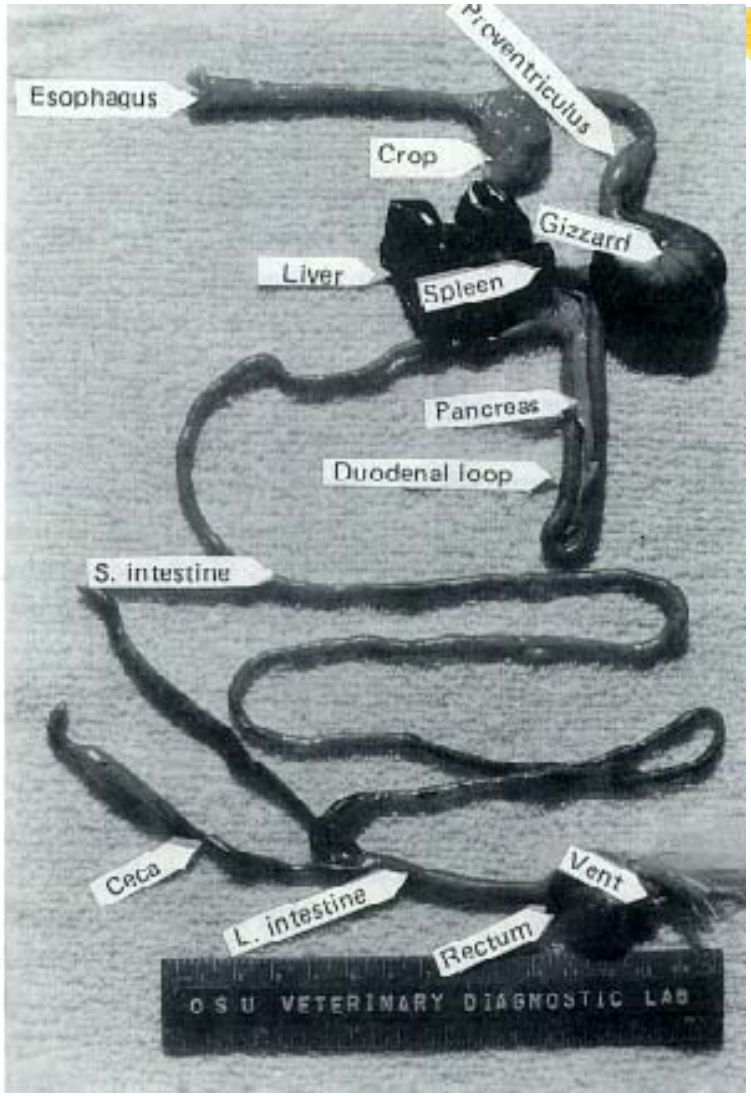
Source: Livestock Feeds & Feeding (Kellens/Church)

Chicken Differences



- Mouth
- Crop
- Proventriculus
- Gizzard

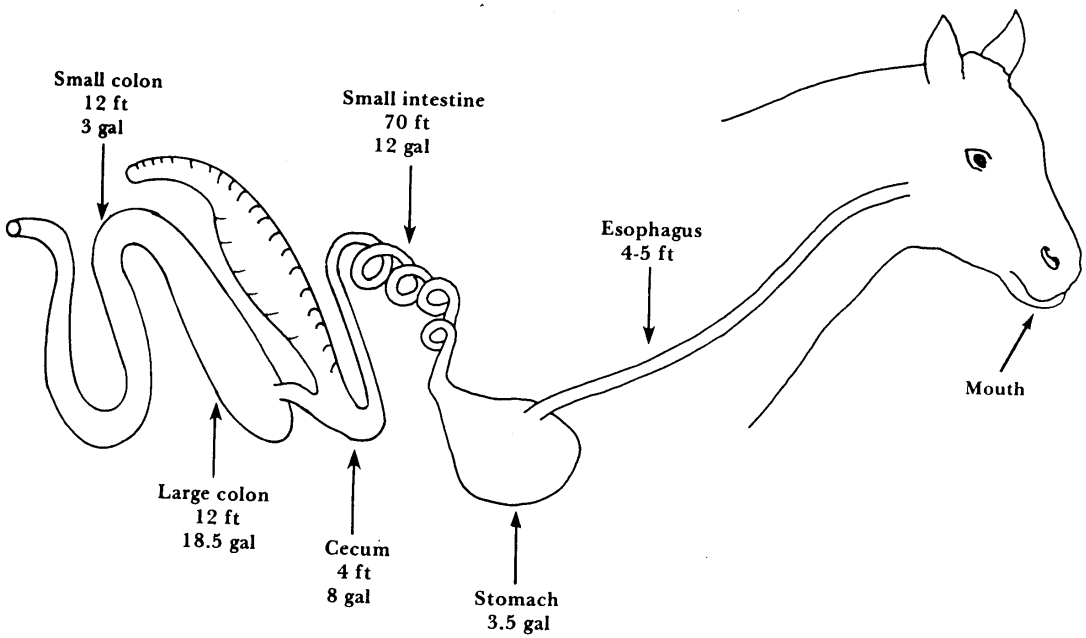
Chicken Differences con't



- Small Intestine
  - Very long
- Large Intestine
  - 2 ceca
  - Short LI
  - One excretory gland

Source: Livestock Feeds & Feeding (Kellens/Church)

Horse Differences



More complex digestive tract—12 X body length. Total capacity 45 gal. 40 or 42 teeth.

FIGURE 1–7. Digestive system of the horse.

- Mouth
- Esophagus
- Stomach
- Small Intestine
- Large Intestine
  - 60% of tract