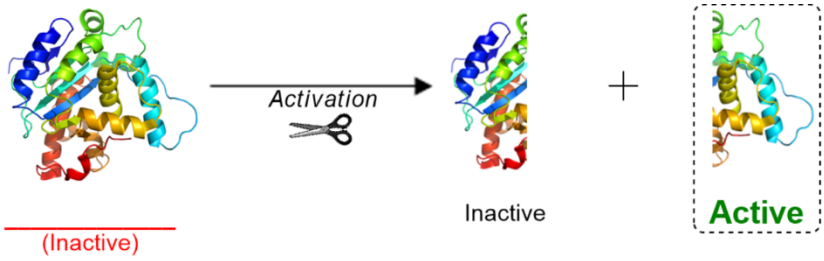
CONCEPT: ZYMOGENS

●_____ (or *proenzymes*): _____ enzyme *precursors* that can be converted to *active* enzymes

□ *Activation* of a zymogen usually occurs via *cleavage* of _____ bonds.

□ Recall: *Proteolytic* _____ is a type of *post-translational-modification*.

□ Zymogens usually begin with "_____" or end in "*-ogen*."



Site of Synthesis	Zymogen (Inactive)	Active Enzyme
Stomach	Pepsinogen	Pepsin
Pancreas	Chymotrypsinogen	Chymotrypsin
Pancreas	Trypsinogen	Trypsin
Pancreas	Procarboxypeptidase	Carboxypeptidase
Pancreas	Proelastase	Elastase

PRACTICE: The active enzyme pepsin is produced in the stomach lining initially as a _____, which requires _____ for activation in the stomach.

a) Kinase; phosphorylation.

b) Zymogen; reversible proteolytic cleavage of covalent bonds.

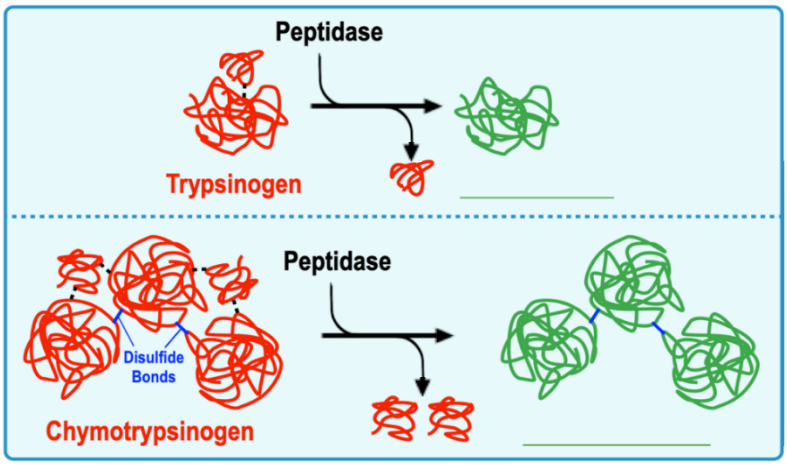
c) Proprotein; reversible proteolytic cleavage.

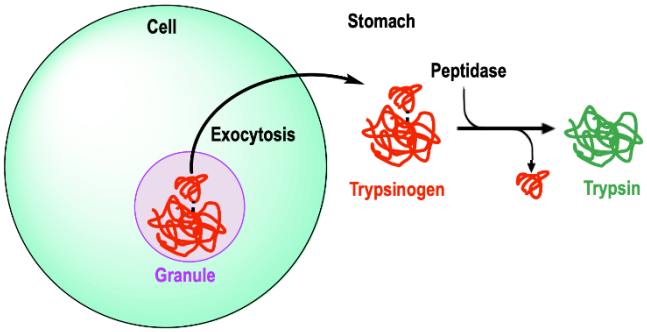
d) Phosphatase; ubiquitination.

e) Proenzyme; irreversible proteolytic cleavage.

Zymogens of Trypsin & Chymotrypsin

●Both _____ & chymotrypsin are digestive enzymes with classic examples of *zymogens*.





●It's critical for cells to store these hydrolytic enzymes as *inactive zymogens* because otherwise they could _____ the cell.

□ Storing enzymes as zymogens is a form of _____ enzyme activity.

CONCEPT: ZYMOGENS

PRACTICE: How is chymotrypsinogen converted to chymotrypsin?

a) A protein kinase-catalyzed phosphorylation converts chymotrypsinogen to chymotrypsin.
b) An increase in [Ca^{2+}] promotes the conversion.
c) Proteolysis of chymotrypsinogen forms chymotrypsin.
d) Two inactive chymotrypsinogen dimers pair to form an active chymotrypsin tetramer.

PRACTICE: Why are most digestive enzymes produced as zymogens?

a) To prevent digestion of cellular enzymes that would destroy the cell.
b) So that the inactive enzyme can be transported in the bloodstream.
c) Because the zymogen has a higher affinity for its substrate.
d) Because the zymogen can't be post-translationally modified.

PRACTICE: Which of the following is a zymogen that can be converted to a peptidase that hydrolyzes peptide bonds adjacent to lysine and arginine?

a) Chymotrypsin.
b) Pepsin.
c) Pepsinogen.
d) Trypsin.
e) Trypsinogen.
f) Proelastase.