

Control Of Pain

When pain reaches the brain :

Hypothalamus secretes **endorphin**

Endorphin -> stimulates periaqueductal gray matter (area in pons & mid brain) to secrete **enkephalin**

Enkephalin -> stimulates raphe magnus nucleus (found in medulla) to secrete **serotonin**

Serotonin -> stimulates substantia gelatinosa of rolando (gate theory of pain found in spinal cord) to stop substance P release and closes of the gate of pain

As a result pain won't reach the cerebral cortex, and we won't feel it

We stop pain by stopping slow pain pathway as it's more imp. and has long duration

Endogenous Opioids (Secreted normally inside our body to stop pain) has three major types :-

مخدرات تصنع داخل الجسم

- 1) Endorphins (secreted by hypothalamus)
- 2) Enkephalins (secreted by periaqueductal gray matter & substantia gelatinosa of rolando)
- 3) Dynorphins

* The secretion of endogenous opioids increases with exercising

Morphine (opium seed derivative) :

- Is a strong analgesic for pain relief
- Acts on receptors in CNS & PNS to perform its analgesic effect

Opioid Receptors :-

- 1) Mu-receptors -> has high affinity to endorphins
- 2) Kappa-receptors -> has high affinity to dynorphins
- 3) Delta-receptors -> has high affinity to enkephalins

Gastrointestinal Tract (GIT)

GIT is regulated by 2 types of regulation :-

1) Nervous regulation (faster & more imp.) which occurs through

a) Reflexes that occur entirely within the enteric nervous system in the GIT wall

ردود الفعل التي تحدث داخل الجهاز العصبي المعوي

Stimulus : stretch of GIT wall , digestive food products & change in PH

Response : Affect GIT motility and secretion

هناك عوامل محفزة كتمدد جدار الجهاز الهضمي وتغير مستوى الحموضة يؤثر حركة وإفرازات الجهاز الهضمي

b) Reflexes from GIT to autonomic nervous system

- **Gastrocolic reflex:** stomach distension sends impulses to evacuate the colon

انتفاخ المعدة يرسل نبضات لإخلاء القولون

- **Enterogastric reflex:** Food in small intestine and colon sends inhibitory impulses to inhibit gastric motility and secretions

وجود الطعام في الأمعاء الدقيقة والقولون يرسل النبضات لمنع حركية وإفرازات المعدة

c) Reflexes from GIT to the central Nervous System (2 Types)

Type 1 - Unconditional Reflexes (innate & don't need training)

ردود الفعل الموجودة بالفطرة

Stimulus: food in mouth or GIT

Receptor: In GIT wall

Center: Brain Stem

Efferent Nerves: Autonomic Fibers

Type 2 - Conditional Reflexes (Acquired and needs experience)

Stimulus: seeing , smelling or hearing

Receptor: visual , olfactory and auditory receptor

Center: Cerebral Cortex

Efferent Nerves: Autonomic Fibers

2) Hormonal Regulation which occurs by GIT hormones secreted by APUD cell (acrine precursor uptake and decarboxilation cells)

*** Hormones of GIT are all secreted from the upper part of the small intestine**

1) Local Hormones

a) Gastrin (secreted ALSO by gastrin cells in stomach antrum) ->

- Increase acid secretion
- Increase gastric motility
- Contracts LES (lower esophageal sphincter)
- Trophic to mucosa

b) Gastric inhibitory peptide ->

- Decrease gastric acid secretion
- Decrease gastric motility
- Increase insulin secretion

c) Secretin ->

- Increase aqueous pancreatic juice (rich in bicarbonates)
- Decrease gastric acid secretion

d) CCK (cholecystokinin) ->

- Increase enzymatic pancreatic juice
- Evacuates gall bladder

e) Motilin ->

- Increases motility of gastric antrum and duodenum
- Contracts LES

f) Vasoactive intestinal peptide ->

- Vasodilatation of intestinal blood vessels
- Decrease HCL secretion
- Increases bicarbonate pancreatic secretion

**** These hormones are polypeptides**

2) Systemic Hormones -> Aldosterone