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# Pancreas

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1. Lists the major contents of pancreatic secretions.
    a. Enzymes
    b. Bicarbonate rich fluid
    c. Ions (Na+, Cl-, HCO3-)
        i. At low secretory rate, Cl-
        ii. At high rate, HCO3-
2. Describes the mechanisms by which chyme is neutralized in the duodenum.
    a. Bicarbonate from CO2 or Na+/HCO3- cotransporter into duct cell
    b. Cells transport HCO3- into lumen and H+ to the blood
    c. Na+/H+ exchanger also sends H+ out to blood
    d. Secretin can cause H+ ATPase to be implanted in membrane
    e. CFTR ion channel (Cl-/HCO3- out) or Cl-/HCO3- exchanger sends HCO3- into lumen
    f. CFTR channel activated by cAMP produced in response to secretin bound to basolateral membrane (adenylyl cyclase)
3. Describes the mechanism by which pancreatic zymogens are activated in the small intestine.
    a. Synthesis on polysomes and transfer to RER
    b. Protein modification in RER
    c. Transfer to Golgi complex
    d. Modification and sorting in Golgi and condensation in vacuoles
    e. Vacuoles condense to form zymogen granules
    f. Regulated exocytosis or constitutive secretion
    g. In small intestine, proenzymes are cleaved by trypsin to be activated
        i. Enterokinase and trypsin responsible for actvation of trypsinogen -->trypsin
        ii. Most pancreatic enzymes are proenzymes w/ exception of amylase, lipases
        iii. Multiple forms of enzymes relates to specificity
4. States the stimuli that release secretin.: low pH
5. States the stimuli that release CCK.
    a. Fat
    b. Peptides and AA
6. States the effects of secretin and CCK on pancreatic secretion.
    a. Secretin acts on duct cells to release HCO3-
    b. CCK acts on acinar cells to increase enzyme secretion
    c. CCK has potentiating effect on duct cells
    d. CCK can also excite vagal afferents to neurally stimulate acinar cells (important in humans)
7. Identifies the intracellular mediators of secretin and CCK action.
    a. Secretin acts on adenylyl cyclase --> PKA activation
    b. CCK acts on PLC --> IP3 + DAG
    c. IP3 stimulates release of Ca2+ from intracellular stores and Ca2+ influx
        i. Calmodulin activated PP, PK
        ii. Ca2+ activated PK-C
    d. DAG activates PKC
8. Describes the role of CFTR in pancreatic ductular secretion.
    a. See 2e and f
9. States the significance of the potentiating interaction of CCK and secretin on pancreatic secretions.
    a. See 6
10. States the effects of the autonomic nerves to the pancreas on pancreatic secretion.
    a. Vagal efferents release ACh to both acianar and duct cells
    b. ACh acts to activate PLC cascade