

BIOLOGY 202 Lecture 14

Vertebrate Nutrition



M & H CHAP 27 exc 27.5

OUTLINE

- What Heterotrophs Need (and WHY)
- Adaptations for food-getting

JAWS and TEETH

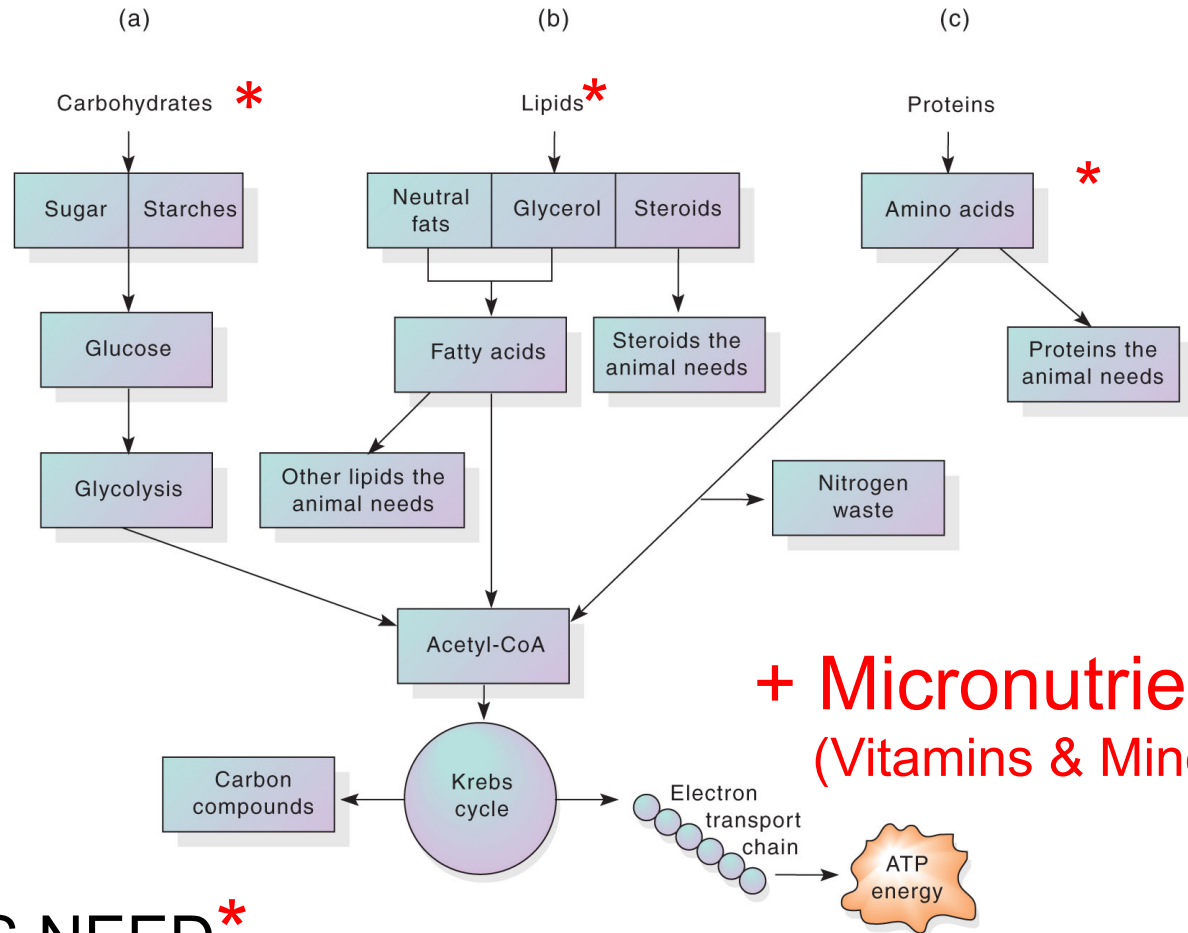
- Specialization of the Digestive Tract
- Vertebrate Learning & Food Acquisition

“Cognitive Ecology”

Figure 27.1

HETEROTROPHS: **ANIMALS**, fungi, many protists, bacteria

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+ Micronutrients:
(Vitamins & Minerals)

WHAT ANIMALS NEED*

M & H FIG 27.1

How is it adaptive to lose biosynthetic pathways for complex organic molecules?

OMNIVORY = *relaxed* selection pressure to maintain biosynthetic abilities for widely available molecules

Amino acids*

histidine	leucine
isoleucine	lysine
phenylalanine	valine
threonine	tryptophan
methionine	

Fatty acids*

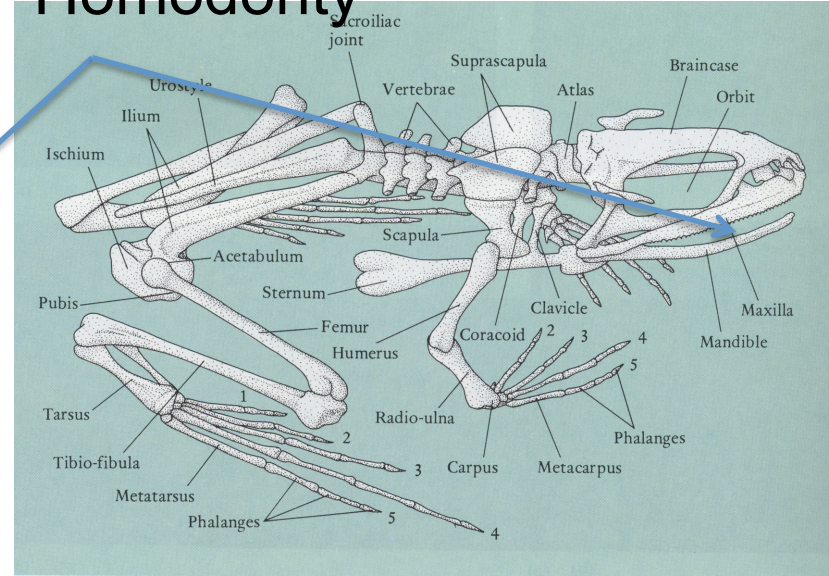
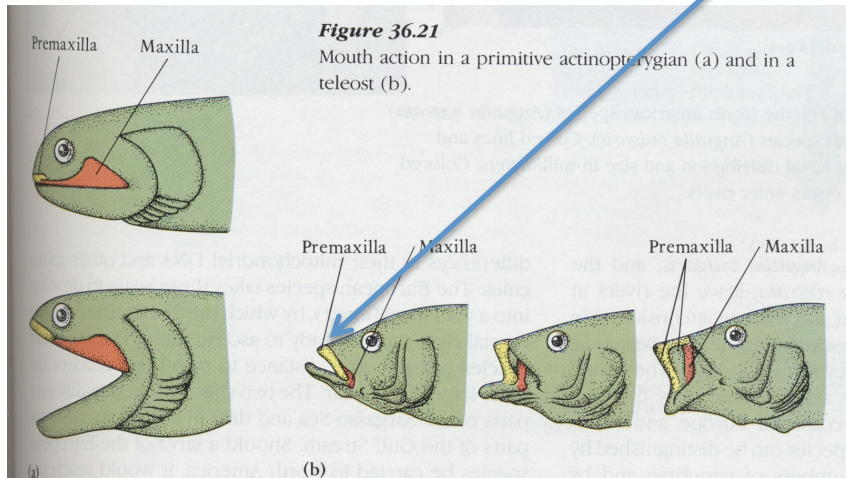
linoleic
alpha-linolenic

* These are “Essential” in humans

Vertebrate Jaws

Homodonty

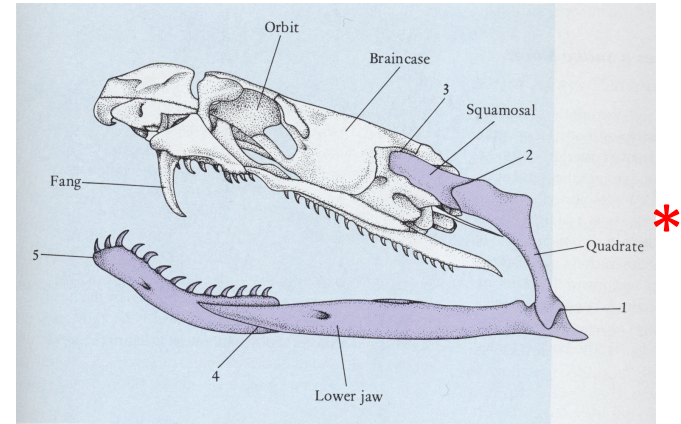
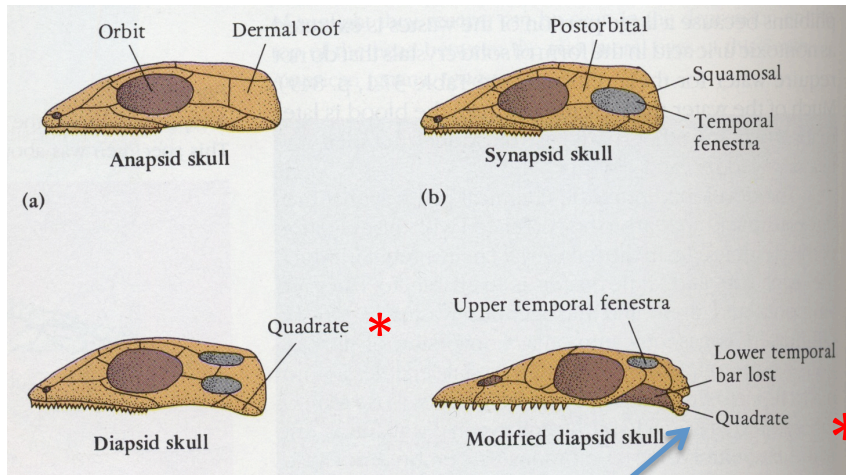
Premaxilla & maxilla of teleosts
= more effective prey capture



Frogs use jaws, tongue & inertial feeding
Epomis ground beetle larva lure frogs
PLoS One (2011)

Vertebrate Jaws

Reptiles (DIAPSIDS)



SNAKE JAWS: 5 movable points

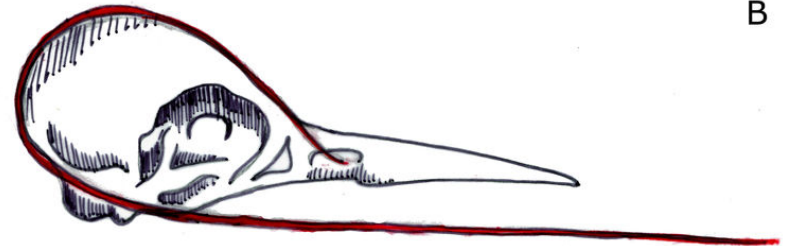
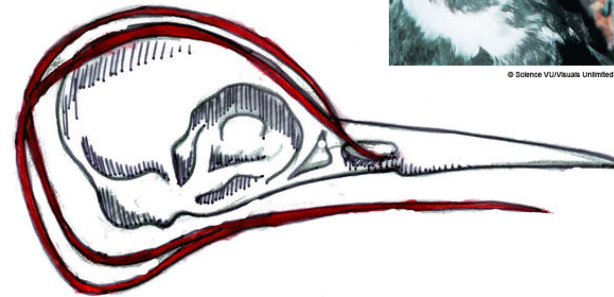
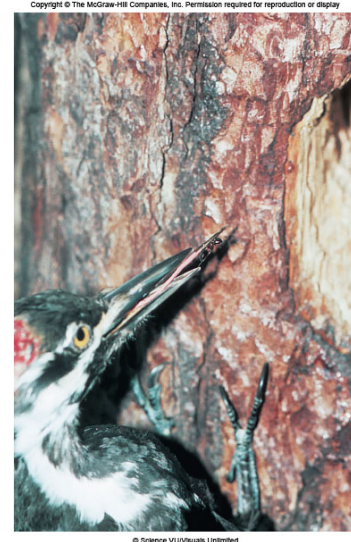
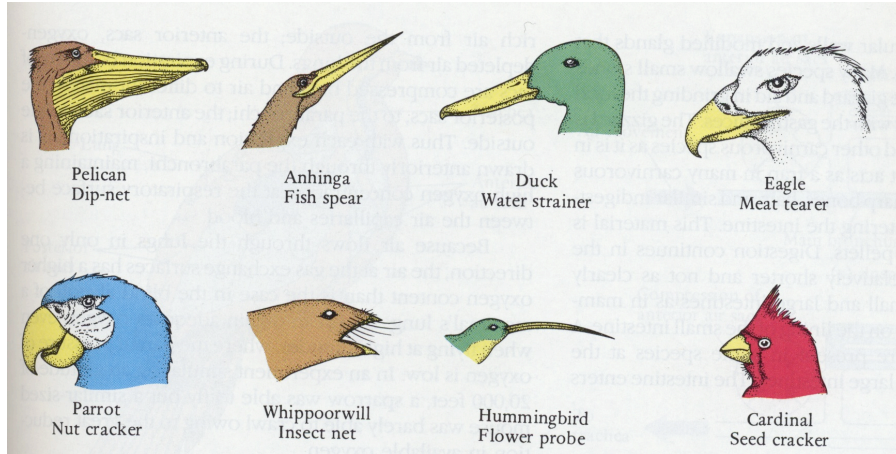
ROCK PYTHON: M & H pg 509

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Loss of lower temporal bar
=open jaw widely (lizards)

Vertebrate Jaws: Beaks

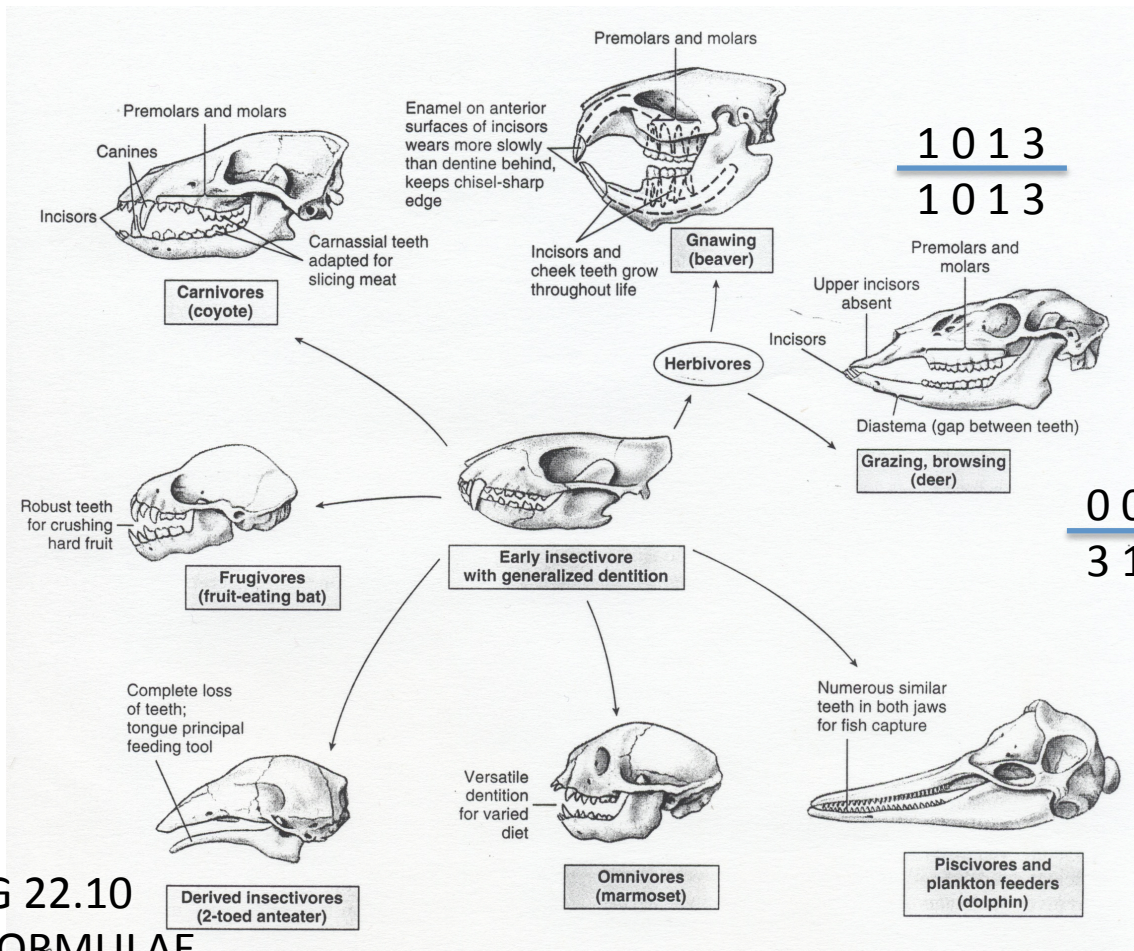


BIRDS:
Lack teeth
Bills & tongues highly modified
Consume high calorie food

Woodpecker tongue sheathed *in hyoid apparatus*

Mammal Jaws & Heterodont Teeth

3 1 4 2
3 1 4 2



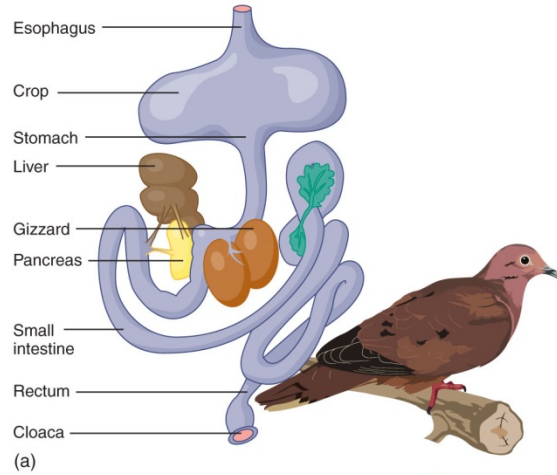
SEE M & H FIG 22.10
For DENTAL FORMULAE



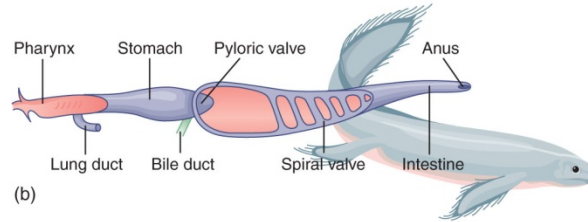
Figure 27.8

Digestive Tract Specialties

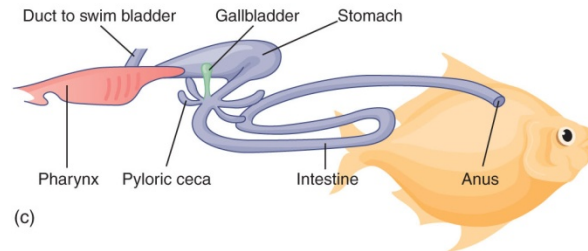
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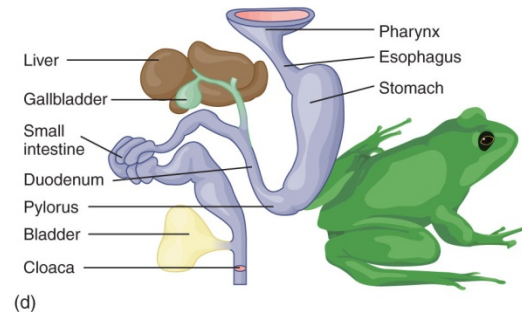
Large crop
Gizzard
Small short intestine



Spiral valve extends entire intestine



(c)

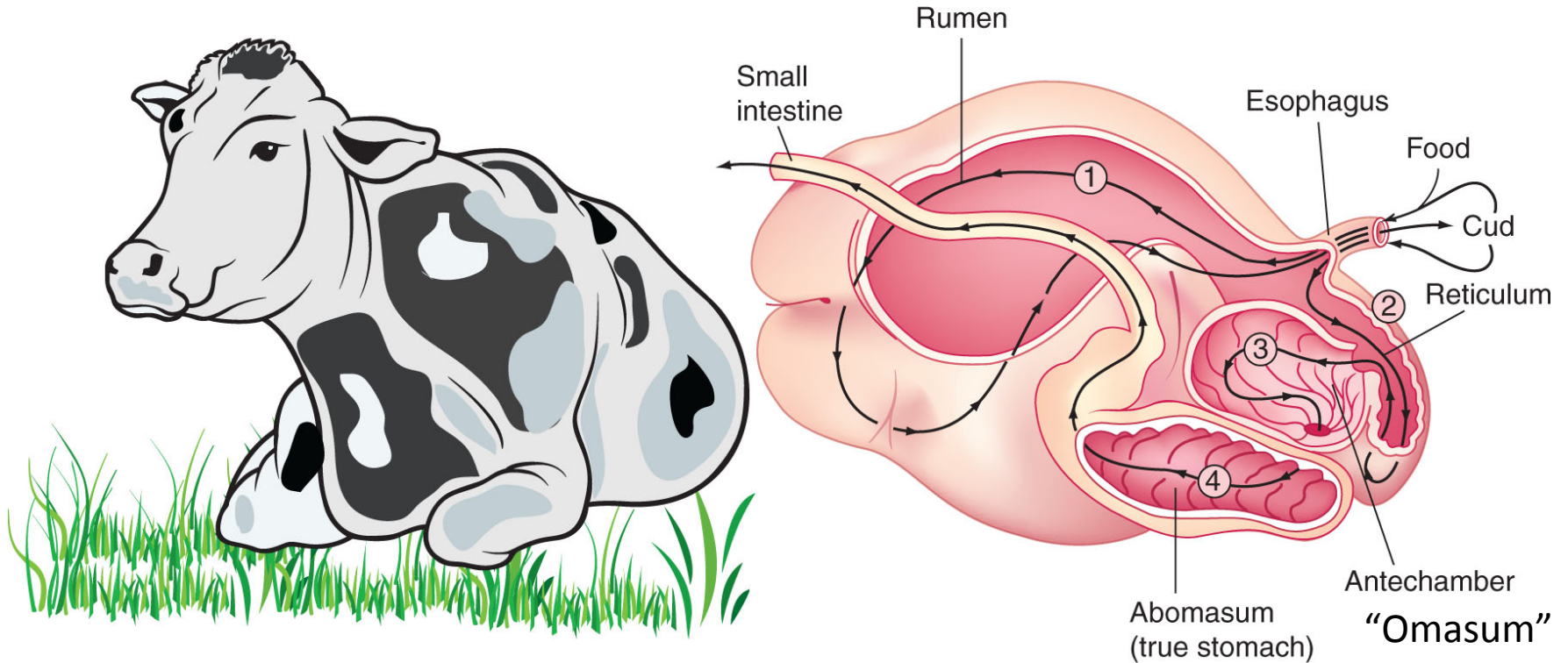


(d)

Intestine longer than most fish
Chitinase enzyme

Ruminant herbivores digest cellulose in rumen & reticulum

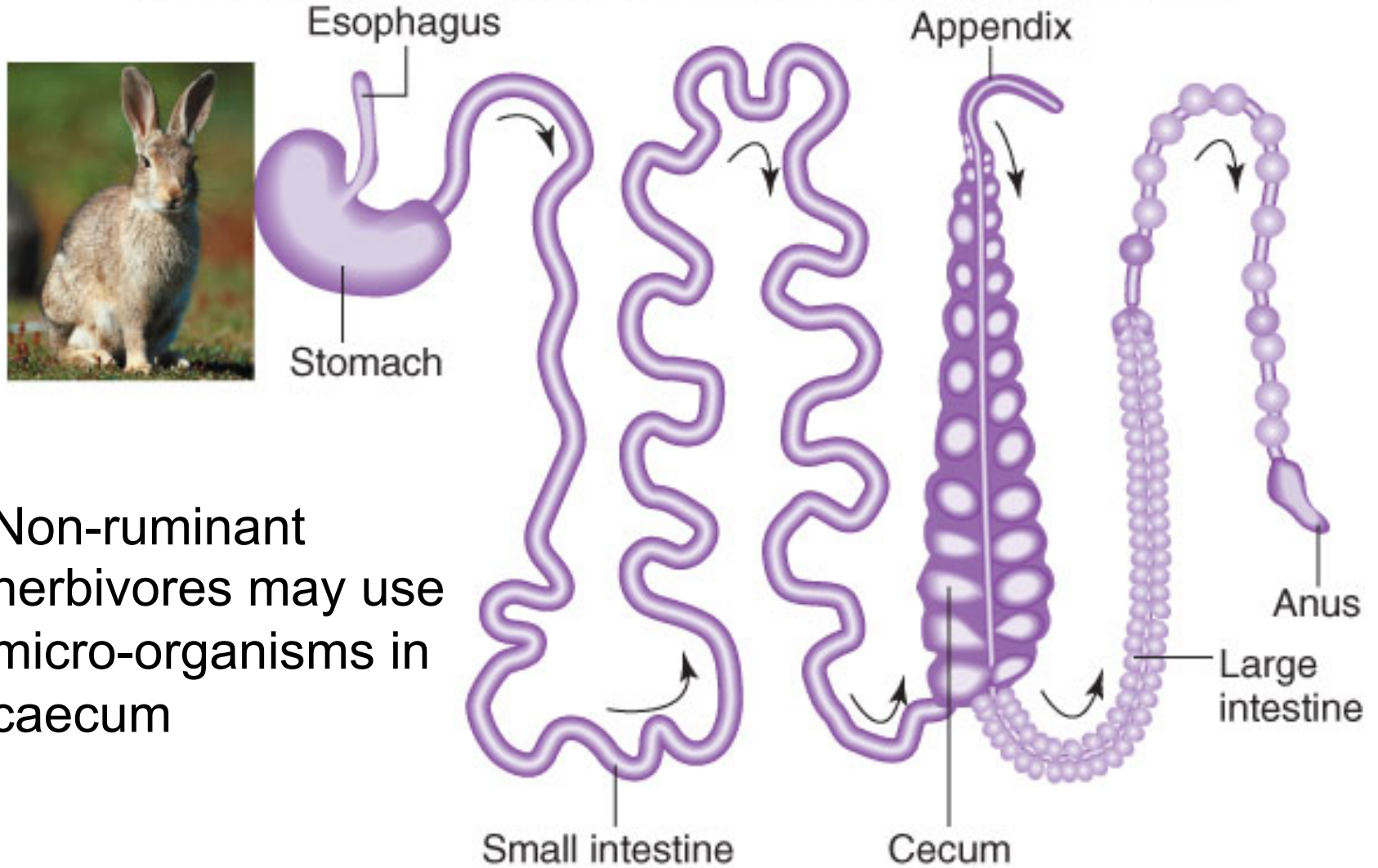
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Why the rumen strategy is not perfect.....

Figure 27.10

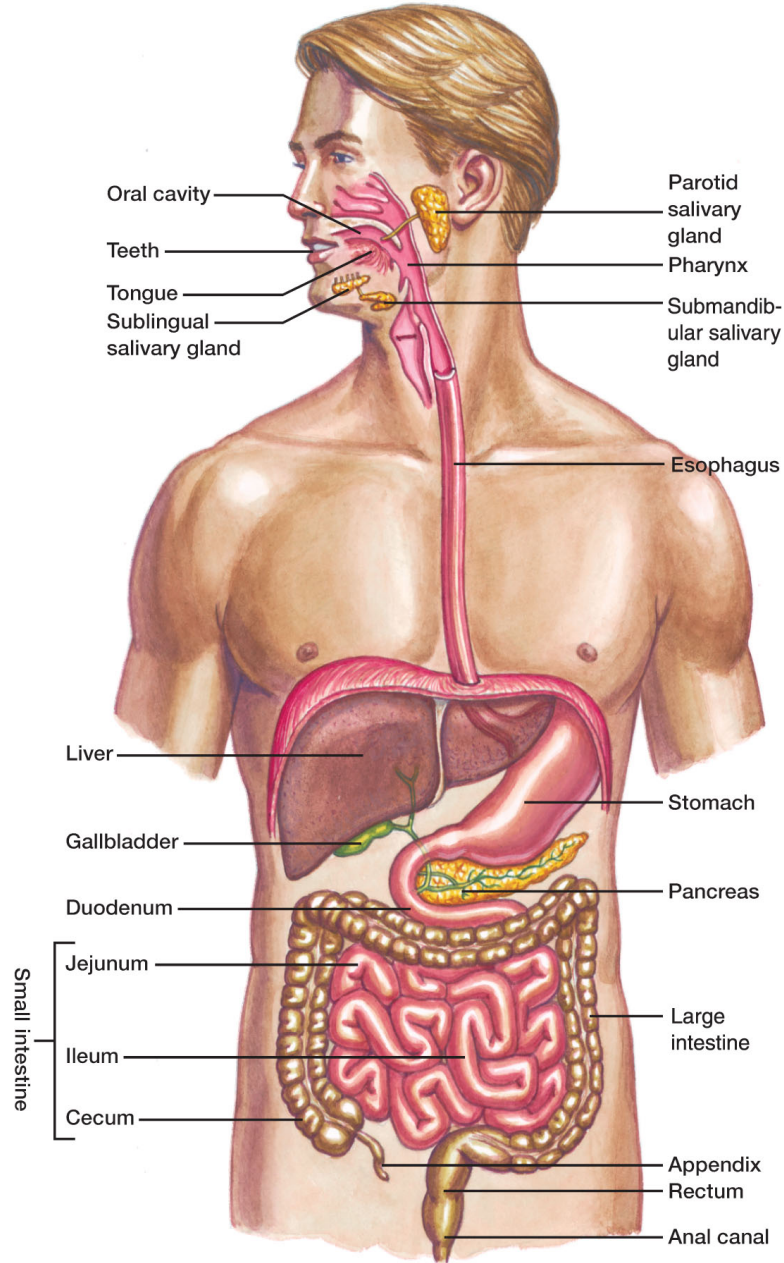
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Non-ruminant herbivores may use micro-organisms in caecum

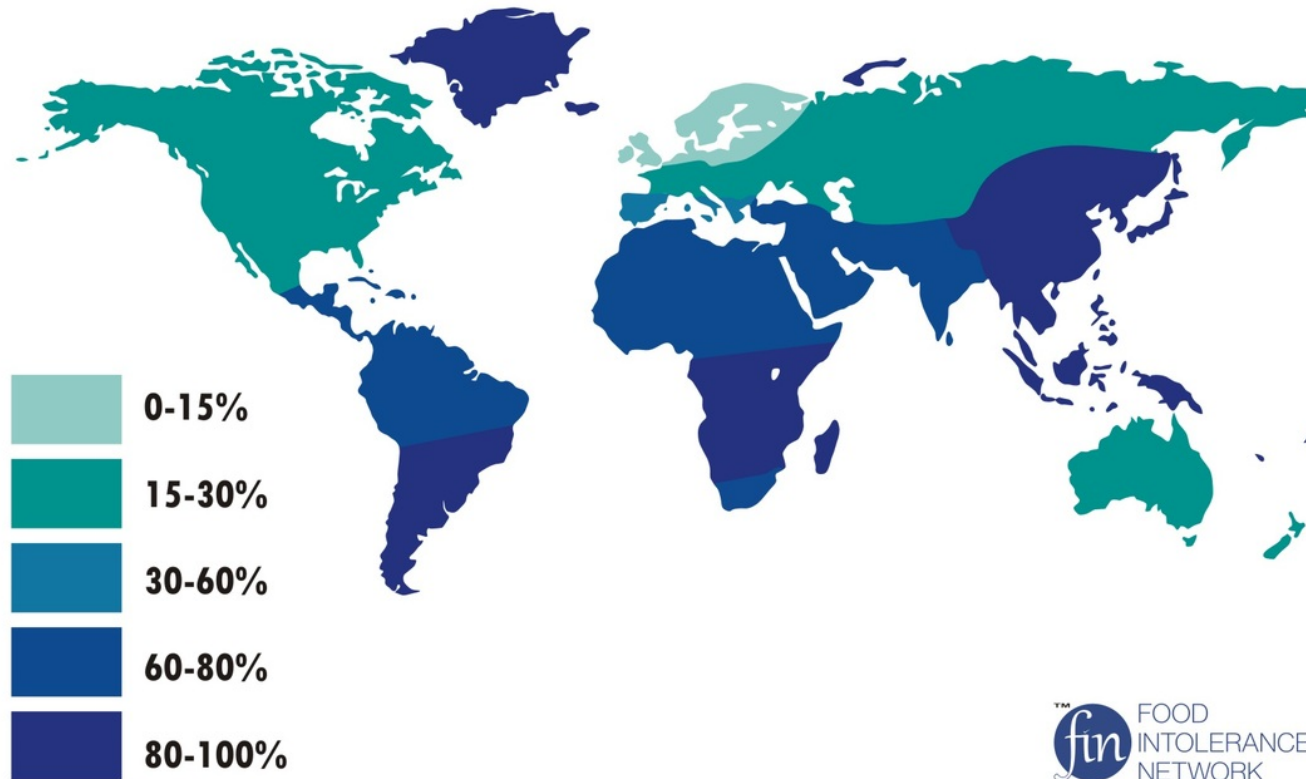
Figure 27.11

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Variation in Human Lactose Intolerance

Worldwide prevalence of lactose intolerance in recent populations
(schematic)



Behavioural Adaptations for Food Acquisition in Vertebrates

- Learning
 - Trial & Error
 - Observation – Horizontal or Vertical Information Transmission
- Environmental Manipulation
 - Tool use
 - Co-operation