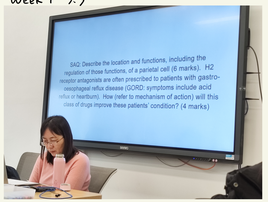
Week 1 3.3



Parietal cell.

location: gastric pit (body and antrum gastric pits and glands)

function: Secreting intrinsic factor and HCl

regulation: SS / SST; histamine/H_2; gastrin / CCK2; ACh / M_3

H_2 receptor can receive signals from histamine to promote the HCl secretion of parietal cells. By giving H_2 antagonist, the function of H_2 is inhibited, and the secretion of HCl will be decreased. Patients with GORD usually secrete excess HCl. and H_2 antagonist can relieve the symptom.

$H^+ \Rightarrow H_2 \Rightarrow cAMP\uparrow \Rightarrow pump\uparrow, K^+\uparrow \Rightarrow HCl\uparrow$

antagonist $\Rightarrow cAMP\downarrow \Rightarrow pump\downarrow, K^+\downarrow \Rightarrow HCl\downarrow$.

vagus → enterochromaffin: secrete histamine

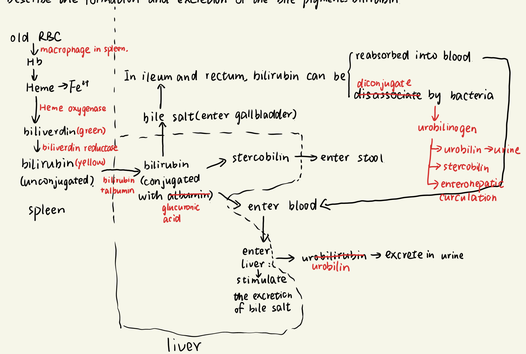
→ G cell: secrete gastrin

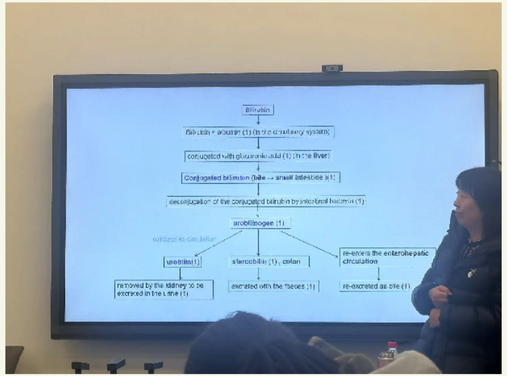
SS ⊣ H_2 → cAMP

CCK2, M_3 → Ca^{2+}

Week 2 3.5

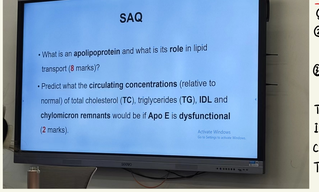
Describe the formation and excretion of the bile pigment bilirubin





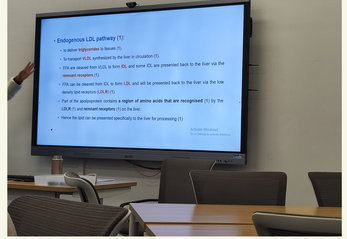
week 3 3.7

Apolipoprotein is a type of protein on the surface of lipoprotein.



① structural components: They can make lipoprotein more soluble
② They can help with the recognition of lipoprotein and decide the binding and absorption of lipoprotein
③ Acting as coenzymes to help with the degradation of TGA. cholesterol. ecc

TC↑
IDL↑
CM↑
TG↑



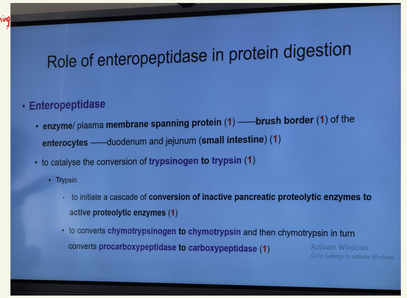
week 4

Enteropeptidase is located at the brush border of small intestine enterocytes. It can degrade protein or peptides into amino acids. also activating the protease. membrane spanning

trypsinogen (pancreas) $\xrightarrow{\text{enteropeptidase}}$ trypsin → trypsin → chymotrypsinogen, procarboxylpeptidase; chymotrypsin, carboxylpeptidase (carboxypeptidase)

When enteropeptidase is activated. trypsin. chymotrypsin, as well as other protease secreted by pancreas are all activated. Therefore, the protease secreted by pancreas can remain inactivated as proenzyme or proteasinogens. and will not degrade pancreas tissue (1).

Sphincter of Oddi:



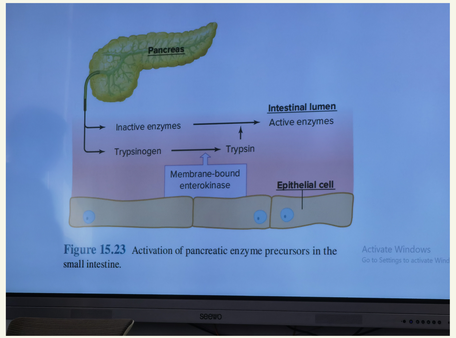


Figure 15.23 Activation of pancreatic enzyme precursors in the small intestine.

More information from the chart get one mark each.

Table 30.3 The main proteolytic enzymes of the small intestine

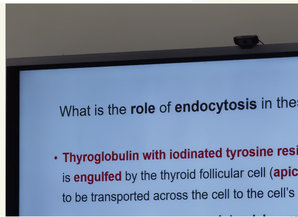
Enzyme	Class	Source	Site of hydrolysis
Trypsin	Endopeptidase	Pancreas	Cleaves peptide bonds involving basic amino acid residues to yield oligopeptides that have a basic amino acid at the C-terminal
Chymotrypsin	Endopeptidase	Pancreas	Cleaves peptide bonds involving aromatic amino acid residues, glutamine, leucine, and methionine to yield oligopeptides with one of these at the C-terminal
Elastase	Endopeptidase	Pancreas	Cleaves peptide bonds involving neutral amino acid residues to yield oligopeptides with a neutral amino acid residue at the C-terminal
Aminopeptidase A	Exopeptidase	Pancreas	Cleaves peptide bonds with acidic amino acids at their N-terminal end
Aminopeptidase N	Exopeptidase	Brush border	Cleaves peptide bonds with neutral and basic amino acids at their N-terminal end
Carboxypeptidase A	Exopeptidase	Pancreas	Cleaves peptide bonds with aromatic or neutral amino acids at C terminal end
Carboxypeptidase B	Exopeptidase	Pancreas	Cleaves peptide bonds with basic amino acids at C terminal end

week 5.

Thyroid stimulating harmone.
TSH binds to the basal lateral side of thyroid gland follicular cells, activating Gs and Gq pathway to increase the transcription level of thyroidglobulin and thyroid peroxidase, phosphorylate Na^+/I^- antiporter and pendrin to insert them into cell membrane on the basal lateral side and apical side, respectively, Also, increasing the exocytosis of T_3 and T_4.

Exocytosis happens after the thyroglobulin with DIT and MIT is transported into the cell. Then, the cell will activate the proteolysis process to split the thyroglobulin into active T_3 and T_4. and rT_3. This process can be regulated by TSH, and are transported into blood vessel. (from basal lateral) ↪ 返回样由MCT通道完成，不是胞吐！
Another exocytosis process happen when the follicular cells are secreting thyroglobulin into colloid (from apical)

(1) Thyroid stimulating hormone. TSH



and TPO

Endocycosis happen when the thyroglobulin with MIT and DIT is transported into cells.
The thyroglobulin have been added I^- on tyrosine in colloid and conjugated by TPO.

- Whilst in the **secretory granule/vesicle**, β
  free triiodothyronine (T_3) and thyroxine (T_4) (
  from the degraded thyroglobulin.
- The THs then **move** out of the cell and **into c**
  monocarboxylate transporters (MCT) foun

week 6

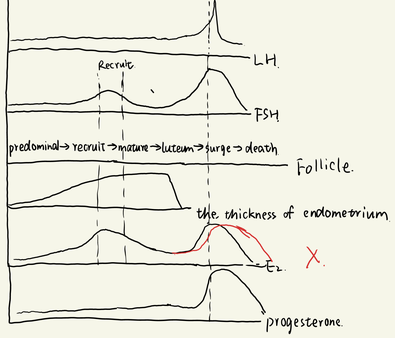
An insulinoma is a rare tumour that forms in the pancreas and secretes insulin regardless of the normal feedback mechanisms. The tumour predominately consists of β-cell the endocrine cells in the __1__ (islet of Langerhans) for insulin synthesis and release. Normally insulin is released when there is a/an __2__ (increase) circulating glucose concentrations. Insulin acts on the liver, muscle and adipose tissue to __3__ (decrease) circulating glucose concentrations. It does this by a decrease in both __5__ (gluconeogenesis) and glycogenolysis in the liver and an increase in __6__ (glucose uptake) skeletal muscle and adipose tissues. To counter the effects of insulin, __7__ (glucagon) is released from the __8__ (α cell) to restore circulating glucose concentrations to within the normal range. In insulinoma, this hormone is not released and the affected individual may start to experience hand tremors, feelings of hunger and anxiety, increased heart rate and excessive sweating. These symptoms are due to the __9__ (adrenergic) response and the consequent actions of the hormone __10__ (noradrenaline) which aims to restore circulating glucose concentrations.

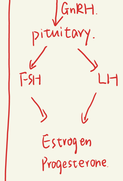
adrenergic	GABAnergic	Islet of Langerhans
α-cell	glucagon	lipid uptake
β-cell	gluconeogenesis	lipogenesis
decrease	glucose uptake	Meissner's corpuscles
γ-cell	glycogenesis	noradrenaline
γ-aminobutyric acid	increase	somatostatin

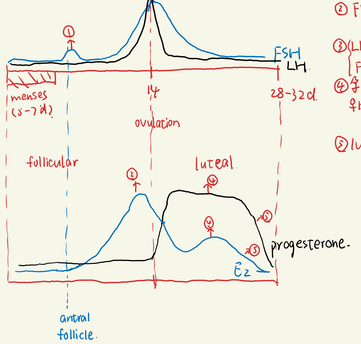
week 7

Hypothalamus

① GnRH上升, FSH上升: 促进 follicle 成长 & 上升. 卵巢释放 FSH.







② FSH上升. 卵上升, 并促LH surge. (由卵巢产生的E2 正反馈, 卵巢产生的P 负反馈)

③ LH surge. 排卵. 促孕H
FSH上升: 卵促FSH (正反馈).

④ 孕H上升 (黄体分泌P)
卵H上升 (黄体分泌E)

⑤ luteolysis

MCQ.

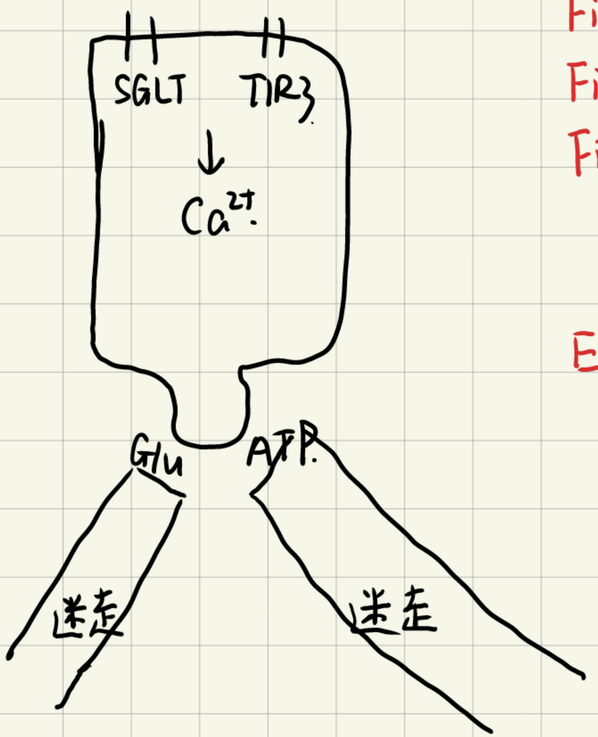


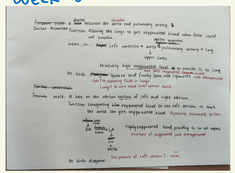
Fig 1: 糖、甜味剂、类似物均激活迷走

Fig 2: 抑制 neuropod 即抑制所有迷走反应

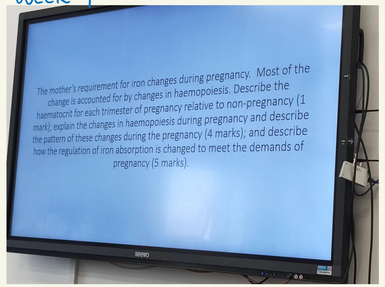
Fig 3: 在以上所有刺激下

Extended figure 2 {
- a. 迷走本身不感受糖
- c. CCK 与迷走 pair ⇒ 只对 D-glucose 反应;
- d.

week 8



week 9



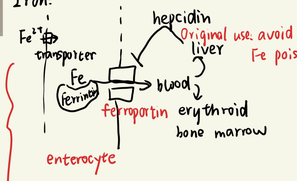
definition:

The haematocrit decreases at first, then increases to normal.
(slightly decrease)

The haemopoiesis is elevated. Erythropoiesis ↑ to upregulate RBC. and ADH/AVP is ~~less~~ secreted to increase plasma volume. Decreasing hepcidin increases Fe store for haemopoiesis. Also. platelet and blood clotting factors are upregulated to decrease blood loss.

RBC↓ 先下后升. Maintain haematocrit.

Iron:

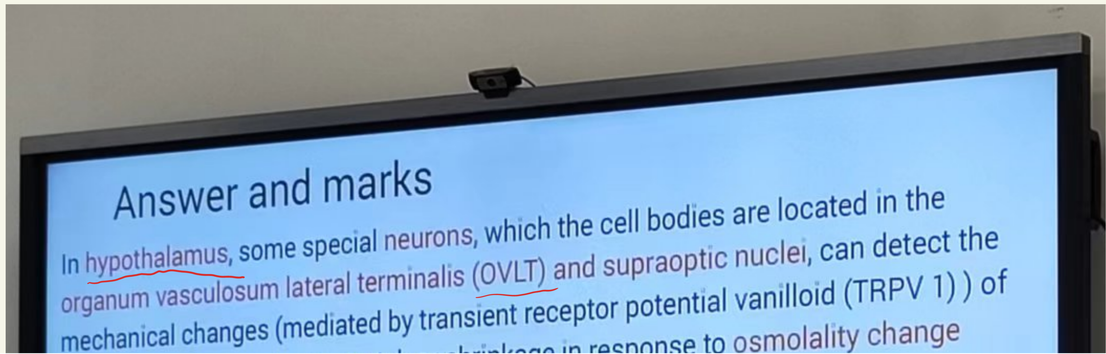


During pregnant. with increasing levels of Fe needs in placenta and spleen. hepcidin decreases due to less Fe store.

mucosal block.

week 10

Hypothalamus:
- OVLT: the osmolality sensor
  - Sensing the surrounding osmolality through mechanically swelling or shrinking
  - set point: 290 mOsm.
- synthesize ADH/AVP.
  - release into posterior pituitary
  - stored in posterior pituitary
  - The ending of the OVLT neuron extends to the posterior pituitary and activate or suppress the ADH release
  - nerve (control the secretion of ADH into blood)
  - posterior pituitary
  - release



ADH → vasopressin → Binding to the receptor on collecting

ADH → regulate urine osmolality:
- increasing AQP2in ~~distal tubes~~ collecting tubes
- increase the activity of NKCC2 or other ion channels to reabsorb minerals

ADH → kidney: sensing the change of Na^+ in distal tube, and release renin from granule cells

renin → activate → Liver: proangiotensin

Ang → ACE (lungs)

Ang II:
- stimulate the release of mineral cortisol
- vasopress the vessels.

In pregnant women:
- fluid intake ↑.
- hCG · decreases increases the osmolality threshold of ADH/AVP. The set point of the osmoreceptor decrease
- renal sensitivity of ADH/AVP decreases.

the cell membranes due to stretch or shrinkage in response to
(normal set point is 290 mOsm) in plasma. (2.5 mark)
In response to hyperosmolality or hypo-osmolality, stored vasopressin/anti-diuretic hormone (AVP/ADH) is released or inhibited from the endings of these neurons which extend to the posterior pituitary. (2 marks)
Binding of AVP/ADH to its receptor on the epithelial cell on the collecting duct of kidney causes aquaporin 2 to move to the apical surface of these cell thereby allowing water to be reabsorbed and return to circulation via constitutively present aquaporin 3 on baso-lateral surface of these cell. (2.5 mark)
In pregnancy, the set point of the osmoreceptors decreased to about 280 mOs
that AVP/ADH release is stimulated/released at lower plasma osmolality which cause

week 12

Describe the changes in the HPA axis of the pregnant woman(8), and explain how the fetus is protected from the consequences of the changes.(2)

Hypothalamus → Pituitary → Adrenal gland

1. Increasing placental GH level, decreasing maternal GH in pituitary gland.
2. Activin and Inhibin produced by placenta can decrease FSH through binding to Follistatin
3. Adrenal gland: Decreasing NE level in pregnant woman.
4. Producing cortisol binding globulin to increase cortisol half-life
5. Increasing CRH and ACTH to increase GC.
6. Increasing (H)Aldosterone (P) level

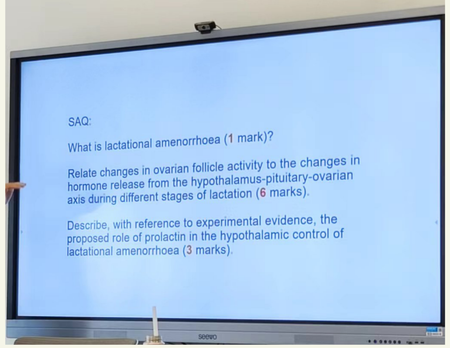
High level of 11β-HSD2 in the fetus syncytiotrophoblast to decrease maternal GC

Placenta
CRH
ACTH
HSD11β2.
Estrogen
↓
liver
↓
CBG → binding → GC (cortisol)

HPA (mother)
Hypothalamus
↓
CRH
↓
pituitary
↓
ACTH
↓
Adrenal gland
↓
GC (cortisol)

1. Cortisol increased in the late pregnancy (3-folo)
2. placental CRH triggers increase of maternal ACTH
3. GC increase causes increasing placental CRH (positive feedback)
4. At first, CBG decreases the level of active GC. Later, CBG begins to decrease and upregulate the active GC.
5. GC ↑ finally inhibits maternal CRH
6. The HPA setpoint changes.
7. The size of adrenal gland ↑.
8. The number of corticotroph: no change

HSD11β2 (from syncytiotrophoblast): inactivate cortisol.
cortisol → cortisone.



The increase of prolactin can inhibit the secretion of kisspeptin, thus decreasing the secretion of GnRH and FSH/LH, stopping the menstrus cycle.

After pregnancy → lactation → After lactation

After pregnancy: prolactin↑, GnRH↓.

lactation: prolactin↑, LH↓, FSH↓, GnRH↓. no ovarian follicle.

After lactation: prolactin↓. After a cycle, GnRH, LH↑. Start new cycle. ovarian follicle↑.

① hypothalamus: GnRH ← kisspeptin ⊣

pituitary: LH/FSH ⊣ prolactin

ovary: E、P. ⊣ prolactin

Reducing prolactin with dopamine can decrease

注意 渗透压与血浆渗透压的区别:

渗透压 { 血浆渗压 / 胶体渗压

oncotic pressure. plasma osmolality.

oncotic pressure.

hCG. syncytiotrophoblast cells. hCG.

oncotic pressure. ADH. decreased ADH.

collecting duct.

Na^+

distal tubule.

albumin.

plasma osmolality

oncotic pressure.