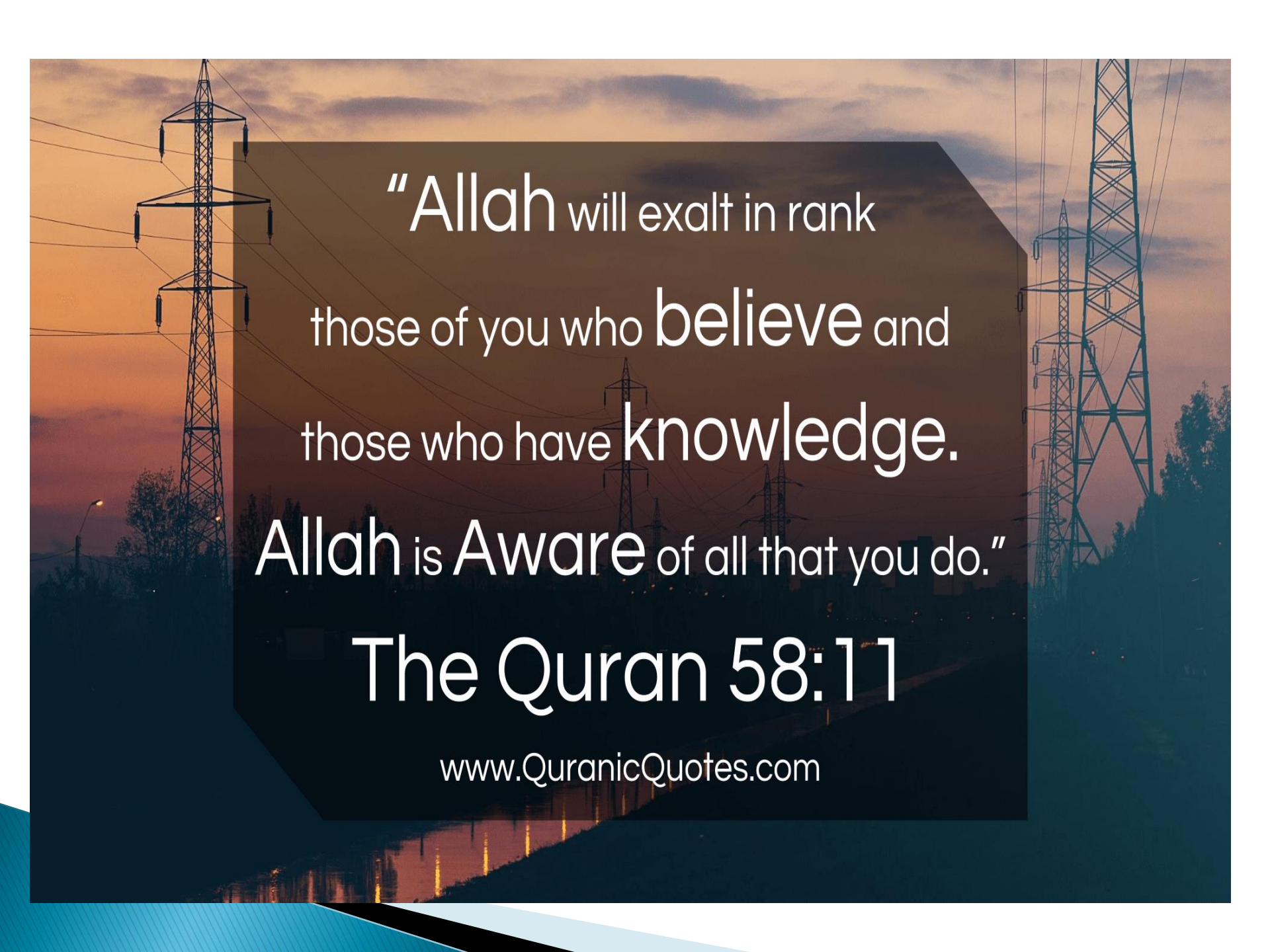


GASTRIC JUICE

DR.BELA INAYAT

سُبْحَانَكَ اللَّهُمَّ رَبِّ السَّمَاوَاتِ
الْأَعْلَى رَبَّنَا لَا إِلَهَ إِلَّا
أَنْتَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ
السُّنُورُ يُدْعَى بِكَ الْحَقُّ
وَالْحَقُّ لَا يَكْفُرُ بِكَ
شَيْءٌ فِي السَّمَاوَاتِ وَلَا
فِي الْأَرْضِ وَإِنَّكَ
أَنْتَ الْغَفُورُ الرَّحِيمُ

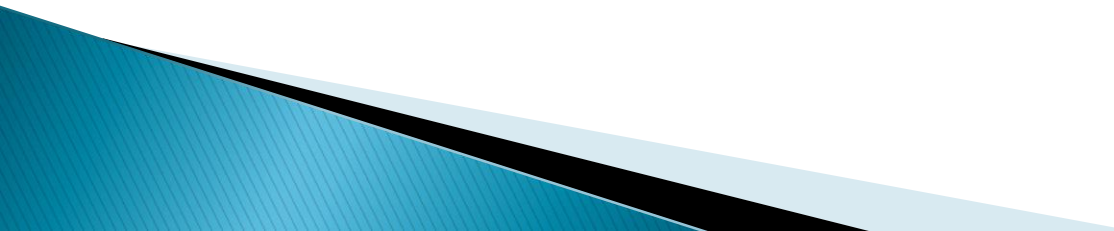


“Allah will exalt in rank
those of you who **believe** and
those who have **knowledge**.
Allah is **Aware** of all that you do.”

The Quran 58:11

www.QuranicQuotes.com

LEARNING OBJECTIVES

- ▶ Describe the chemical composition of gastric secretions
 - ▶ Describe the functions of HCL & other constituents of gastric secretions
 - ▶ Discuss the mechanism of synthesis & secretion of HCL
 - ▶ Discuss the mechanism of secretion & role of intrinsic factor from gastric parietal cells
- 

GASTRIC JUICE

- ▶ Gastric juice is a clear pale
- ▶ Yellow fluid
- ▶ Approx. 2 – 3 L of gastric juice is secreted per day by the Gastric Glands

Gastric Gland: Gastric Juice

It is a colourless, watery, acidic, digestive fluid produced in the stomach

- Pale yellow in colour, pH is 1-3
- Per day secretion is 2-3 liters

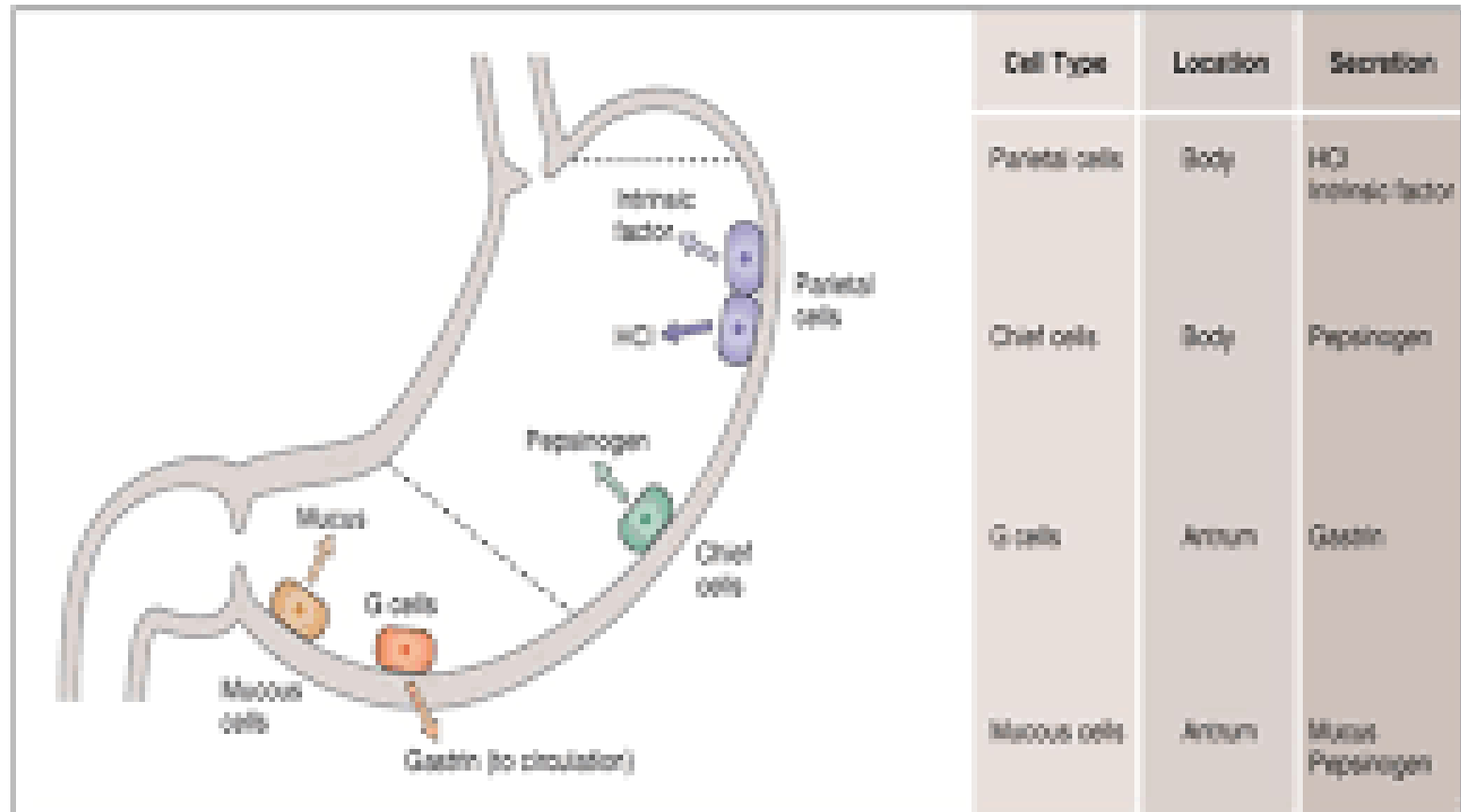


Gastric glands secrete a complex digestive fluid referred to as gastric juice

Gastric Juice

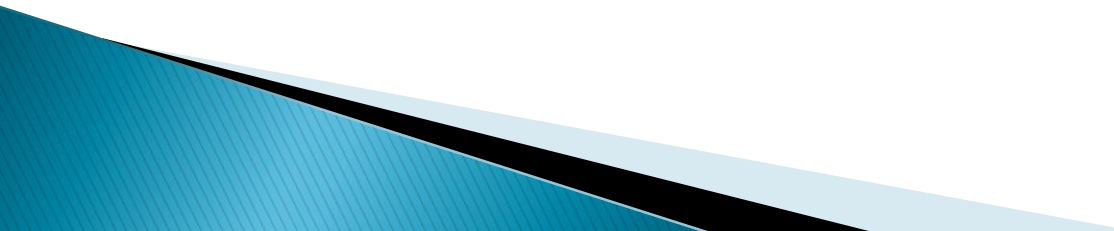
- HCl
- Electrolytes
- Mucus,
- Water
- Intrinsic factor
- Bicarbonate

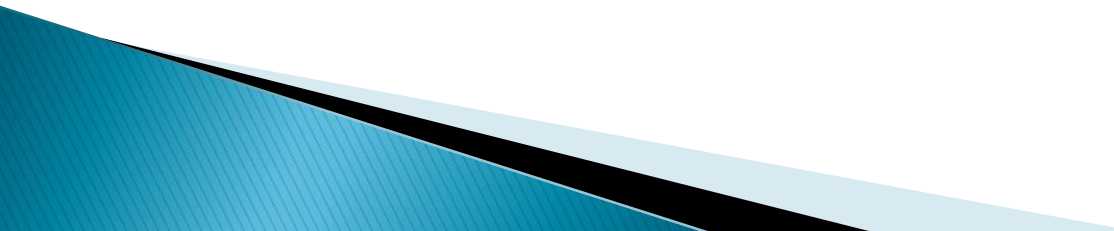
Secretory products of various gastric cells



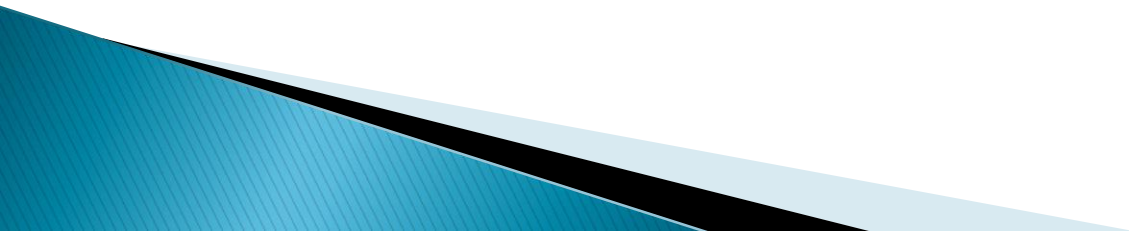
Chemical Composition of Gastric Secretion

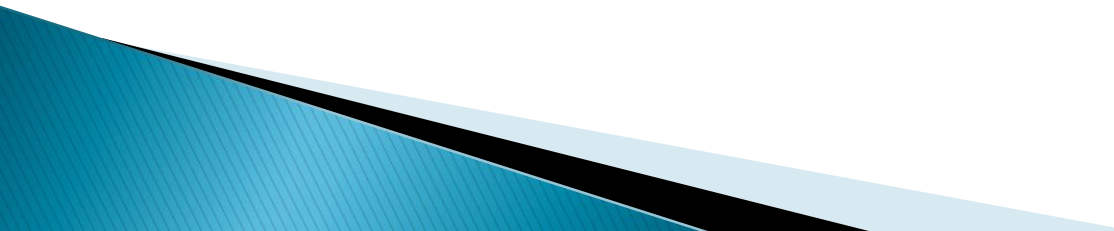
- ▶ About 99% of gastric juice comprises of WATER
- ▶ Remaining consist of ORGANIC & INORGANIC matter.

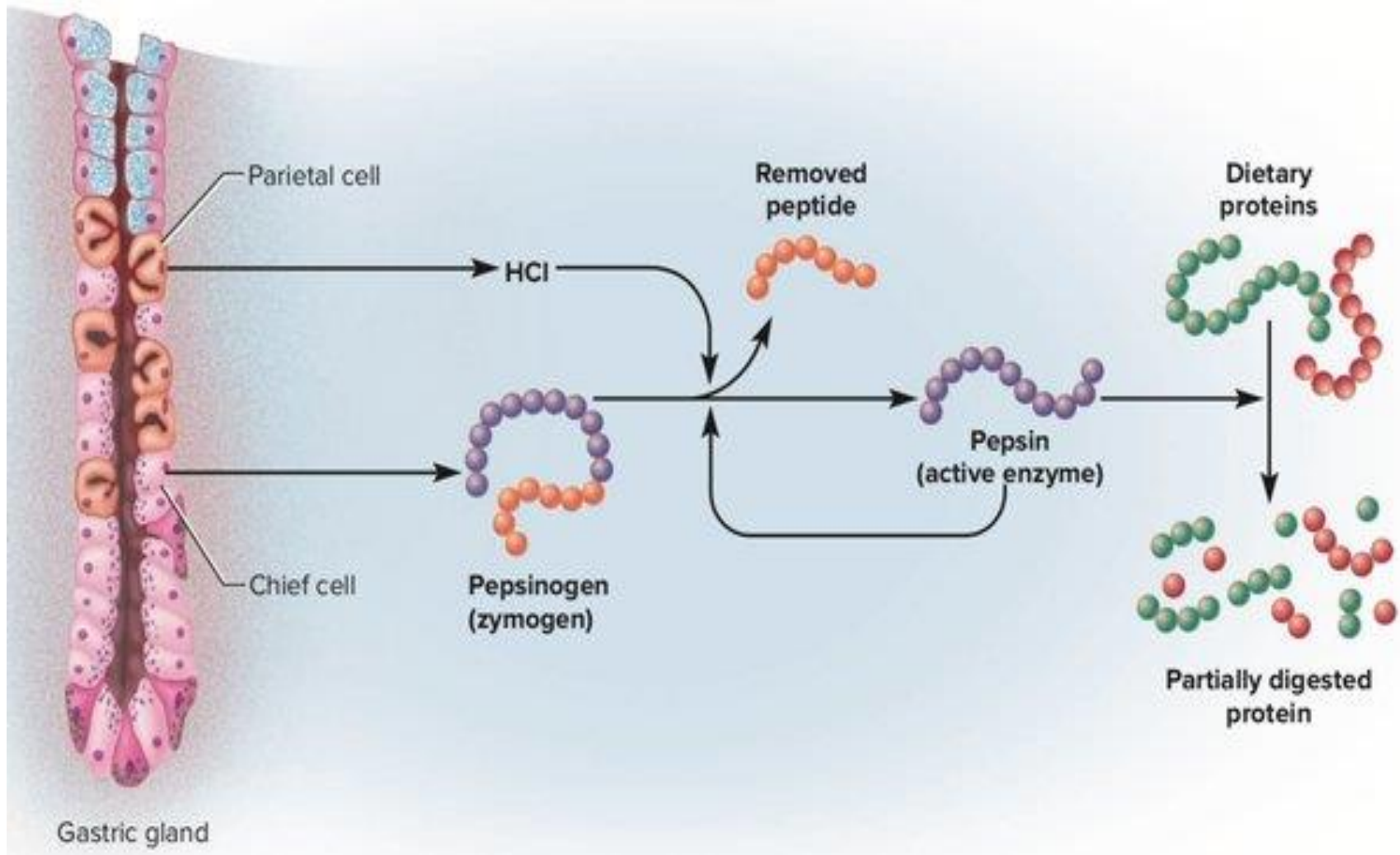
- ▶ ORGANIC CONSTITUENTS:
 - ▶ Mucin
 - ▶ Pepsinogen
 - ▶ Gastric lipase
 - ▶ Traces of some enzymes
 - ▶ Protein.....Intrinsic factor
 - ▶ Traces of Lactic acid (excess signifies bacterial growth in the stomach)
- 

- ▶ INORGANIC CONSTITUENTS:
 - ▶ HCl (most important)
 - ▶ Na
 - ▶ K
 - ▶ PO₄ (to a lesser extent)
- 

FUNCTIONS OF CONSTITUENTS OF GASTRIC SECRETIONS



- ▶ PEPSIN :
 - ▶ Pepsin is secreted in inactive form (zymogen form).....Pepsinogen
 - ▶ Pepsinogen activated into pepsin by gastric HCl.
 - ▶ Once formed then activation by autocatalytic process
 - ▶ Not essential for protein digestion....absence no significant impairment in protein absorption and digestion
- 

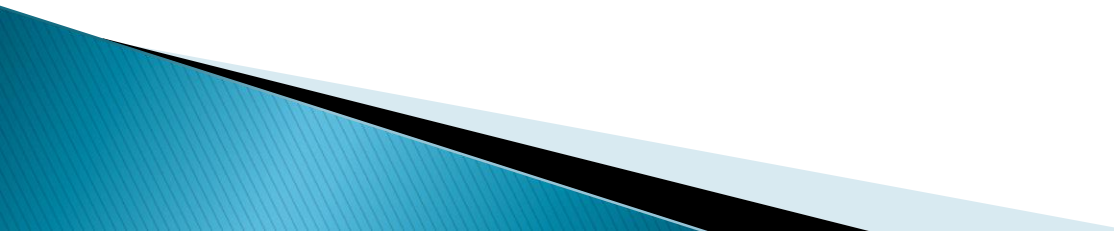



- ▶ Functions: pepsin converts proteins to polypeptides by hydrolyzing specific peptide bonds
- ▶ It curdles milk: casein into paracasein by partial hydrolysis
- ▶ Paracasein combine with Ca.....Ca paracaseinate.....responsible for curdling

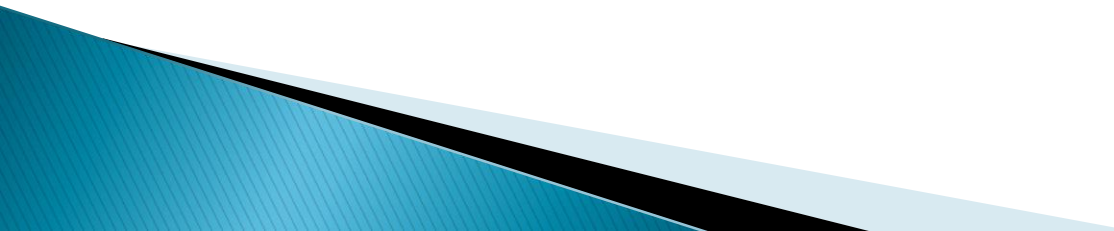
Casein $\xrightarrow{\text{Renin}}$ paracasein

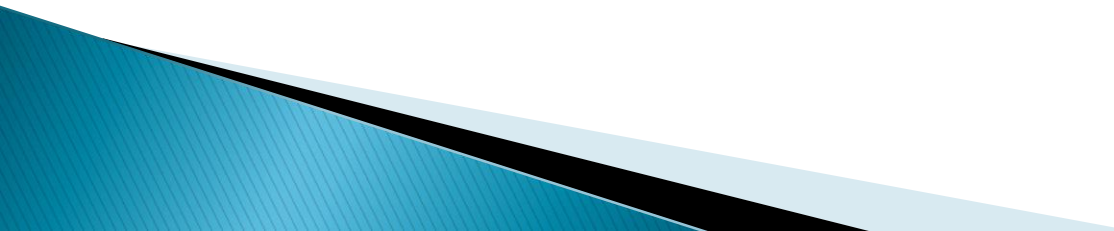
Paracasein $\xrightarrow{\text{Ca}^{2+}}$ calcium paracaseinate

Calcium paracaseinate $\xrightarrow{\text{Pepsin}}$ proteoses,
peptones & polypeptides.

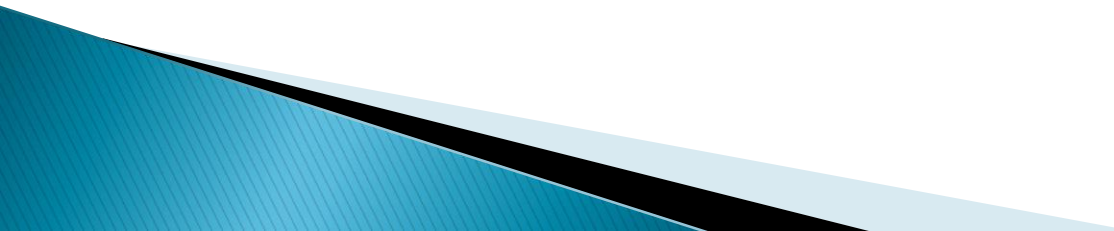
- ▶ GASTRIC LIPASE:
 - ▶ Stable in acidic medium
 - ▶ Activity confined to stomach.....as destroyed by trypsin
 - ▶ Gastric lipase hydrolyzes the ester bonds of triglycerides in the stomach. Fatty acids and diacylglycerols are produced from this reaction.
 - ▶ More active against fats with short or medium chain fatty acids e.g milk fats
- 

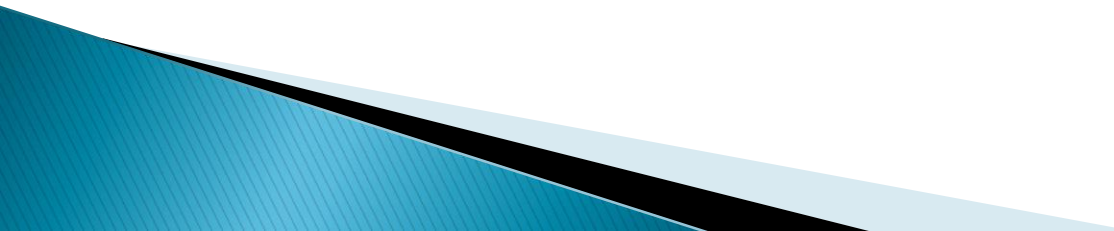
- ▶ MUCIN:
 - ▶ This is a carbohydrate containing protein present in the mucus
 - ▶ It acts as a lubricating agent forming a slippery coating over the stomach mucosa.
 - ▶ The layer acts as a barrier to the action of G.J on stomach wall.....preventing digestion of stomach itself
 - ▶ Mucin has anti-pepsin activity and also buffering action against HCl
 - ▶ Irritants of gastric mucosa, hyperacidity & vagal stimulation → increase mucin secretions
- 

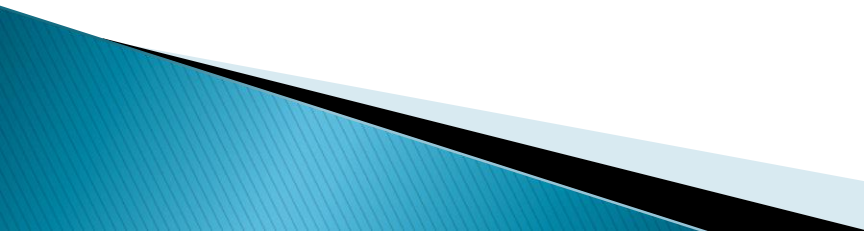
- ▶ OTHER GASTRIC ENZYMES:
 - ▶ These other enzymes are:
 - ▶ Gelatinase (not found in adult humans)
 - ▶ Carbonic anhydrase
 - ▶ Renin
 - ▶ Lysozyme
- 

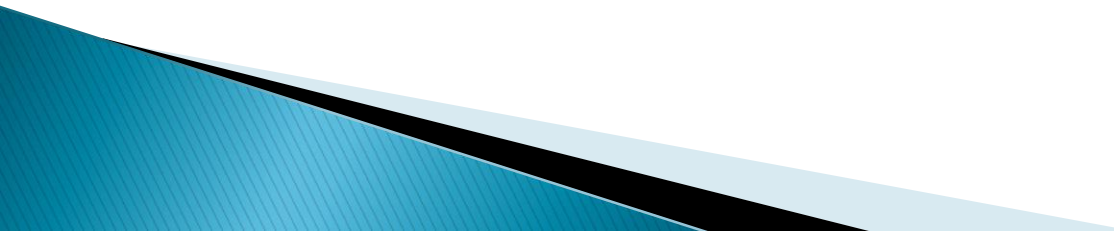
- ▶ These enzymes are not that much important in digestion
 - ▶ Renin is found in infant's GJ for curdling of milk.
 - ▶ GJ also contains urease activity that can produce NH_3 from urea
 - ▶ This NH_3 maybe of some importance in neutralizing the gastric acidity
- 

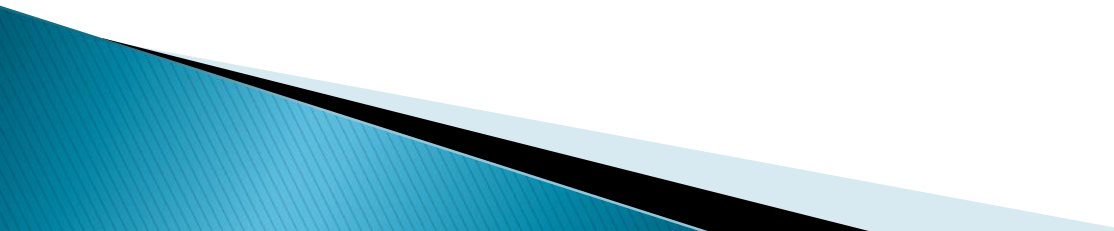
- ▶ **ROLE OF HYPOTONICITY:**
 - ▶ Hypotonicity of GJ helps in decreasing tonicity of the hypertonic food ingested towards isotonicity with plasma

 - ▶ **DUMPING SYNDROME:**
 - ▶ In patients whose stomach has been removed function of hypotonicity is lost and entry of hyperosmotic food into the small intestine results in severe symptoms
- 

- ▶ SYMPTOMS:
 - ▶ Weakness
 - ▶ Nausea
 - ▶ Palpitations
 - ▶ Pallor
 - ▶ Diarrhea
 - ▶ Abdominal distention
 - ▶ Symptoms more marked with high carbohydrate meal
- 

- ▶ **INTRINSIC FACTOR:**
 - ▶ This factor is glycoprotein in nature
 - ▶ Required for active absorption of vit.B12 (cobalamin) from the ileum
 - ▶ Its lack produces vit.B12 deficiency leading to pernicious anemia
 - ▶ The formation of intrinsic factor is the only function of the stomach which is essential for life
 - ▶ Some other glycoproteins within stomach called R proteins compete with intrinsic factor for vit.B12
- 

- ▶ However pancreatic proteases release vit B12 from these proteins to bound with intrinsic factor
 - ▶ Intrinsic factor secretion is stimulated by
 - ▶ Histamine
 - ▶ Gastrin and
 - ▶ Acetylcholine.
- 

- ▶ HYDROCHLORIC ACID:
 - ▶ Gastric HCl is not essential for life but it has many important functions
 - ▶ It activates pepsinogen to pepsin
 - ▶ Lowers the pH of gastric juice.....helps pepsin to have favourable pH for protein digestion
 - ▶ Antiseptic action: prevents growth of microorganisms in the stomach.
 - ▶ Hypochlorhydria and achlorhydria causes microbial growth in stomach shown by increased levels of lactic acid in gastric juice
- 

- ▶ Helps in Iron absorption : by helping release of iron from its bound form in food
- ▶ Role in converting ferric to ferrous form.....easily absorbed.
- ▶ Gastric contents containing HCl on entering duodenum stimulate release of secretin into blood stream

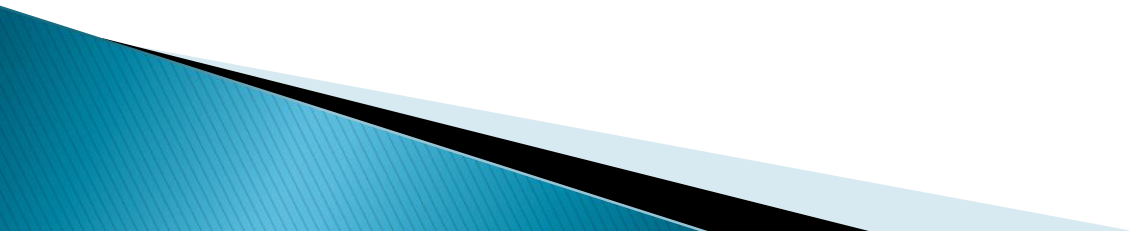
SECRETIN

Secretin is released from small intestine when stomach acid contents come to duodenum.

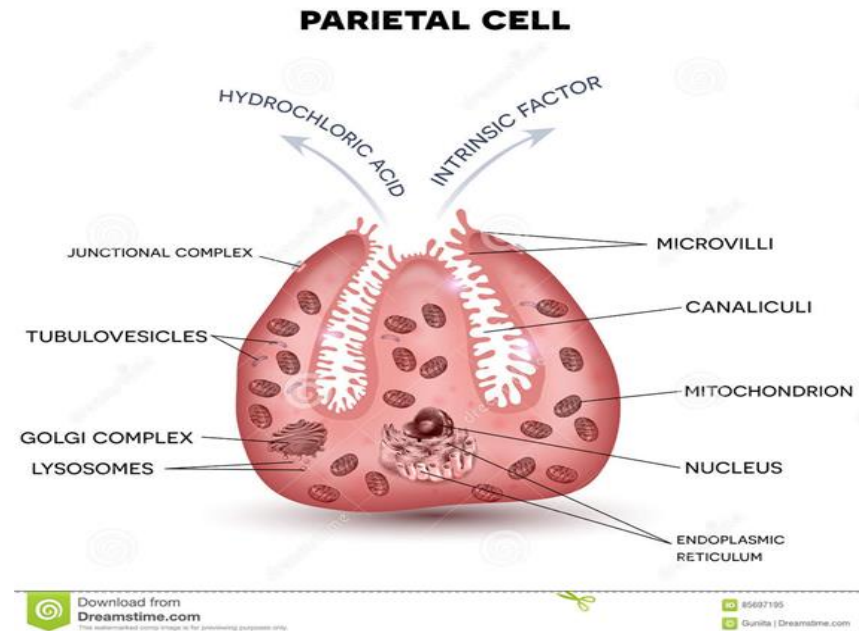
Functions:

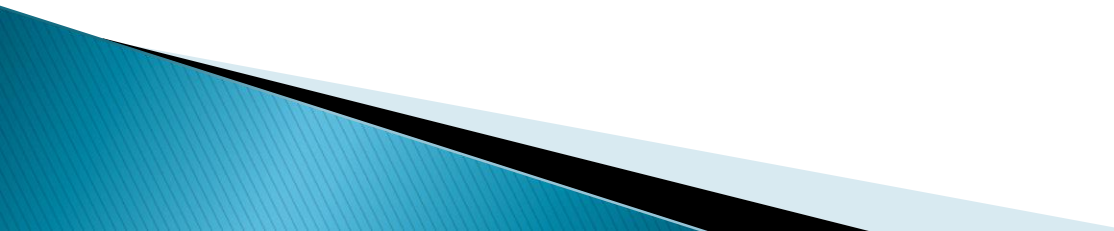
- It inhibits gastric emptying to delay the acid contents of stomach to enter in the duodenum.
- It inhibits gastric secretion.
- It acts on pancreatic duct to produce large volume of watery, NaHCO_3 secretion.
- It stimulates the secretion of NaHCO_3 rich bile in the liver by acting on the bile ducts.

Mechanism of synthesis and secretion of HCl



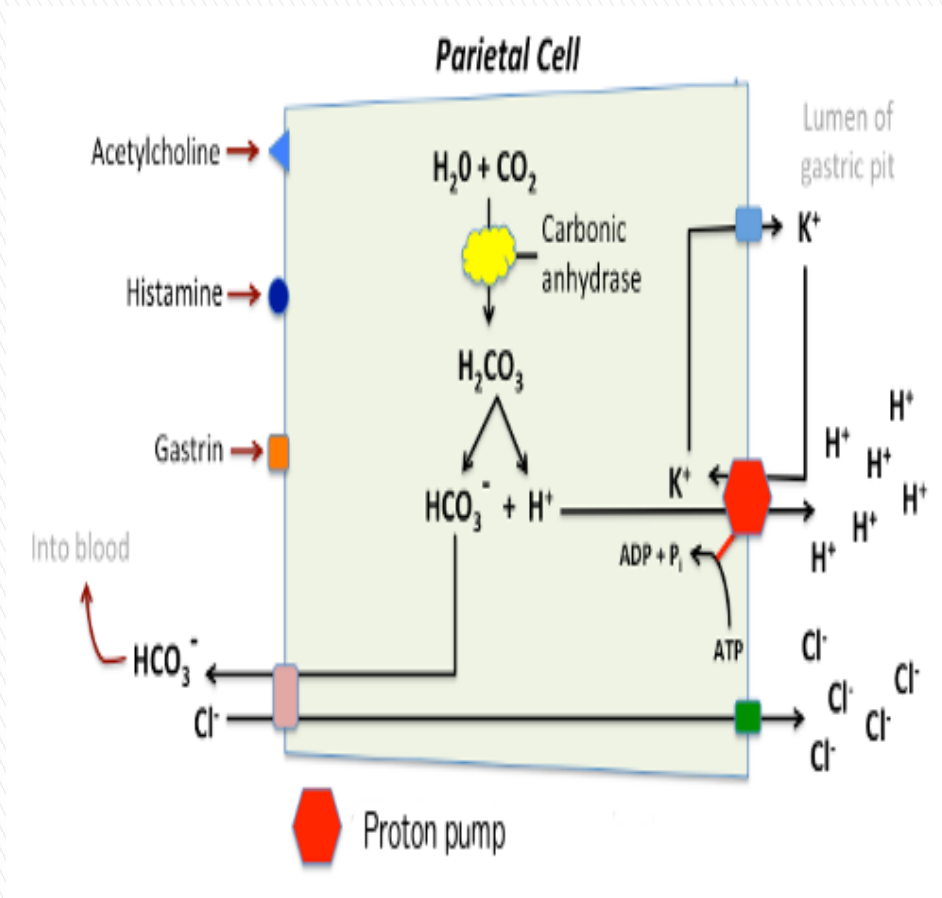
- ▶ HCl is secreted by the parietal cells.....OXYNTIC CELLS
- ▶ These cells secrete 0.17 N HCl with a pH of 0.87
- ▶ This represents 2 million times more H conc of parietal cells secretion as compared to that of blood plasma



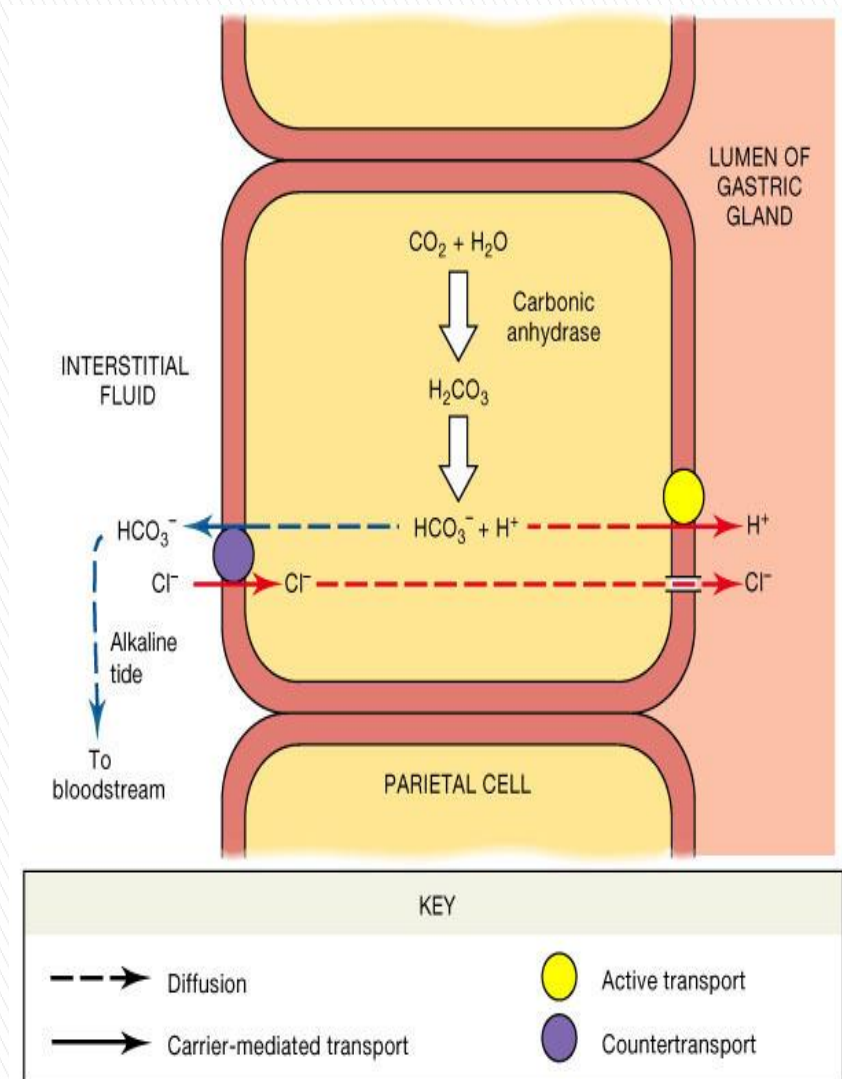
- ▶ The Parietal cells possess 5 receptors on its surface
 - ▶ Acetylcholine
 - ▶ Histamin
 - ▶ Gastrin
 - ▶ Prostaglandin
 - ▶ Somatostatin
 - ▶ Stimulation of first 3 receptors increases HCl secretion while last two decreases it
- 

MECHANISM OF HCl SECRETION

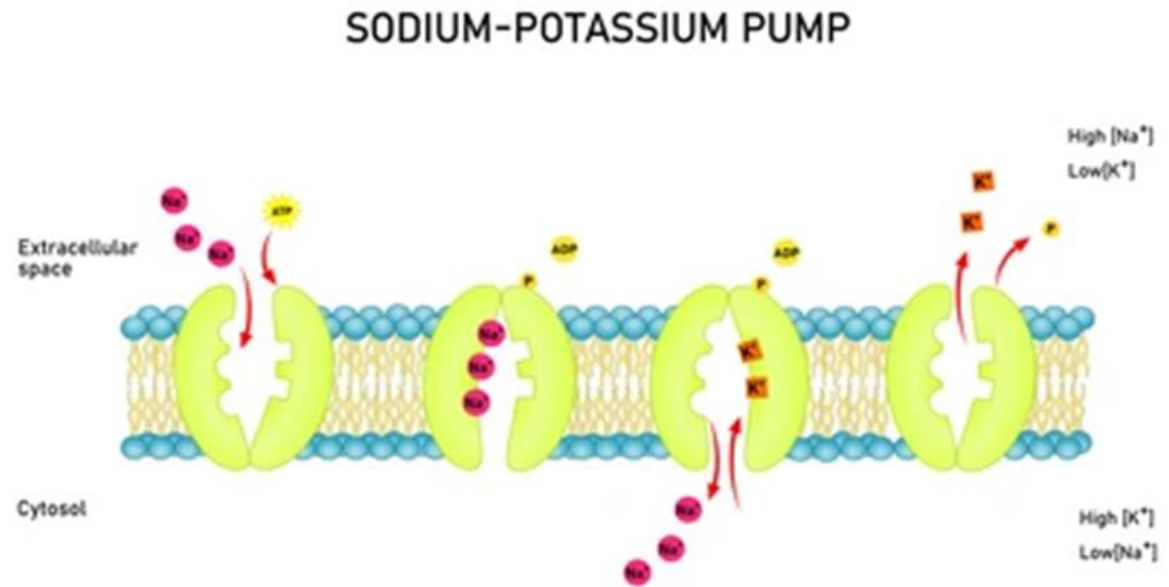
- ▶ The secretion of HCl is an active process which needs ATP.
- ▶ Carbonic acid (H_2CO_3) is formed from CO_2 & H_2O by the enzyme Carbonic anhydrase
- ▶ H_2CO_3 splits into H^+ & HCO_3^-
- ▶ H^+ is actively secreted into the canaliculus of parietal cell by H-K - ATPase.....PROTON PUMP
- ▶ The intracellular HCO_3^- is exchanged across the basolateral membrane for extracellular Cl^- by $\text{HCO}_3^-/\text{Cl}^-$ exchanger



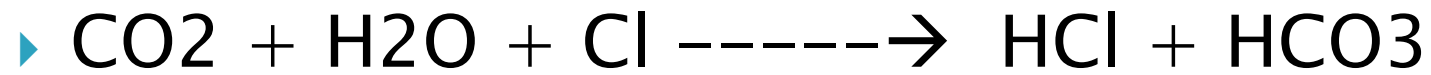
- ▶ As the Cl conc within the cell increases they are driven into the canaliculus where with H they form HCl
- ▶ The HCO₃ enters the interstitial fluid from where it passes into the blood
- ▶ For each H ion secreted into the gastric juice one HCO₃ enters the blood
- ▶ When HCl production is rapid the plasma pH rises.....POST PRANDIAL ALKALINE TIDE



- ▶ The intracellular K is kept at high level by NA K ATPase
- ▶ K ions move into the lumen of the canaliculus.



▶ Overall reaction



The image features a classic hypnotic spiral background, consisting of concentric circles in shades of red and black that create a strong sense of depth and motion. In the center of the spiral, the phrase "That's all Folks!" is written in a white, elegant cursive script. The text is slightly tilted and positioned over the dark blue/black center of the spiral. The overall aesthetic is reminiscent of the iconic ending of a Looney Tunes cartoon.

That's all Folks!