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1 **Pharmacology of Analgesics**
By **Dr.Muhammad Zahid**

2 **Learnig outcomes**
 ▶ What is algesia(Pain)
 ▶ What are the causes & types of pains
 ▶ Components of pain
 ▶ Pain transmission –Gate Theory
 ▶ **TREATMENT OF PAIN**
Analgesics
 1.Norcotics—
Opioids(Morphine)
 2.Non Noorcotics—NSAIDS
 3.Co Analgesics

3 **What is Algesia?**
sense of pain

Learnig outcomes

- ▶ What is algesia(Pain)
- ▶ What are the causes & types of pains
- ▶ Components of pain
- ▶ Pain transmission –Gate Theory
- ▶ **TREATMENT OF PAIN**

Analgesics

- 1.Norcotics---
- Opioids(Morphine)**
- 2.Non Noorcotics-----NSAIDS
- 3.Co Analgesics

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2 Learning objectives

- What is algesia(Pain)
- What are the causes & types of pains
- Components of pain
- Pain transmission -Gate Theory
- MECHANISM OF PAIN
 - Analgesics
 - 1.Narcotics—Opioids(Morphine)
 - 2.Non Narcotics—NSAIDS
 - 3.Oc Analgesics

3 What is Algesia?

sense of pain or unpleasant sensory experience by noxious stimulation

4 Onset of Pain

- Acute pain

What is Algesia?

*sense of pain
or
unpleasant sensory
experience by
noxious stimulation*

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Sign in

3 What is **Algesia**?
sense of pain or unpleasant sensory experience by noxious stimulation

4 **Onset of Pain**
▶ **Acute pain**
▶ Sudden in onset
▶ Usually subsides once treated
▶ **Chronic pain**
▶ Persistent or recurring
▶ Often difficult to treat

5 **Types of Pain**
Visceral Superficial

Onset of Pain

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- 5 **Types of Pain**

Visceral	Superficial
Vascular	Referred
Neuropathic	Phantom
Cancer	Psychogenic
- 6 **Pain transmission components**

Types of Pain

Visceral	Superficial
Vascular	Referred
Neuropathic	Phantom
Cancer	Psychogenic

Pain transmission components

- ▶ **Pain Quick onset** conducted by **A-type delta fibre**. Velocity **3 to 10m/sec**
- **Pain slow onset** conducted by **C-Type N-fibre**. Velocity **0.5 to 2m/sec**

Components of pain – three

1. Nociception (body detection and signalling)

2. Pain (conscious perception)

3. Suffering or affect (individual response to pain)

Causes of Pain

- ▶ **Tissue damage(Release mediators)**
- ▶ **Tissue ischaemia**
- ▶ **Chemical substances**
- ▶ **Muscle spasm**

Pain Transmission

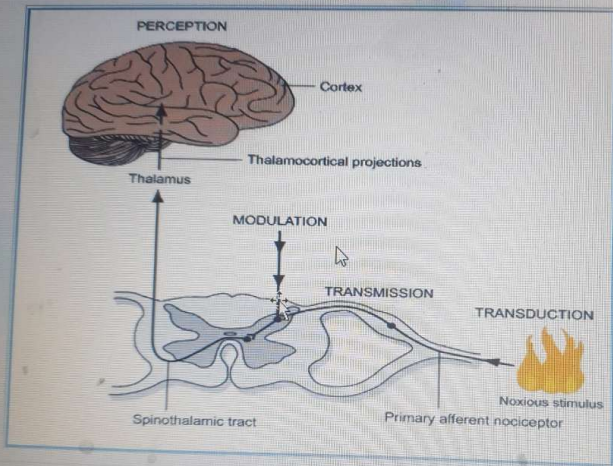
Tissue injury causes the release of
Chemical/neurotransmitter/mediators

- ▶ **Bradykinin**
- ▶ **Histamine**
- ▶ **Potassium**
- ▶ **Prostaglandins**
- ▶ **Serotonin**

These stimulate nerve endings & start the
pain process.

Pain Transmission

- ▶ These pain fibers enter the spinal cord and travel up to the brain.
- ▶ The point of spinal cord entry is the **DORSAL HORN**.
- ▶ **GATE THEORY**
The **DORSAL HORN** is the location of the **"GATE,"** where pain fibres enter & ascend to the higher centre



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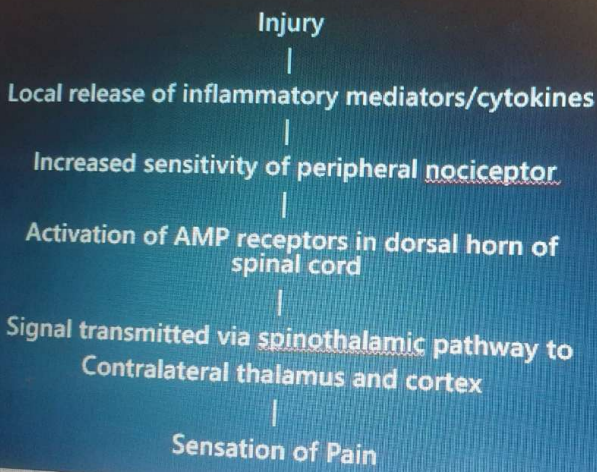
COMMENTS



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Pain Pathway



How to relieve pain

Analgesic

*Selectively relieves pain by acting on
CNS or on peripheral pain mechanisms
without significantly altering
consciousness.*

Analgesics

- 1) Narcotic analgesics -- Opioids
- 2) Non narcotic analgesics -- NSAIDs
- 3) Adjuvant drugs or Co-analgesics

Narcotic analgesics OR Opioid Analgesics

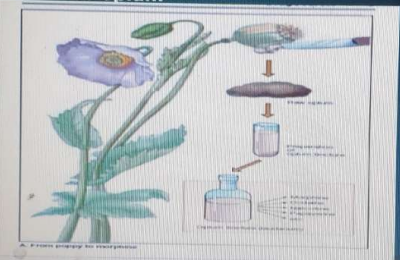
Morphine,

the prototypical alkaloid opioid agonist.

named after **Morpheus** ---
the Greek god of Dreams.

Sertürner -

A pharmacist: in 1803 isolated pure alkaloid morphine after incising unripe poppy capsule, exudes a white substance. When dried "brown" Gum - crude opium



Tap to add notes



Active Principles or Alkaloids of Opium

Two Types of alkaloids

Phenanthrene

Morphine 10%

Codeine 0.5%

Thebaine 0.2% -

Non-analgesic

Benzo-isoquinolines

Papaverine 1.0 %

Noscapine 6.0%

Narcotine -

Non analgesic





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Morphine is an exogenous opioid & is a Standard Analgesic

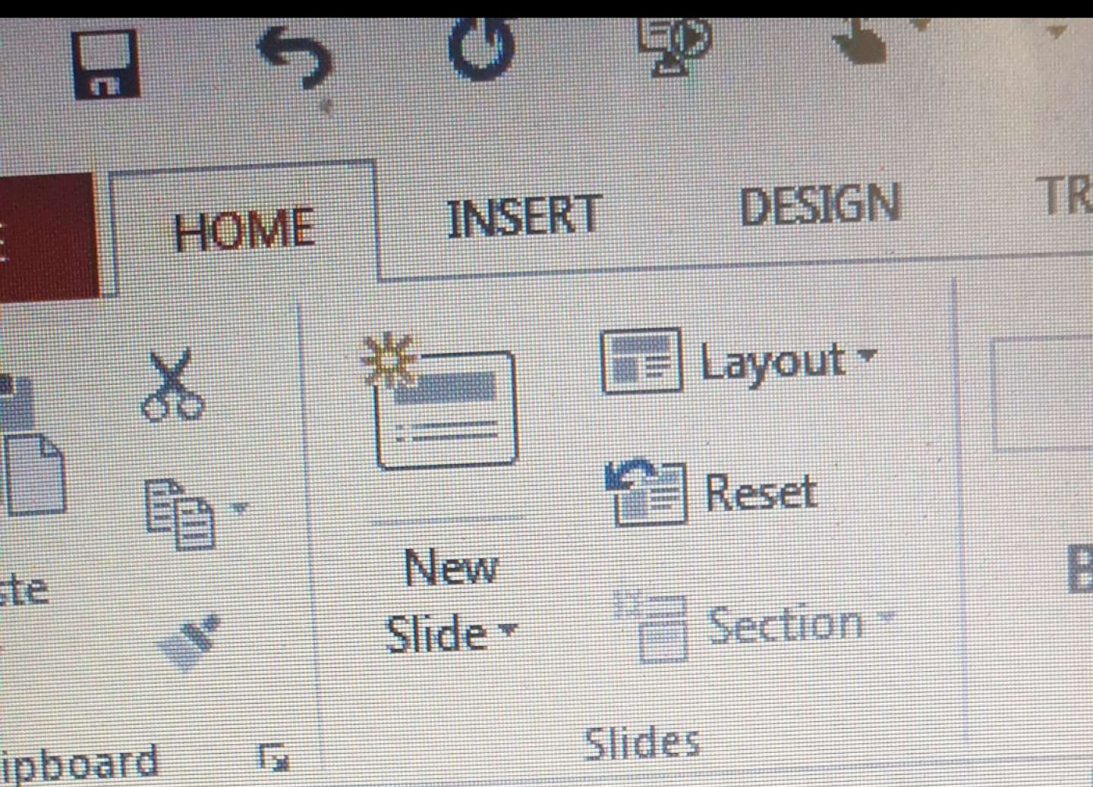
- ▶ - for other analgesics to be compared
- ▶ --Morphine requires for its analgesic action to combine its receptors (μ , δ & κ)
- ▶ *But in our body present endogenous opioid peptides with same functions*



Endogenous Opioid Peptides

- ▶ Body has endogenous opioid peptides possessing *opioid like pharmacological properties*,
- ▶ Anticipation of pain
 - ▶ Modulate the pain released during *stressful conditions*
- ▶ Bind to *Opioid Receptors*(μ , δ & κ)
- ▶ Inhibit transmission of pain by inhibiting transmission of impulses at Dorsal Horn of the Spinal Cord to the brain.

Endorphin 1 & 2. present at CNS,
have high affinity to the μ receptor
and analgesic properties



Endogenous Opioid Peptides

Three Families:

1. Endorphins: Endorphin 1 & 2
2. Enkephalins:
Met-enkephalin,
Leu-enkephalin
3. Dynorphins:

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Endorphin 1 & 2. present at CNS,
have high affinity to the μ receptor

Endogenous Opioid Peptides

Derived from **Precursors Proteins**:

Prepro-Opio MelanoCortin (POMC)

PrePro-enkephalin (Pro-enkephalin A)

Prepro-dynorphin (Pro-enkekphalin B)

Opioid Receptors Subtypes & Their Important Functions

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Functions

μ - Receptors:

- ▶ Supraspinal & spinal analgesia
- ▶ Sedation
- ▶ Euphoria
- ▶ Respiration depression
- ▶ Slowed GIT transit
- ▶ Modulation of Hormone & Neurotransmitter
- ▶ Pupil constriction
- ▶ Physical dependence & tolerance

δ - Receptors

- ▶ Spinal analgesia
- ▶ Respiratory depression

K - Receptors

- ▶ Spinal & *peripheral Analgesia*
- ▶ Pupil constriction
- ▶ Slowed GIT Transit
- ▶ *Dysphorea*
- ▶ Sedation
- ▶ Physical dependence

	<u>Meu</u>	<u>Kapa</u>	<u>Delta</u>
Analgesia			
Supraspinal	+++	-	-
Spinal	++	+	++
Peripheral	++	++	-
Respiratory Depression	+++	++	++
Pupil Constriction	++	+	-

Prof Dr M
Ayman

Majority of Opioids cause μ activation
& produce:

analgesia, euphoria,
respiratory depression,
physical dependence.

Analgesic effects are also due to effect on
delta and Kappa receptors
but extent of contribution not known.

Prof D

Aym

Zurw

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Classification

- a) According to source
- b) According to intensity
- c) According to clinical uses

Classification of OPIOIDS

- **Natural**

- **phenanthrene**
 - morphine 10%
 - codeine 0.5%
 - thebaine 0.2%

- **semisynthetic**

- heroin
- oxymorphone
- Hydromorphone

- **synthetic**

- Phenylpiperidines (meperidine – fentanyl)
- Phenylheptylamines (methadone – levomethadyl)
- morphinians (Levorphanol)
- benzamorphans (pentazocine – dezocine)