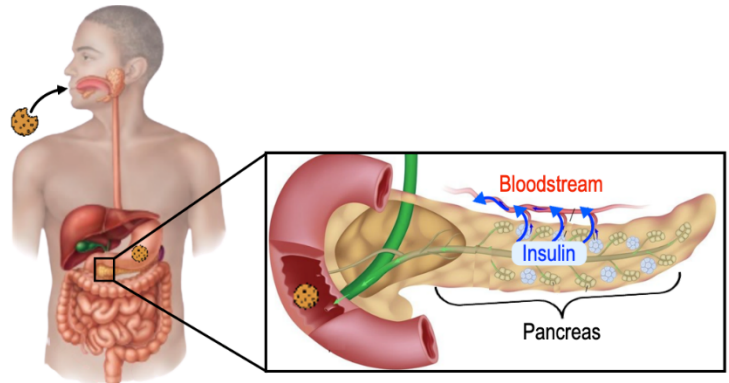
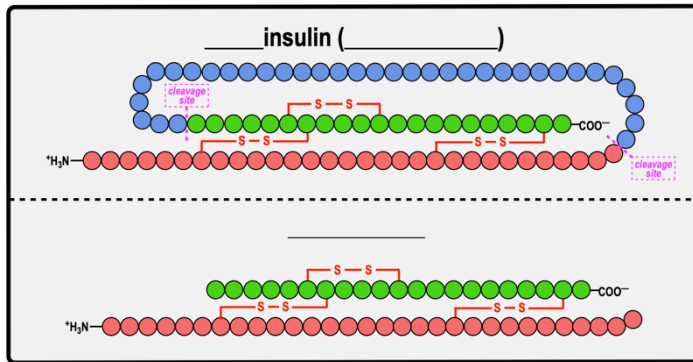


## CONCEPT: INSULIN

- \_\_\_\_\_: a 51-amino-acid peptide hormone involved in classic RTK pathways.
  - Signals a “well-\_\_\_\_\_” or “fuel \_\_\_\_\_” state.
  - Initially secreted as a \_\_\_\_\_ (proinsulin) by *pancreatic  $\beta$ -cells* in response to a meal.



## PRACTICE: Proinsulin:

- Is synthesized in three parts and then assembled for storage.
- Is more active than insulin.
- Is synthesized as a single chain, folded and then cleaved into insulin.
- Stimulates insulin secretion.

## Insulin's 3 Primary Biological Effects

- After eating a meal, insulin can signal many effects, but generates \_\_\_\_\_ primary biological effects:



- 1 \_\_\_\_\_ blood-glucose concentration.
- 2 \_\_\_\_\_ cell growth by *regulating* gene expression.
- 3 Increases the synthesis of specific \_\_\_\_\_.

## PRACTICE: Which of the following is NOT a biological effect of insulin after eating a large meal?

- Increases the concentration of blood glucose.
- Regulates gene expression to activate cell growth.
- Stimulates the production of certain lipid molecules.
- Decreases the concentration of blood glucose.

## CONCEPT: INSULIN

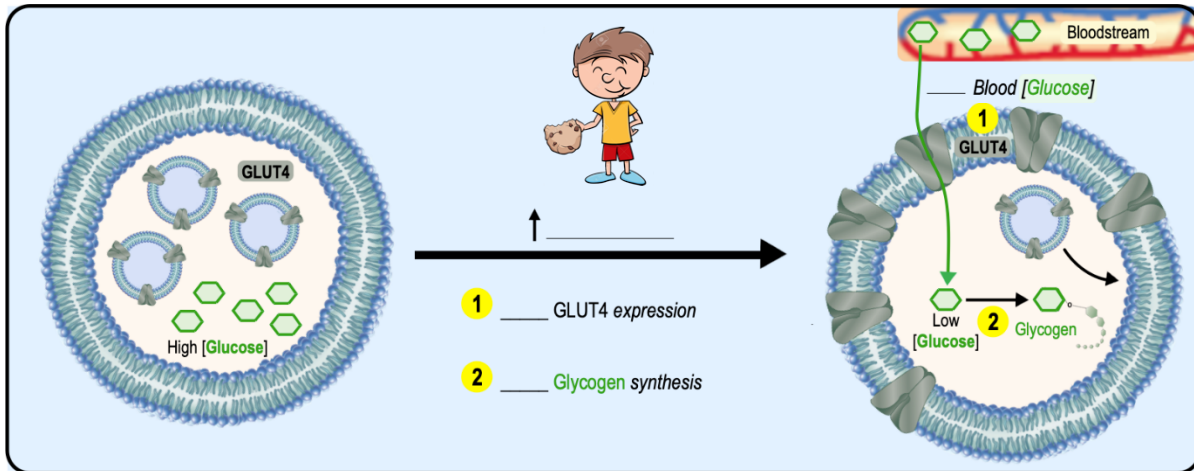
### 1) Insulin Decreases Blood [Glucose]

● After a high-glucose meal, insulin's primary job is to help \_\_\_\_\_ [glucose] in blood in the following ways:

① Insulin \_\_\_\_\_ *glucose transporter* (\_\_\_\_\_) expression, which imports blood glucose into cells.

② Insulin indirectly affects cytosolic enzyme activity (via signaling) to convert *free glucose* to \_\_\_\_\_.

□ This ↓ free [glucose] inside cell facilitates diffusion of blood glucose into cells (\_\_\_\_\_ [glucose] in blood).



**PRACTICE:** What is the primary function of the peptide insulin?

- a) To stimulate transport of glucose out of the cell and into the bloodstream.
- b) To stimulate transport of proinsulin out of the pancreas and into the bloodstream.
- c) To stimulate transport of glucose out of the bloodstream and into the cell.
- d) The transport of epinephrine from the bloodstream to the cell receptor.

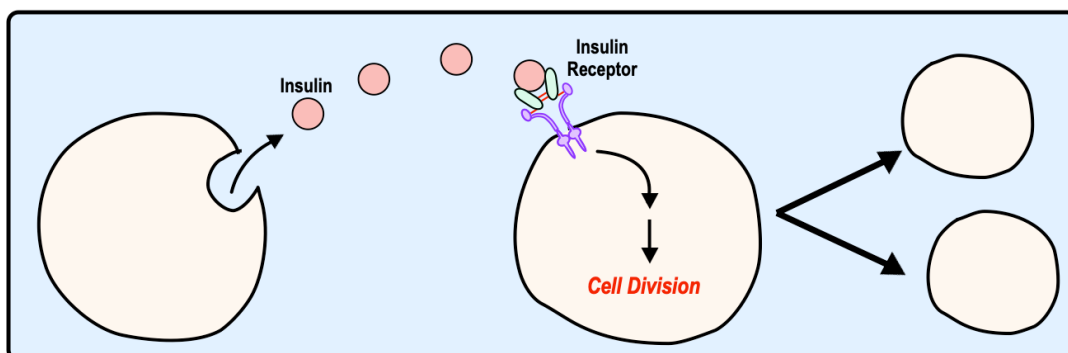
### 2) Insulin Stimulates Cell Growth

● When [insulin] is high, insulin can also act as a \_\_\_\_\_ factor.

□ *Growth factor*: a biological substance that \_\_\_\_\_ cellular growth, healing, &/or differentiation.

□ Insulin as a growth hormone uses a \_\_\_\_\_ signaling pathway than when it lowers blood [glucose].

**EXAMPLE:** Insulin Acts as a Growth Factor to Stimulate Cell Growth.



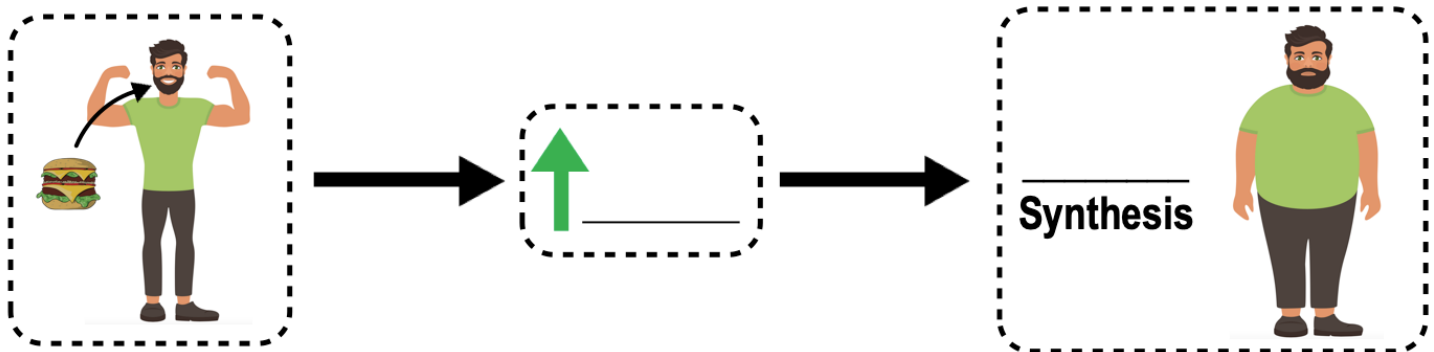
## CONCEPT: INSULIN

**PRACTICE:** The hormone insulin can function as a(n) \_\_\_\_\_.

- a) Secondary messenger.
- b) Adapter protein.
- c) Effector enzyme.
- d) Growth factor.

### 3) Insulin Increases Lipid Synthesis

● Insulin has a large effect on \_\_\_\_\_ synthesis, which we'll discuss more in a later chapter.



**PRACTICE:** What is the effect of insulin on lipid fatty acid synthesis?

- a) It activates regulatory proteins that inhibit synthesis of fatty acids.
- b) It increases the synthesis of fatty acids resulting in higher amounts of fat storage.
- c) It causes fatty acids degradation by liposomes.
- d) It decreases fat storage by converting fatty acids to energy.
- e) None of the above.

**PRACTICE:** Which of the following is NOT an effect of insulin?

- a) It increases the rate of fatty-acid synthesis and storage.
- b) It decreases the concentration of blood glucose.
- c) It stimulates cell growth and division.
- d) It stimulates the release of proinsulin from the pancreas.