

Chapter 12: Ingestive Behavior

Physiological Regulatory Mechanisms

Fluid Regulation

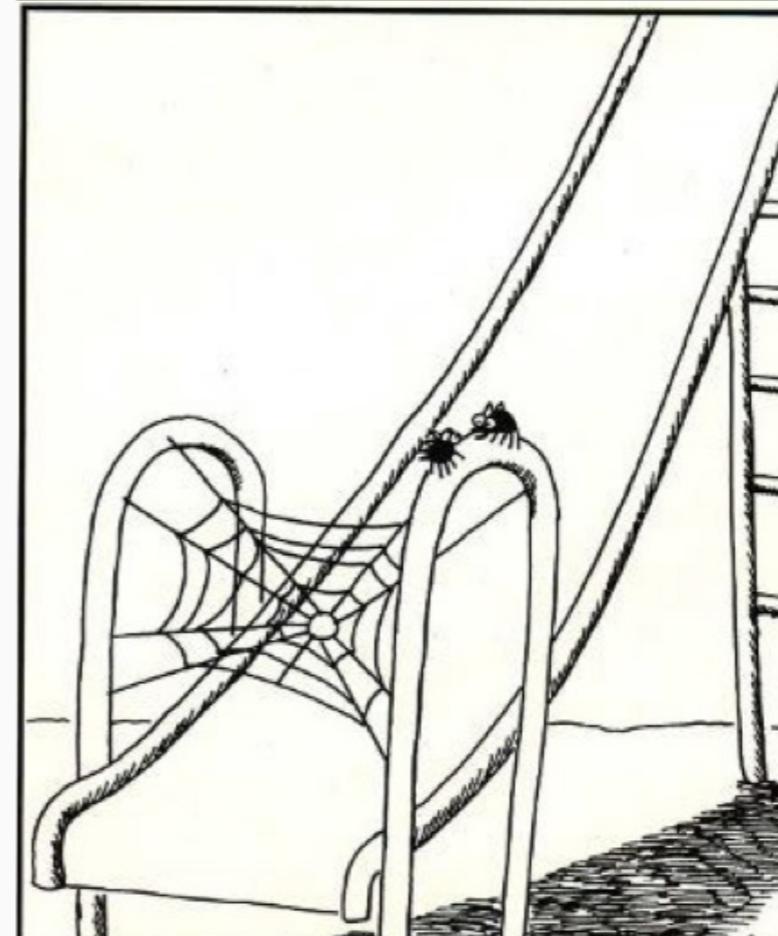
Nutrition and Metabolism

metabolism

hunger and satiety

neural mechanisms

Obesity and Anorexia / Bulimia



"If we pull this off, we'll eat like kings."

Nutrition and Metabolism

Metabolism.

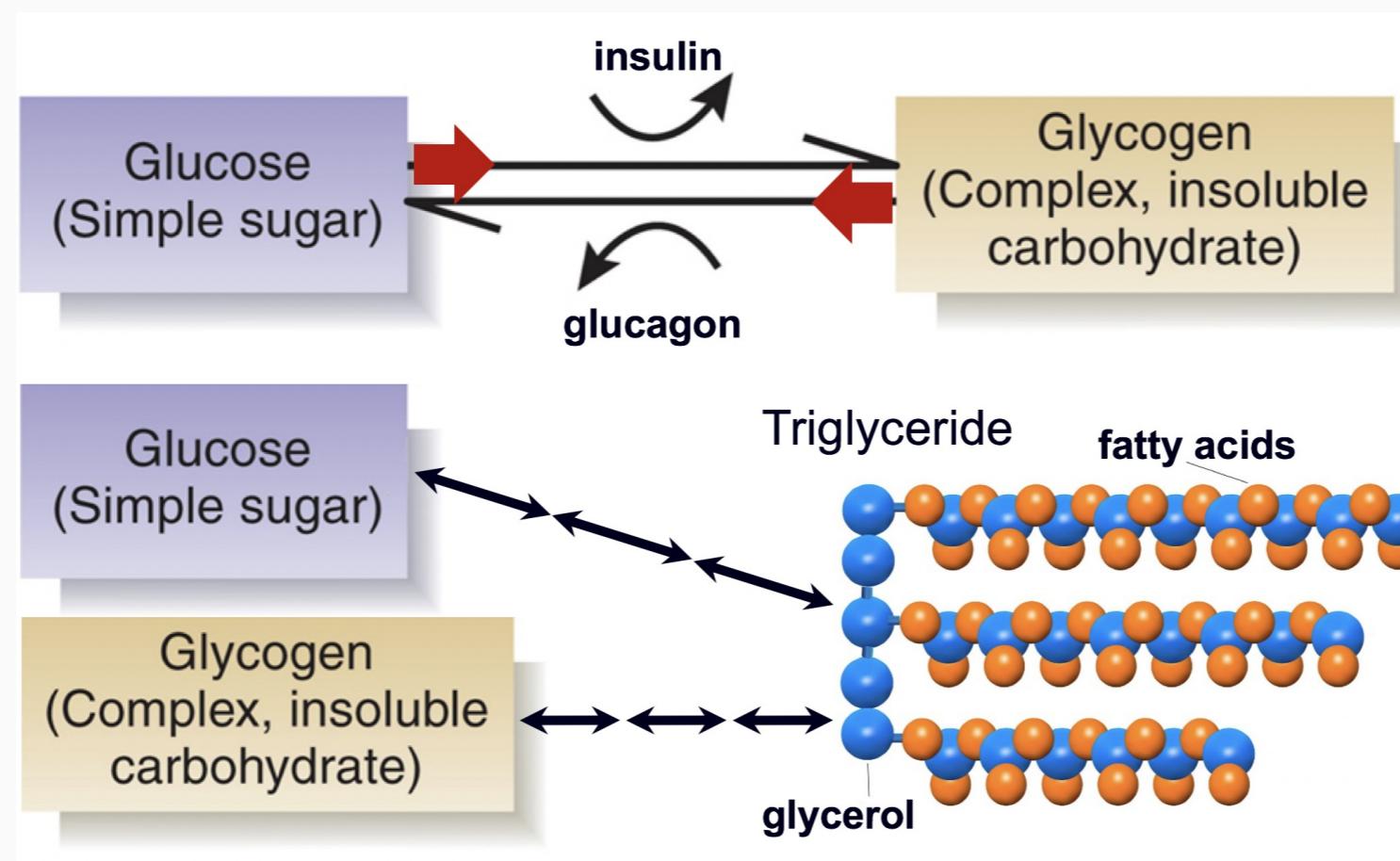
- **fluid homeostasis** = regulation of H₂O and NaCl
- **nutritional homeostasis** = regulation of carbohydrates, fats, amino acids, vitamins, and minerals
- foods serve 2 purposes:
 - building blocks for repair and maintenance
 - energy metabolism



Nutrition and Metabolism

Metabolism.

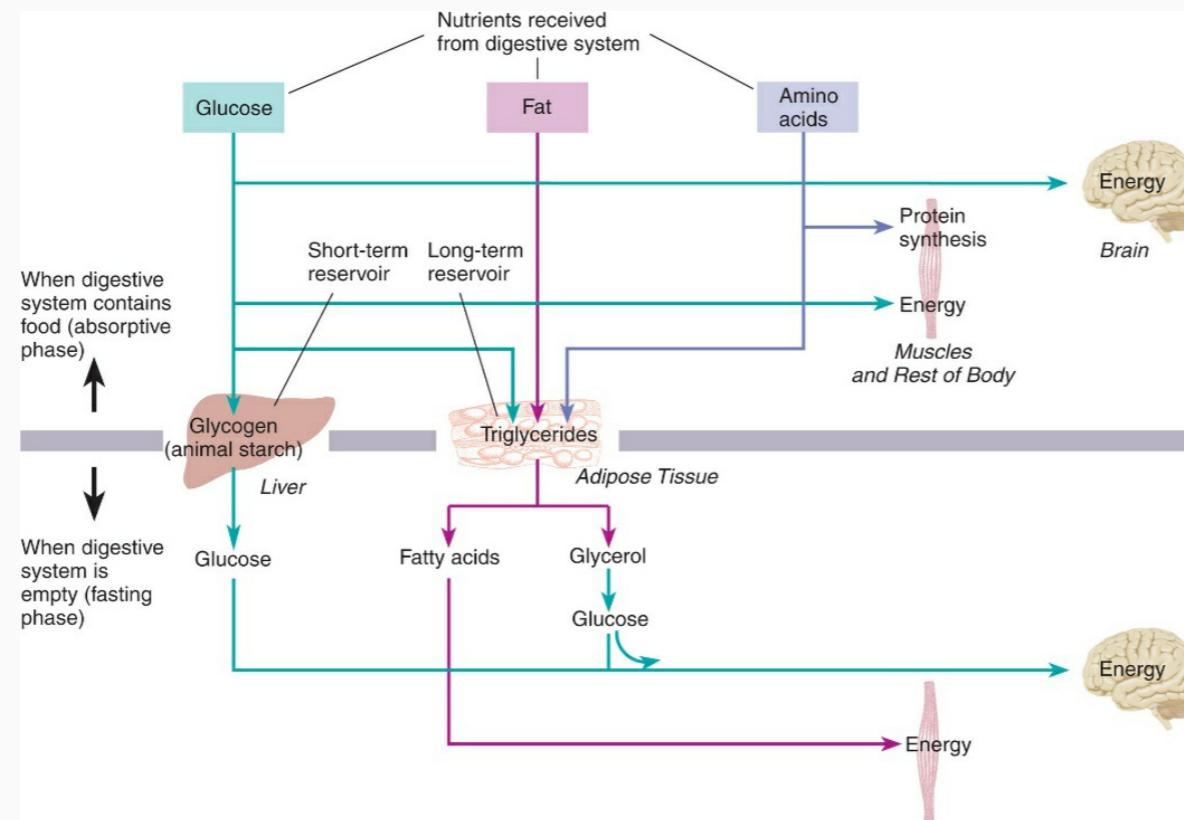
- **short-term storage** = glycogen
- **long-term** = fat (triglycerides)



Nutrition and Metabolism

Metabolism - absorptive and fasting phases.

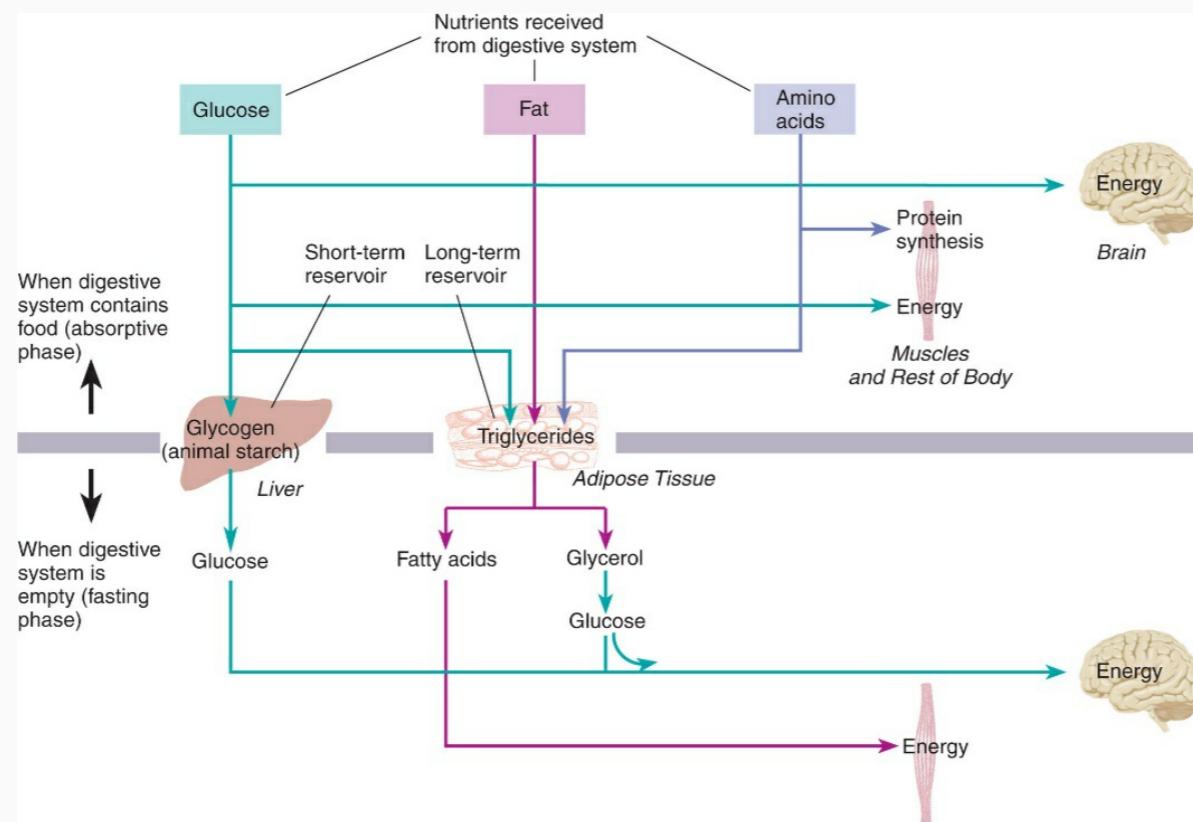
- **absorptive phase** = nutrients absorbed from digestion
- glucose and AAs are principal sources of energy



Nutrition and Metabolism

Metabolism - absorptive and fasting phases.

- **fasting phase** = nutrients not available from digestion
- glucose, AAs, FFAs from glycogen, protein, triglycerides



Nutrition and Metabolism

Hunger - What starts a meal?

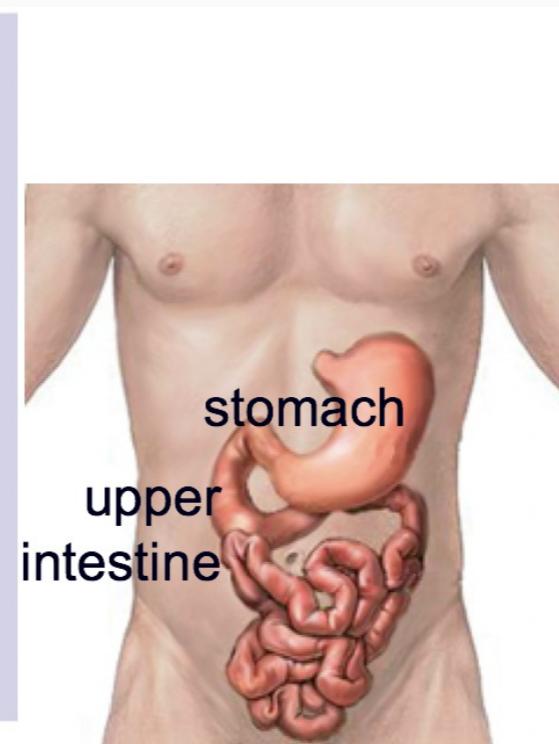
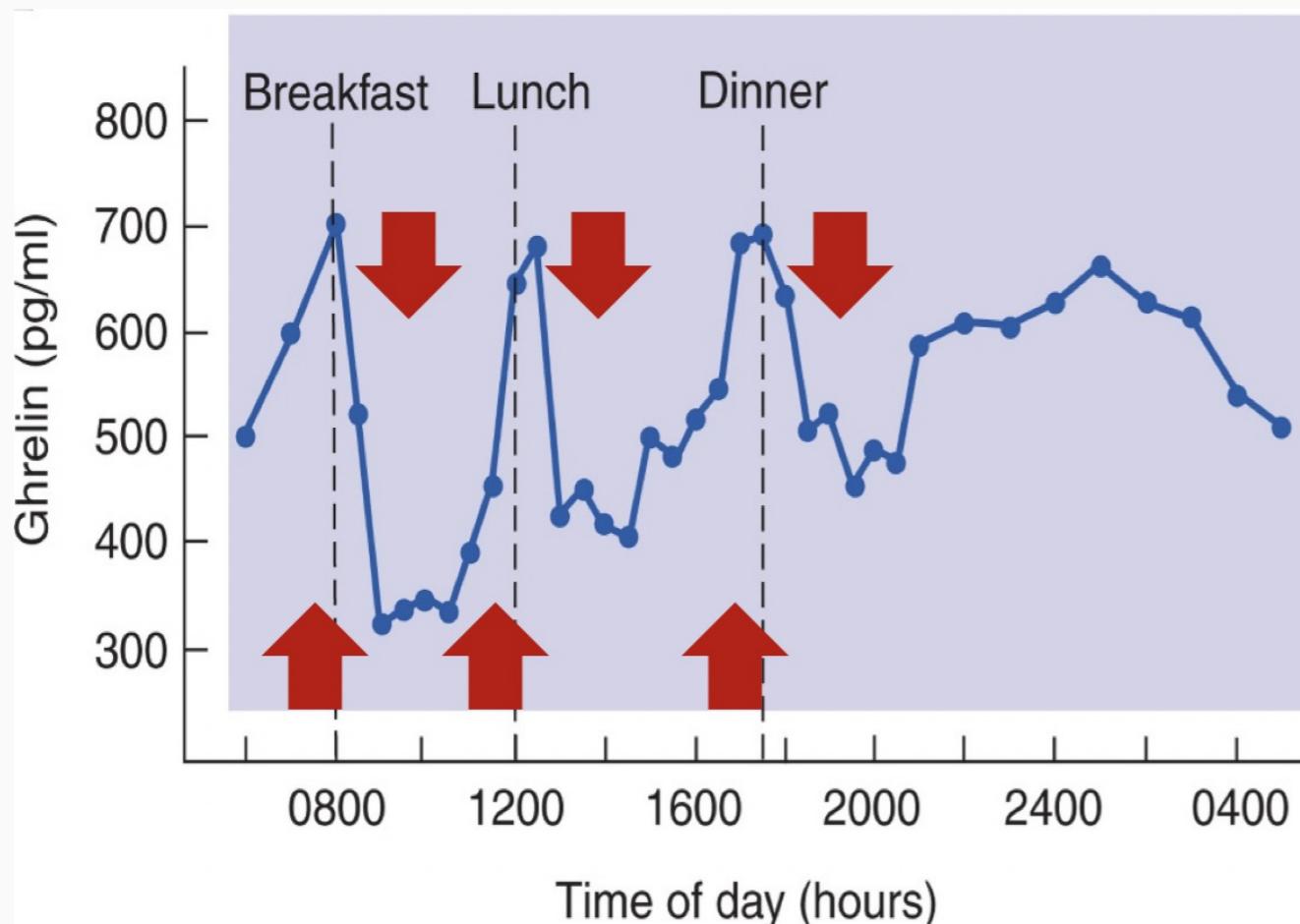
- environmental cues
 - sights and smells of appetizing food
 - social cues and conventions
 - habit
-
- **caloric homeostasis model:**
 - hunger is consequence of gradual depletion of satiety signals generated by previous meal



Nutrition and Metabolism

Hunger - What starts a meal?

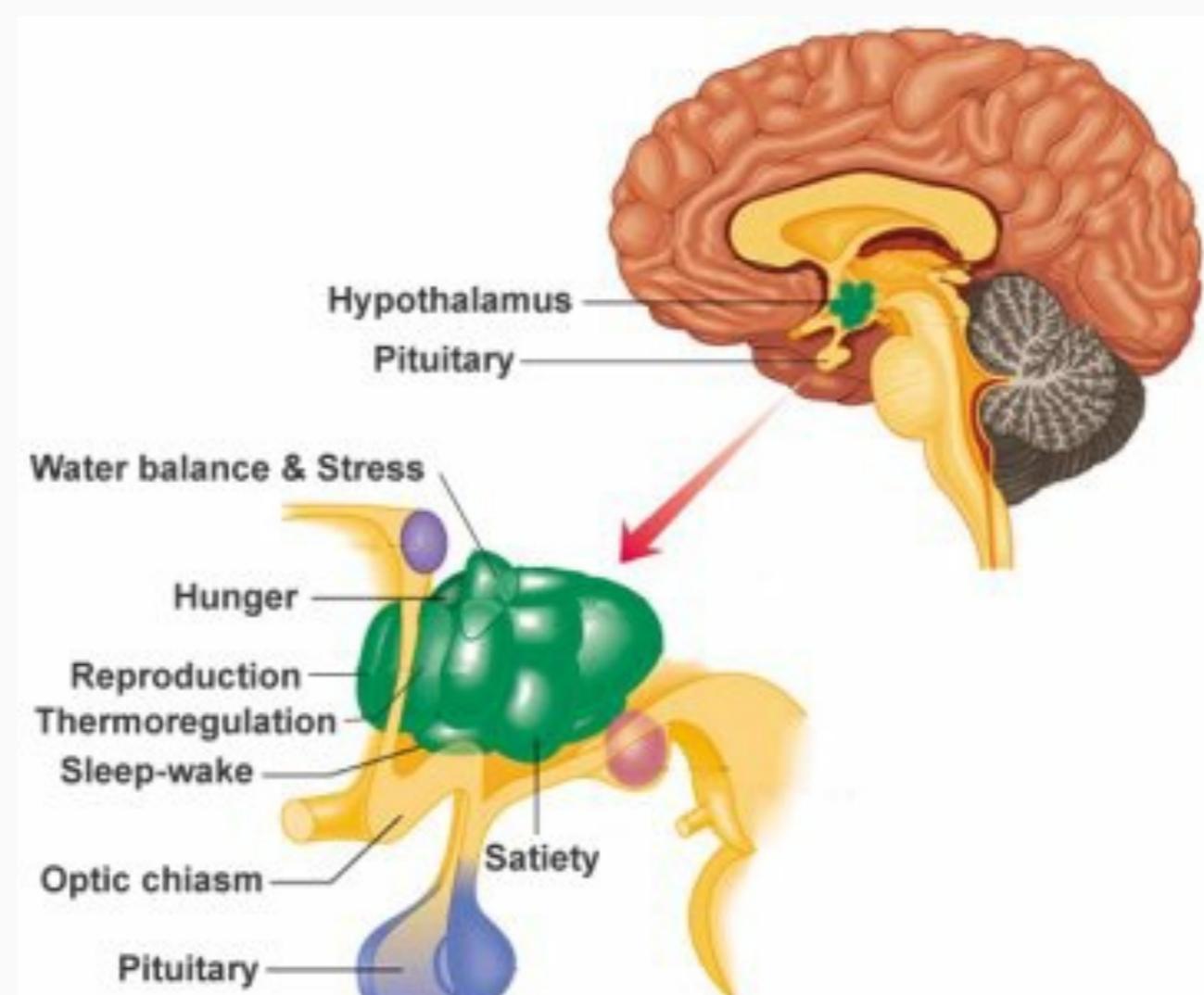
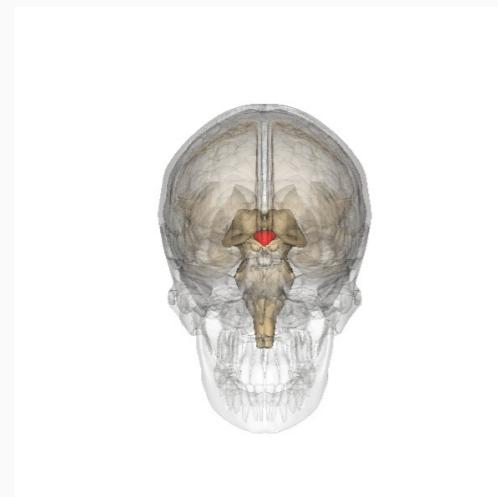
- gastric, hormonal, and nutrient cues
- increases in plasma ghrelin
- glucoprivation/lipoprivation



Nutrition and Metabolism

Hunger - What starts a meal?

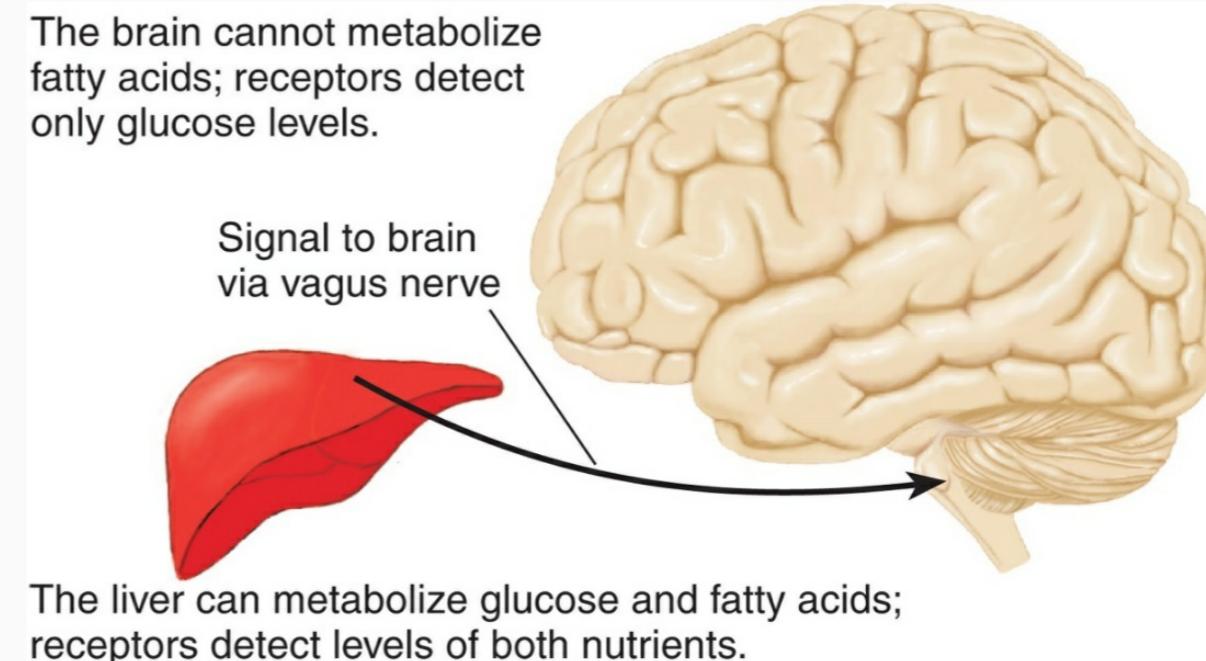
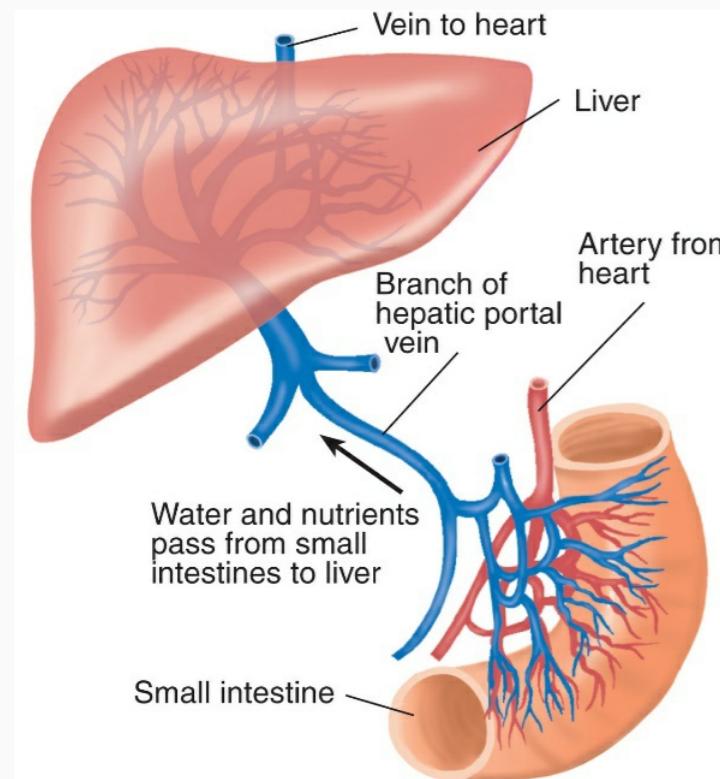
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Nutrition and Metabolism

Hunger - What starts a meal?

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Nutrition and Metabolism

What stops a meal - satiety signals.

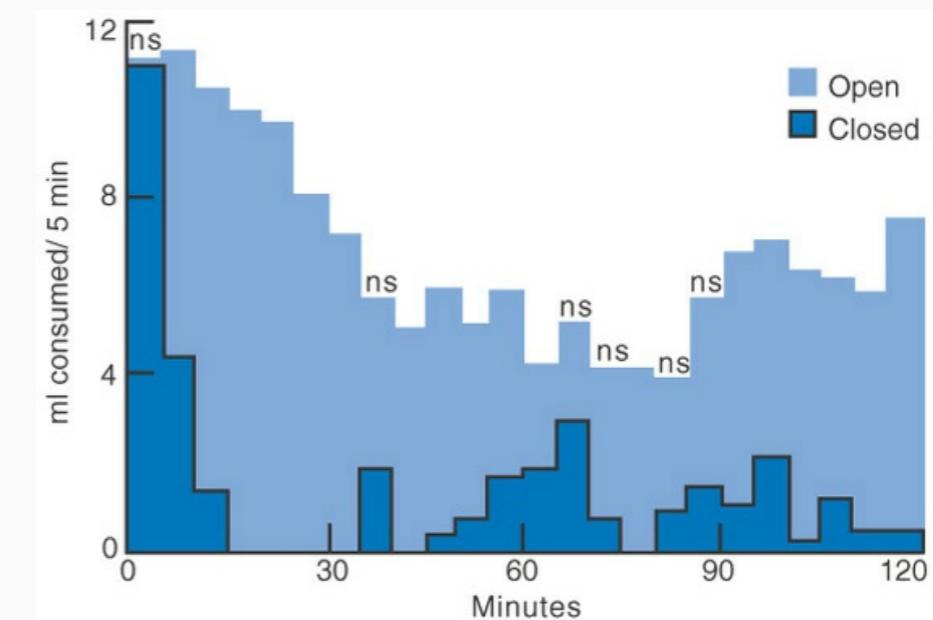
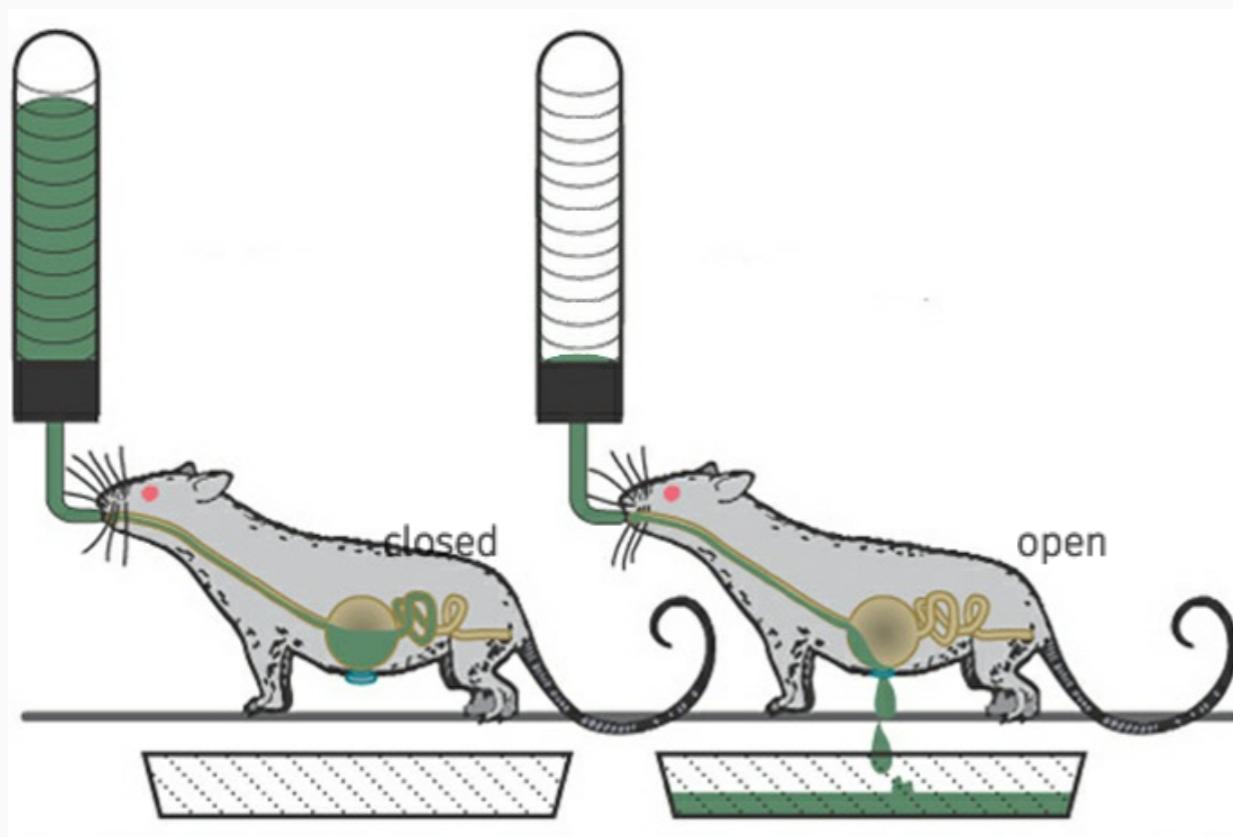
- short-term satiety signals:
- meals end before absorption of nutrients, anticipation
- head, gastric, intestinal, liver, and pancreatic factors
- long-term satiety signals:
- adipose signals



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

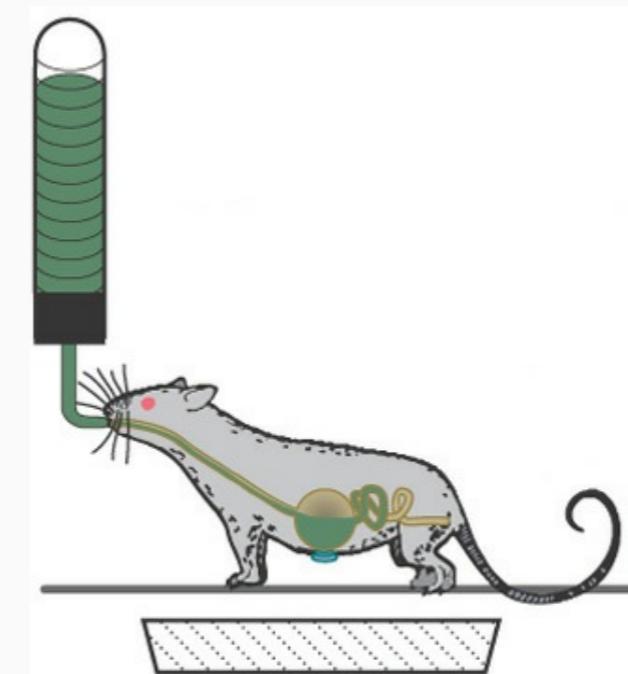
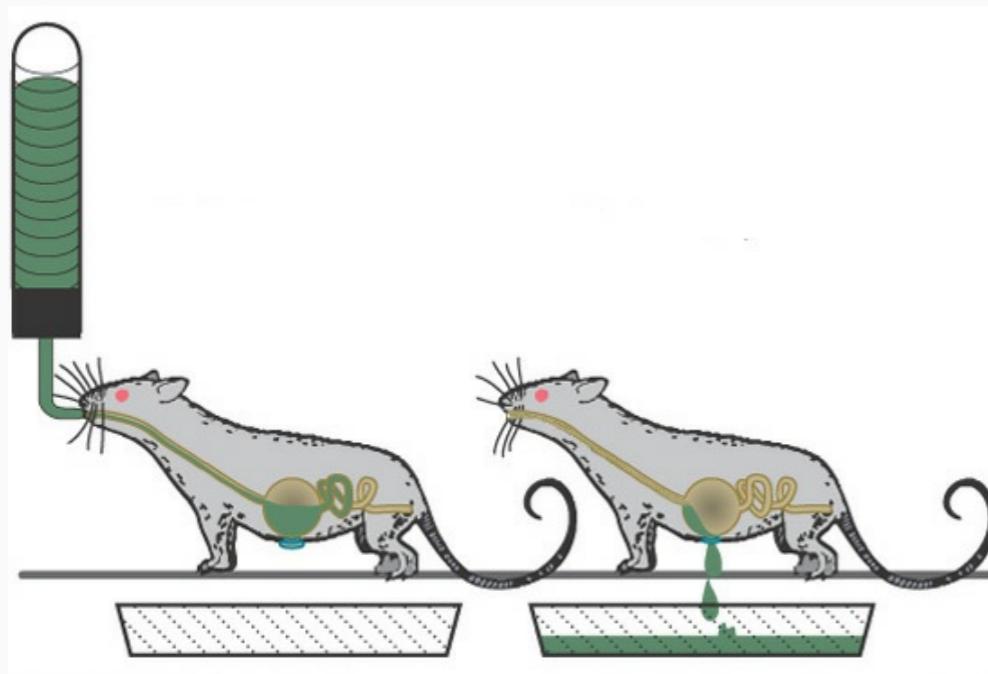
- head factors (sight, smell, taste, texture of food) play a minor and very short-term role
- animal with gastric fistula will eat continuously



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

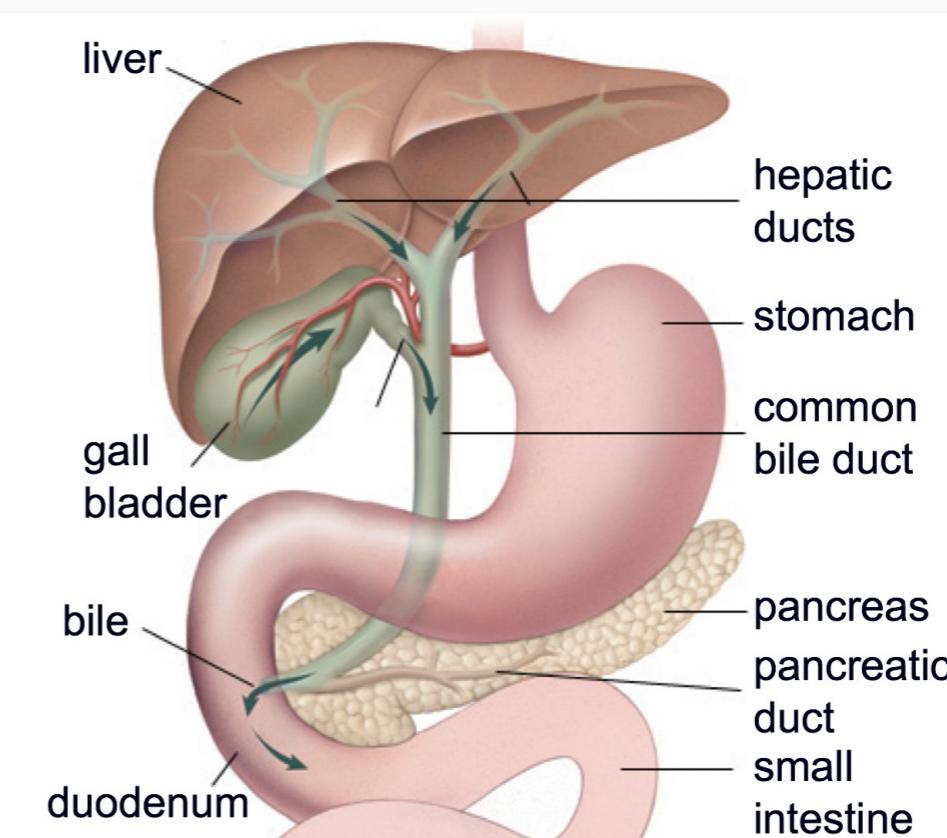
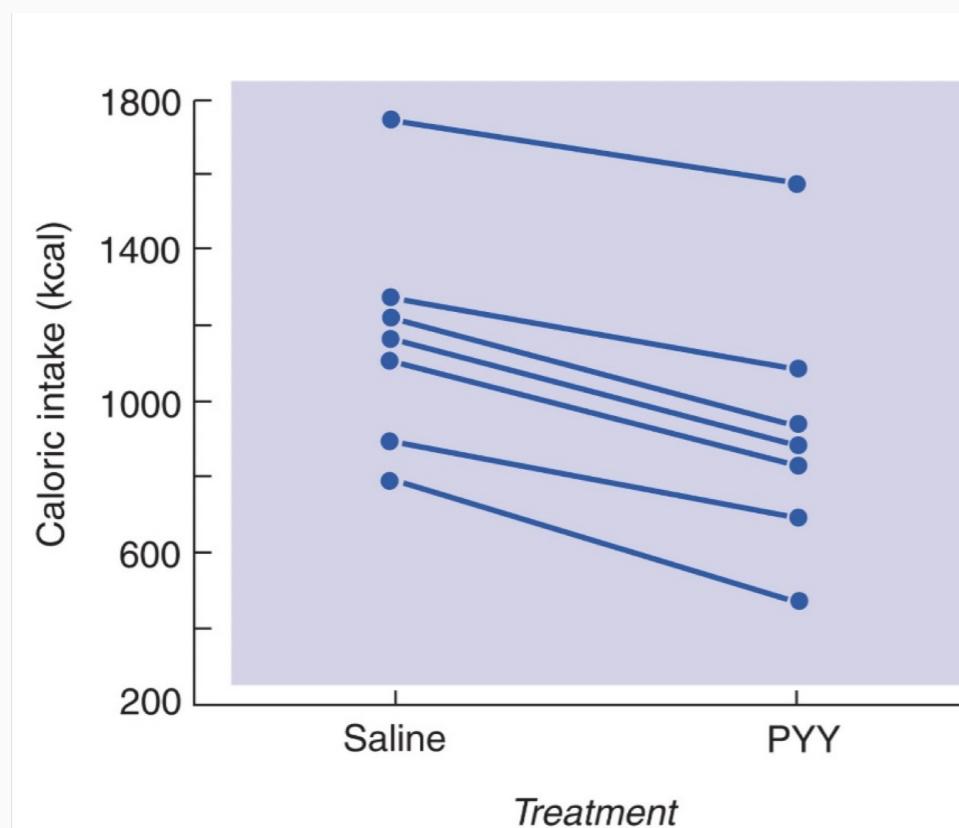
- stomach (gastric) factors (monitoring nutritional content)
- rat feeds freely, food removed from stomach, rat returns to eat almost exact same quantity of food
- not just distension, effect persists if rat is infused with non-nutritive saline solution



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

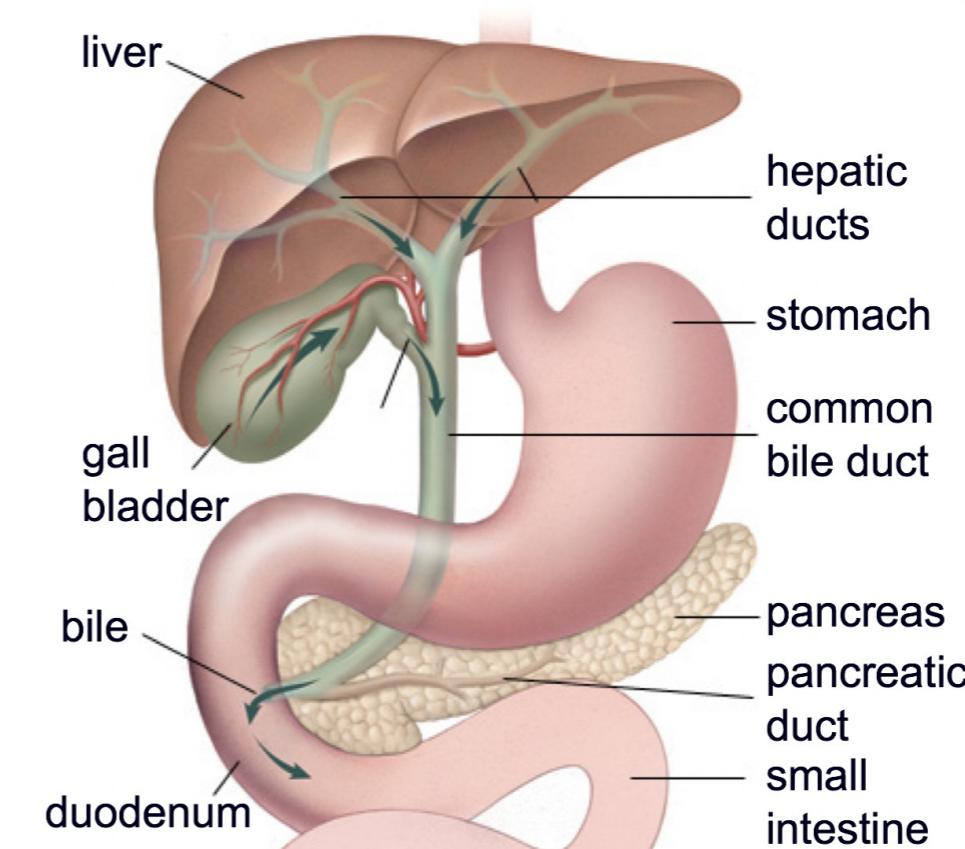
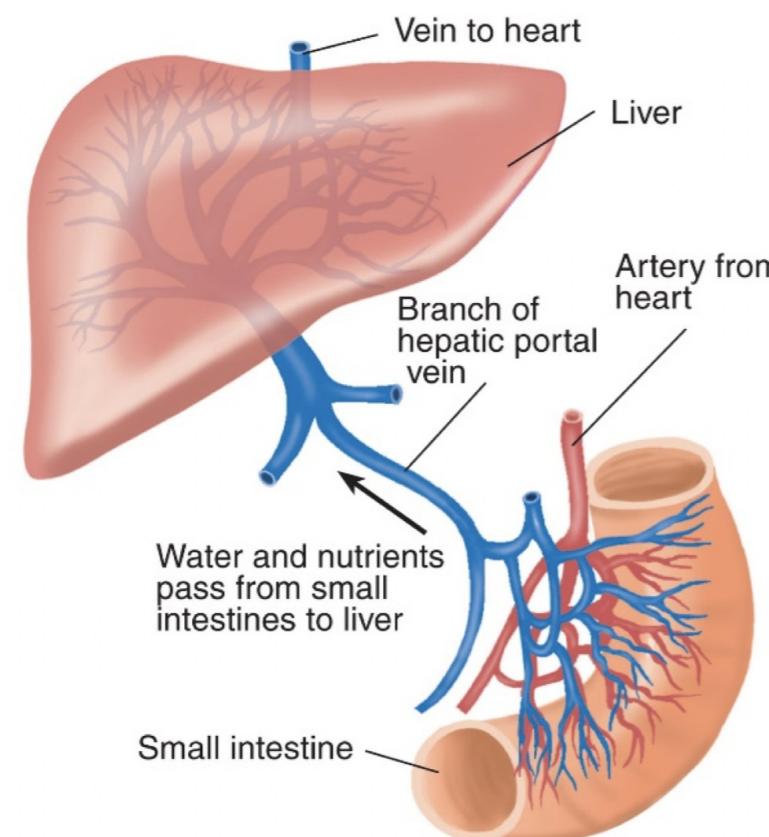
- intestinal factors (monitoring nutritional content of food)
- as food enters duodenum, ghrelin release suppressed
- duodenum senses fat content, releases CCK causing gall bladder to release bile (breaks down fat)
- CCK inhibits gastric transit of food, suppresses eating
- small intestine secretes PYY, induces satiety



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

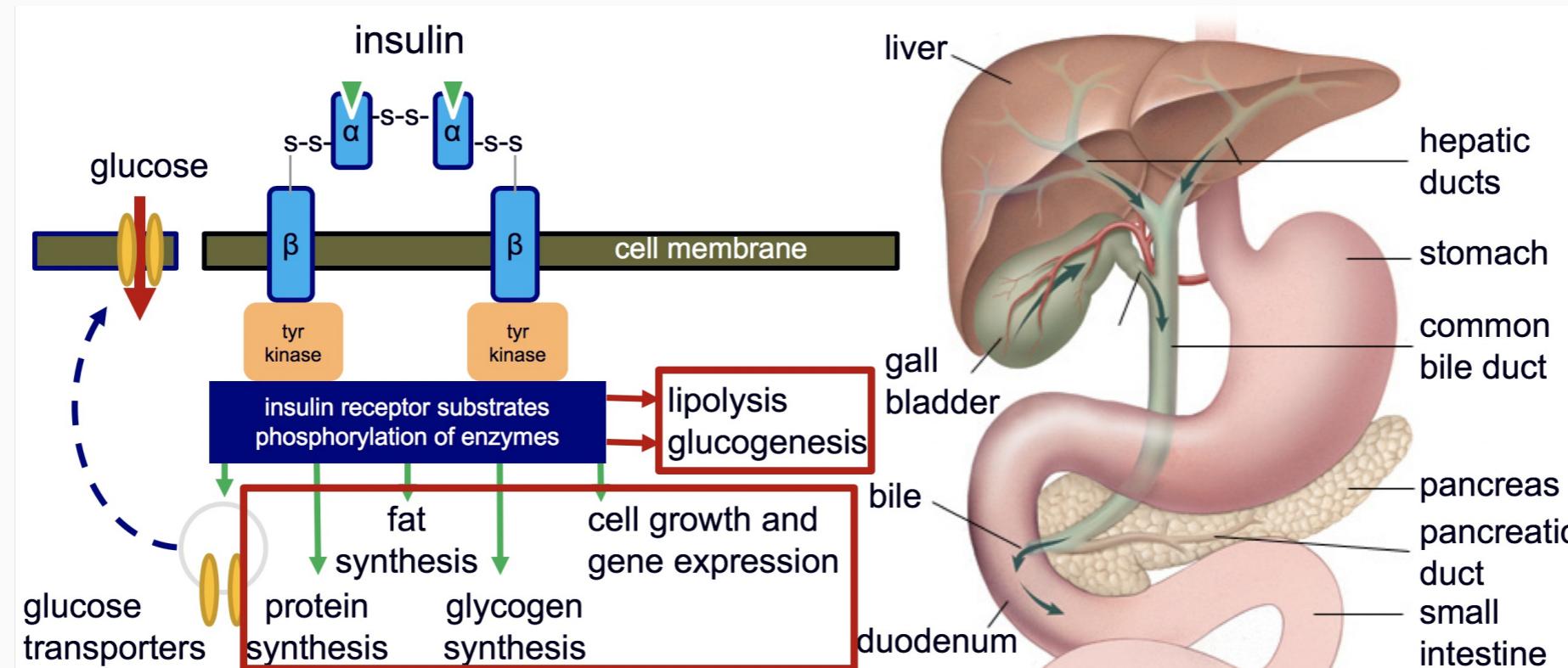
- liver factors (monitoring absorption of nutrients)
- infusion of glucose, fructose, or lipids into hepatic portal vein induces satiety (prolongs satiety that was initiated by gastric, and duodenal/intestinal factors)



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

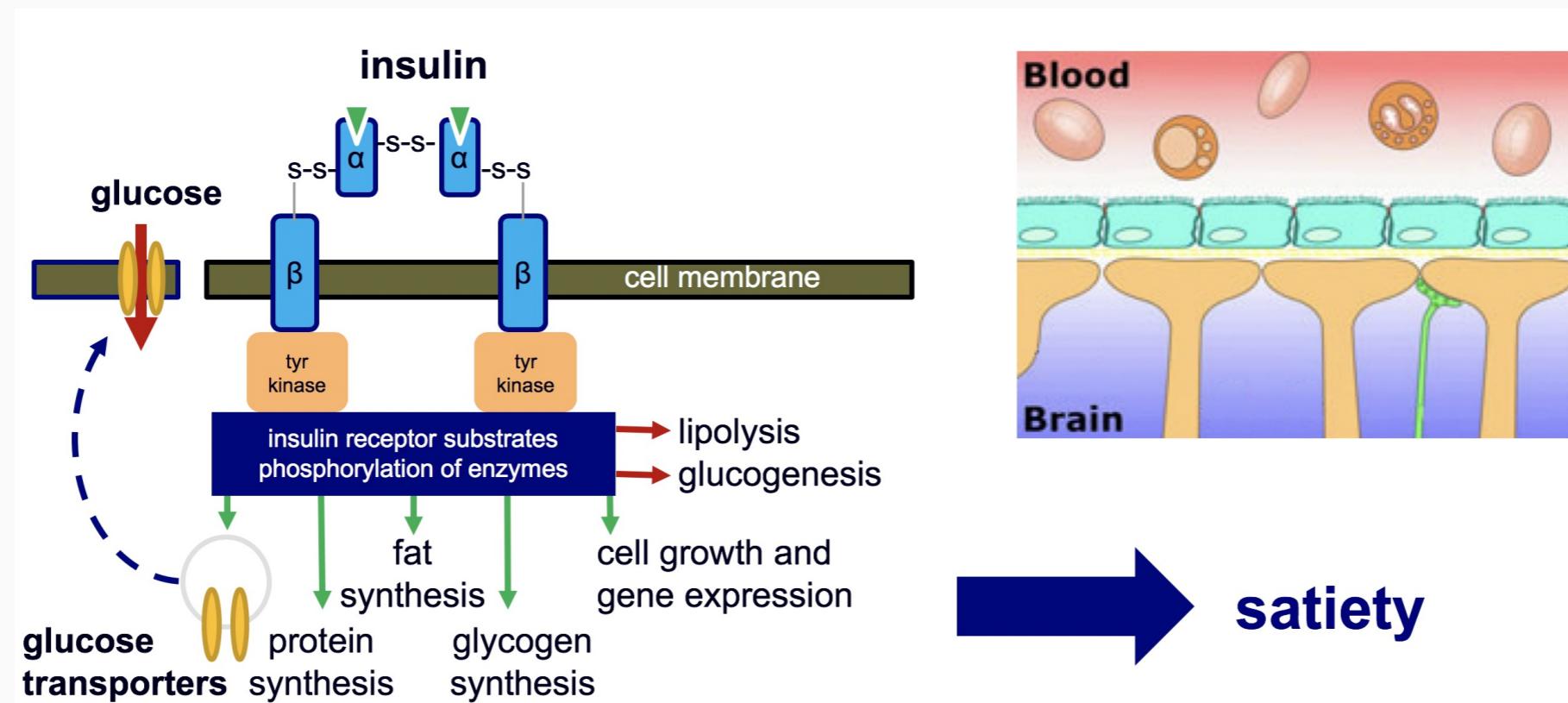
- insulin released by β -cells of islets of Langerhans
- most body cells respond by:
- stopping glucogenesis and lipolysis
- starting protein, fat, and glycogen synthesis
- mobilizing glucose transporters
- also increase influx of amino acids and other nutrients



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

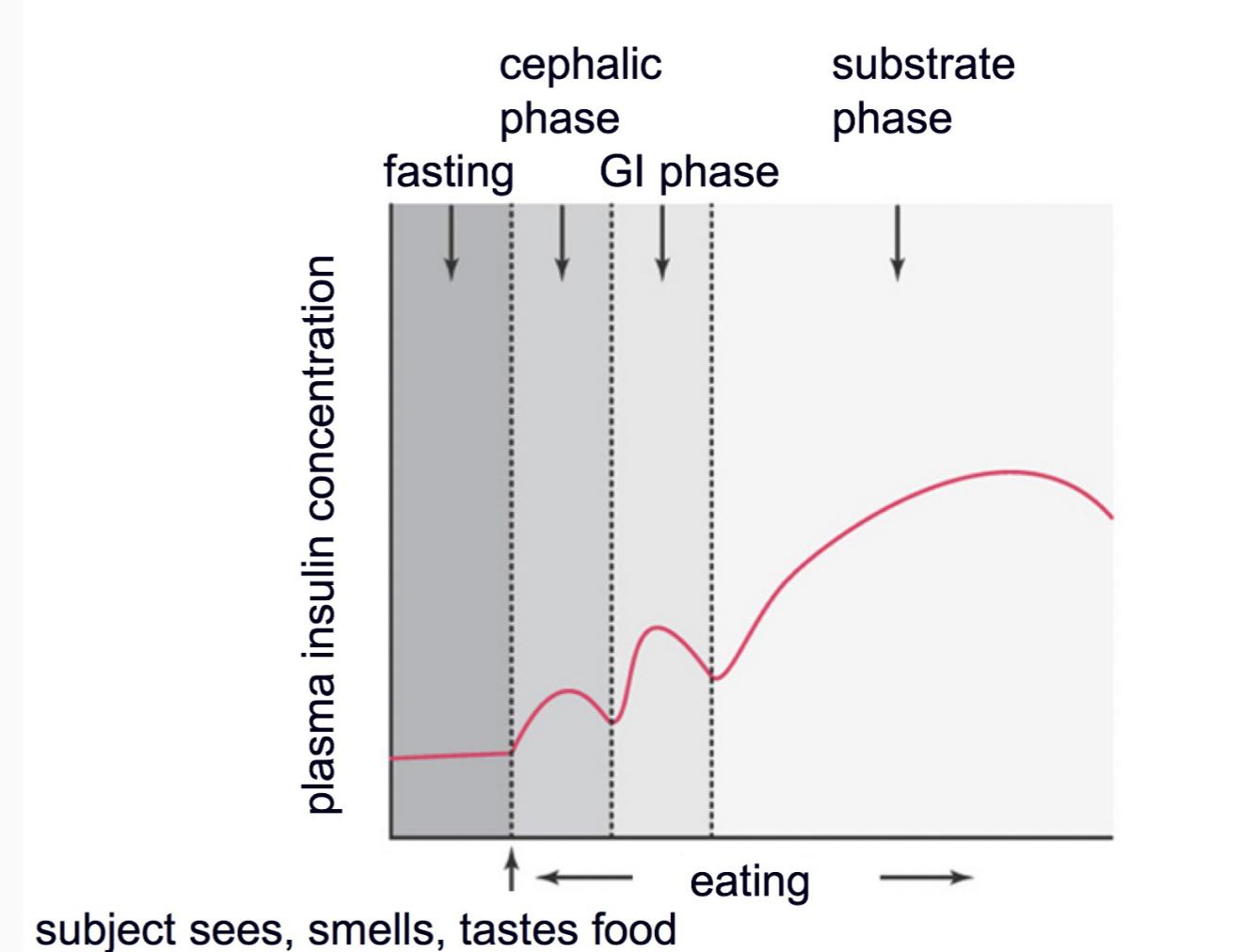
- insulin released by β -cells of islets of Langerhans
- most CNS neurons intake glucose without insulin
- some hypothalamic neurons have insulin receptors
- insulin transported across BBB to trigger satiety



Nutrition and Metabolism

What stops a meal: short-term satiety signals.

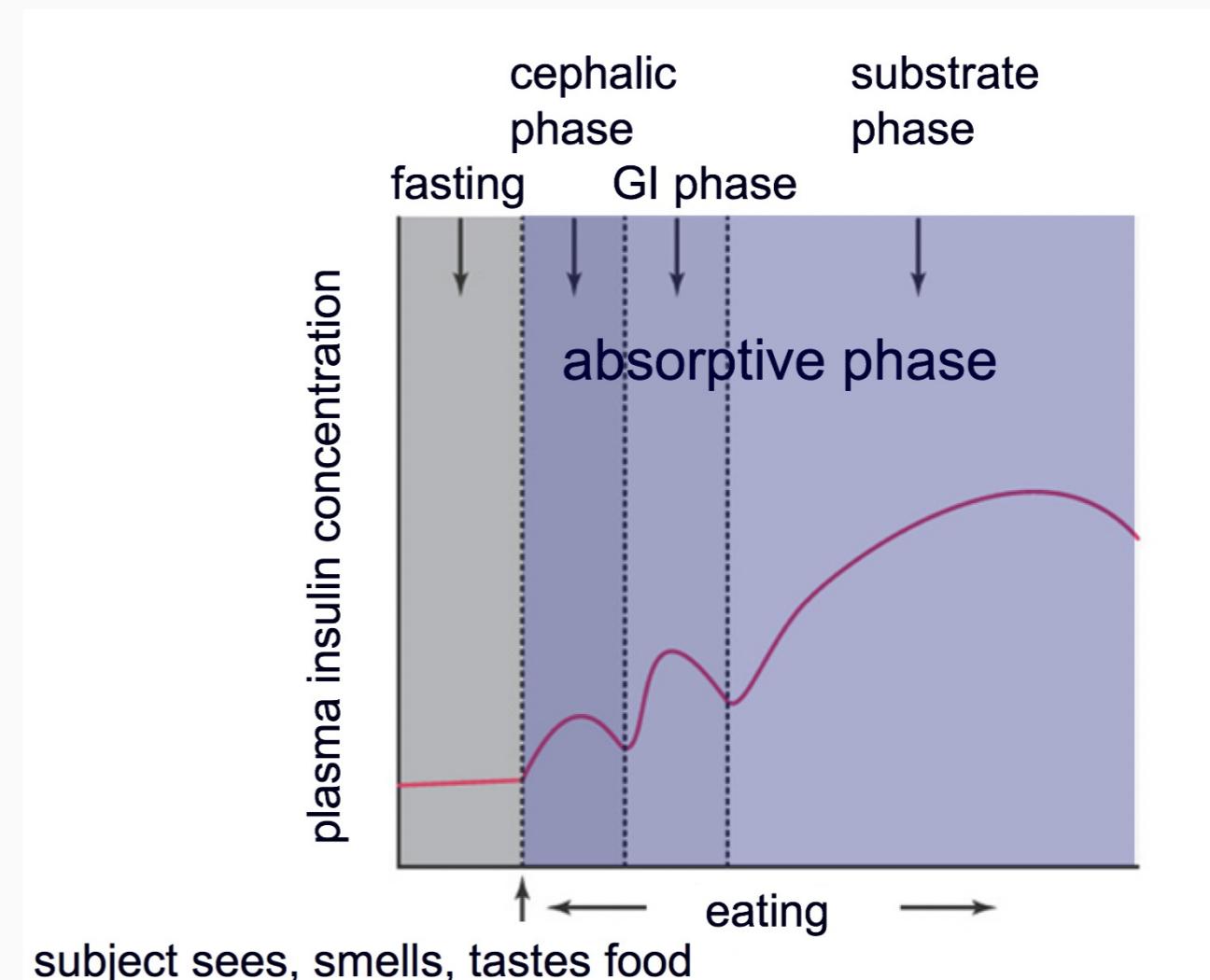
- insulin released by β -cells of islets of Langerhans
- release starts with sight, smell, taste of food
- increases during meal
- highly elevated in GI and absorption phase



Nutrition and Metabolism

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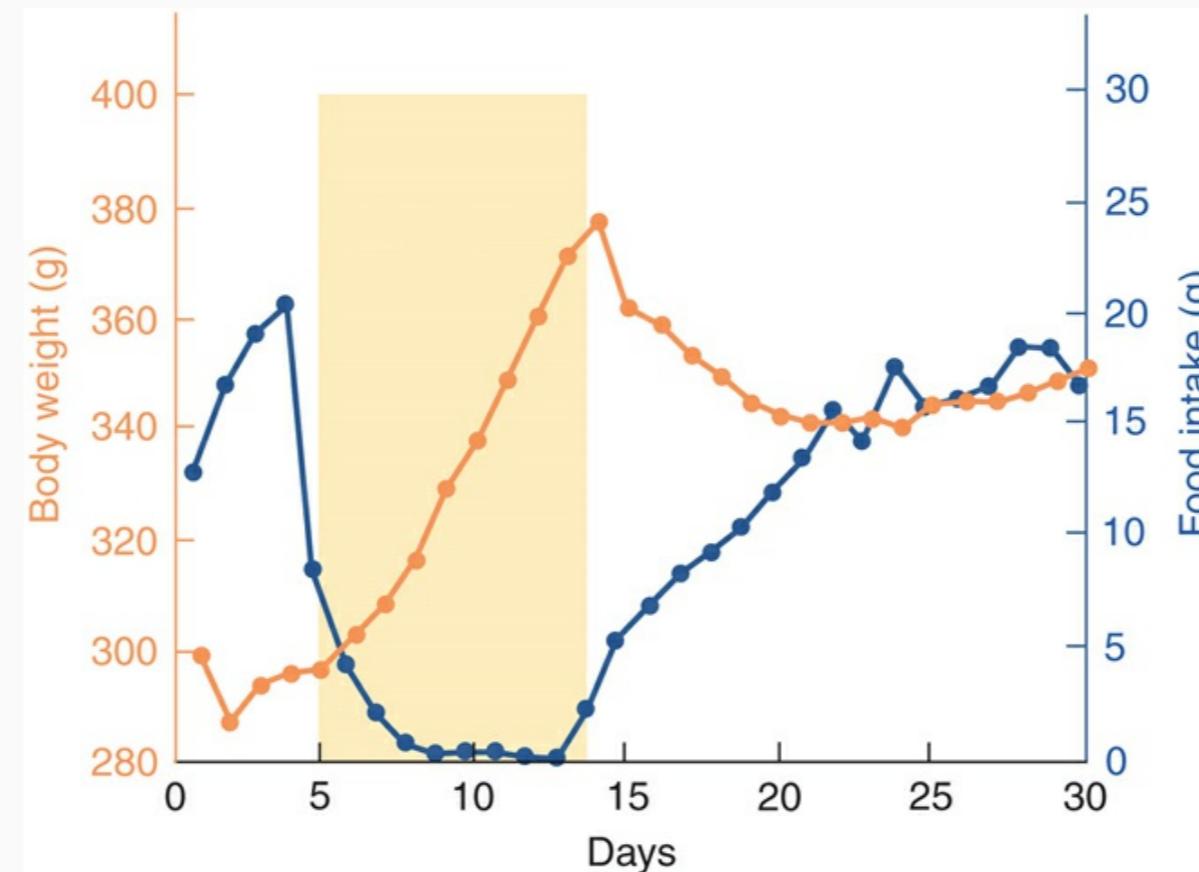
- insulin released by β -cells of islets of Langerhans
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- highly elevated in GI and absorption phase



Nutrition and Metabolism

What stops a meal: long-term satiety signals.

- very tight regulation
- rebound after changes in body mass



Nutrition and Metabolism

What stops a meal: long-term satiety signals.

- adipose and leptin
- ob/ob mice has low metabolism, overeats, and is obese
- develops diabetes in adulthood
- lacking leptin, normally released by adipose cells



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