POLTAVA STATE MEDICAL UNIVERSITY

Pharmacology of medicinal drugs that influence central nervous system. Analgesic drugs

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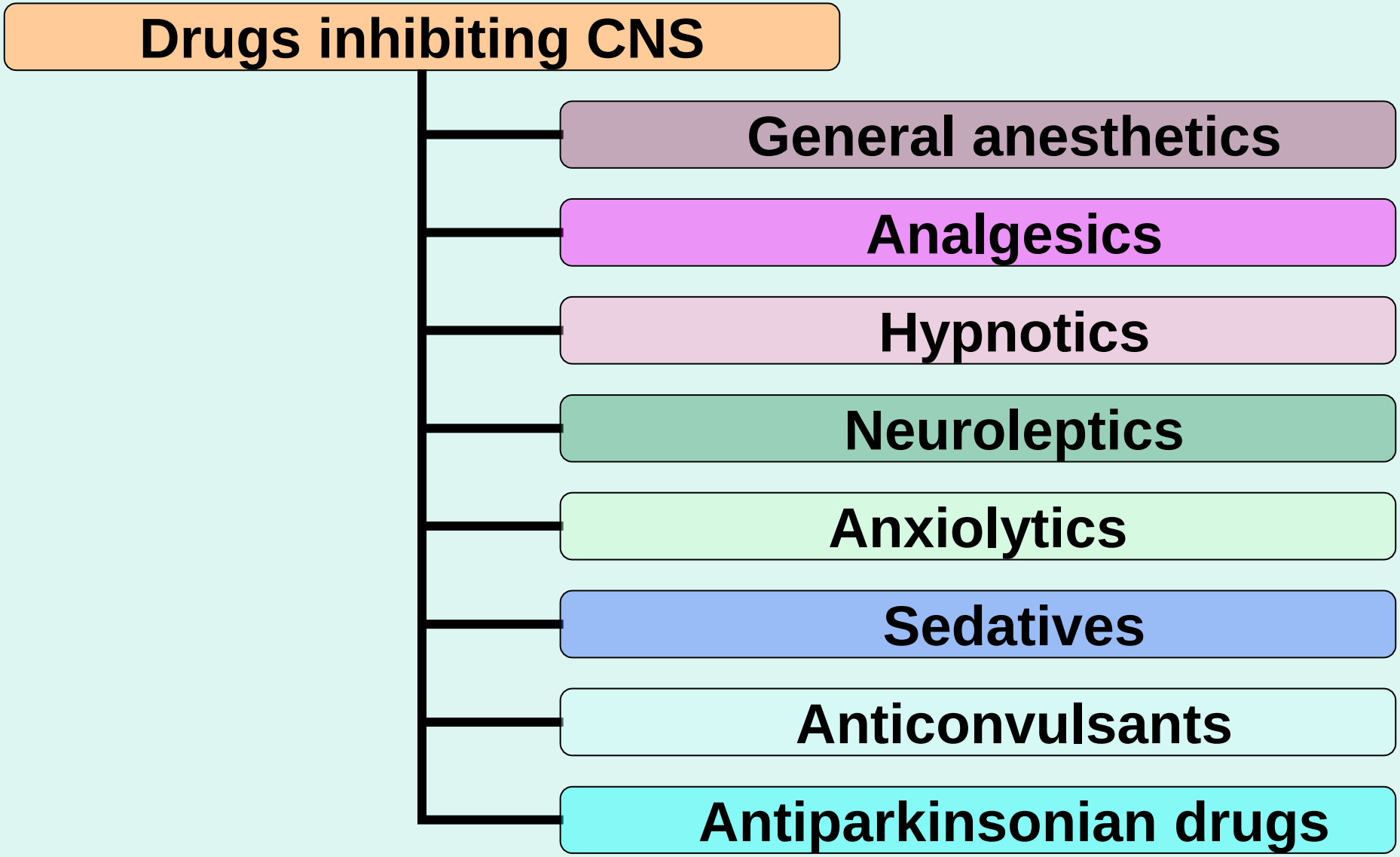
DRUGS INHIBITING CNS



COMMON PROPERTY OF GENERAL ANESTHETICS AND ANALGESICS IS

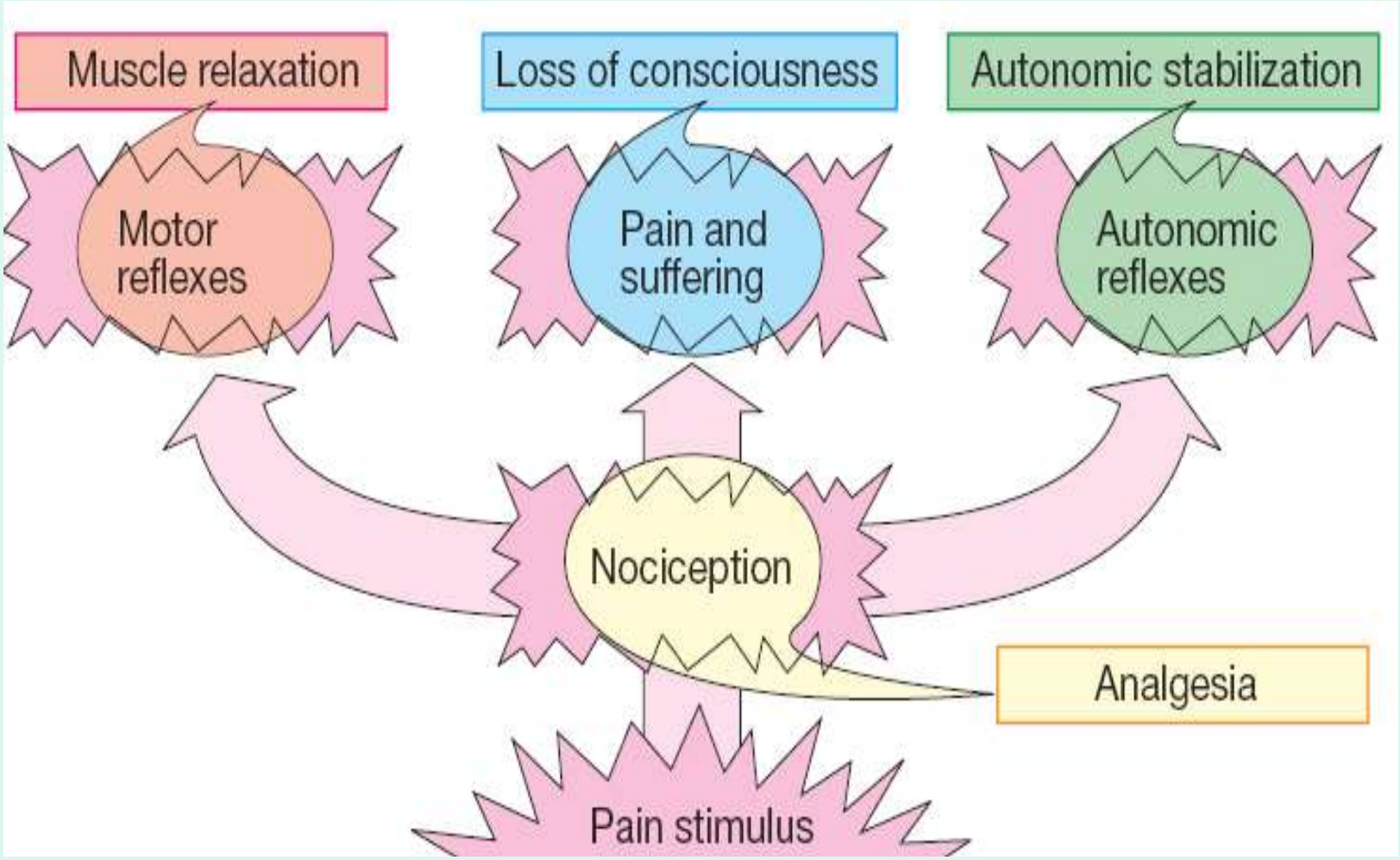
ABOLISHING OF PAIN

GENERAL ANESTHETICS

GENERAL ANESTHESIA

General anesthesia (narcosis) **is a reversible oppression of CNS with abolishing of pain and all kinds of sensitivity, with myorelaxation and unconsciousness.**

MAIN GOALS OF GENERAL ANESTHESIA



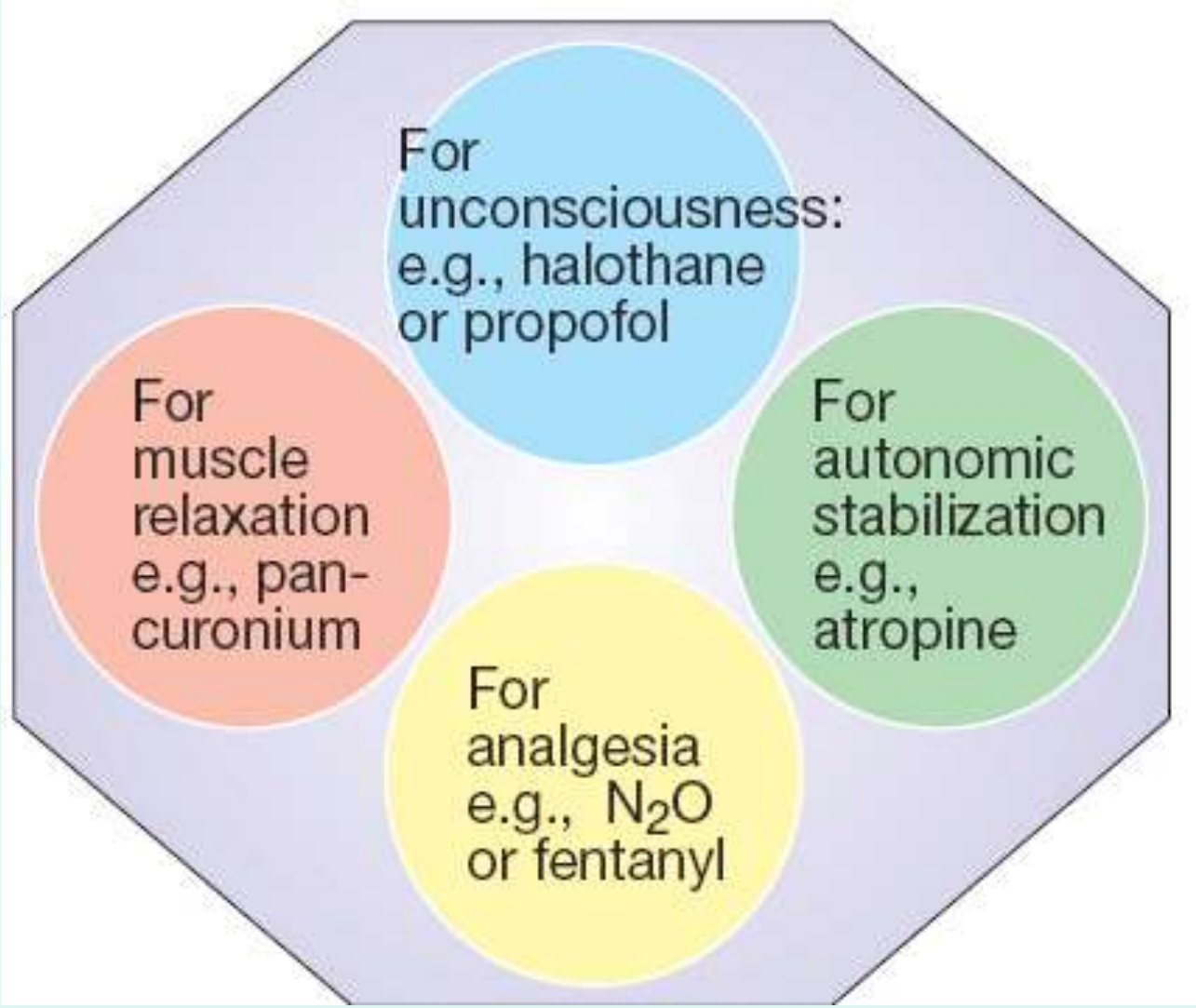
DISTINGUISHES BETWEEN GENERAL AND LOCAL ANESTHESIA

General anesthesia	Local anesthesia
Total abolishing of pain	Local abolishing of pain
Loss of consciousness	Normal consciousness
Relaxation of skeletal muscles	Normal muscular tone
Abolishing of reflexes	Normal reflexes
Used for all kinds of surgeries	Used for uncavitary surgeries

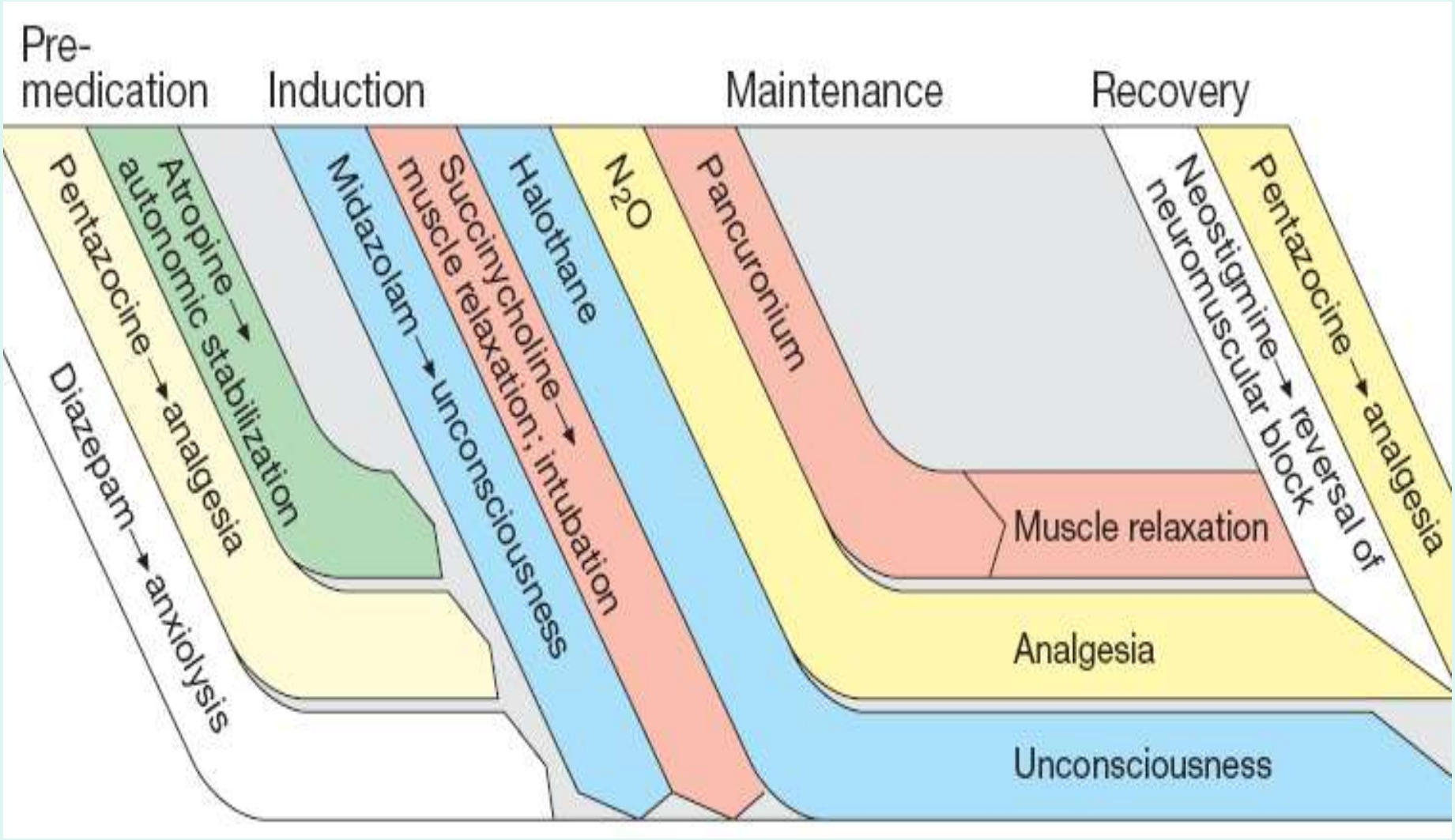
MAIN CONCEPTS OF GENERAL ANESTHESIA

- ***Induction to anesthesia (inductive narcosis)*** **is the beginning of narcosis, should be pleasant for patient.**
- ***Basis narcosis*** **is a maintenance of narcosis for all periods of surgery**
- ***Mixed narcosis*** **is a combined usage of general anesthetics from one pharmacological group (halothane + nitrous oxide)**
- ***Combined narcosis (balanced anesthesia)*** **is a combined usage of general anesthetics and preparations from another pharmacological groups (ganglia blockers, myorelaxants, etc.).**
- ***Safety margin*** **is a difference between the dose that causes surgical anesthesia and the dose that causes lethal oppression of respiratory center.**
- ***Premedication (preanesthetical madication)*** **is the administration of preparations for potentiation of narcosis as well as for prophylaxis of side effects of general anesthesia.**

BALANCED ANESTHESIA



REGIMEN FOR BALANCED ANESTHESIA



DRUGS FOR GENERAL ANESTHESIA

Inhalation anesthetics	Drugs for IV anesthesia
Inhalation	IV administration
Long duration of narcosis	Short duration of narcosis
Strong myorelaxation Well managed anesthesia	Weak myorelaxation Unmanaged anesthesia after the single injection
May be used for cavitary surgeries	Used for short uncavitary surgeries

INHALATION ANESTHETICS

Inhalation anesthetics **are preparations for general anesthesia which are administered by inhalation through special mask or system.**

EQUIPMENT FOR INHALATION GENERAL ANESTHESIA

(APPARATE AND MASK)

INHALATION ANESTHETICS
CLASSIFICATION

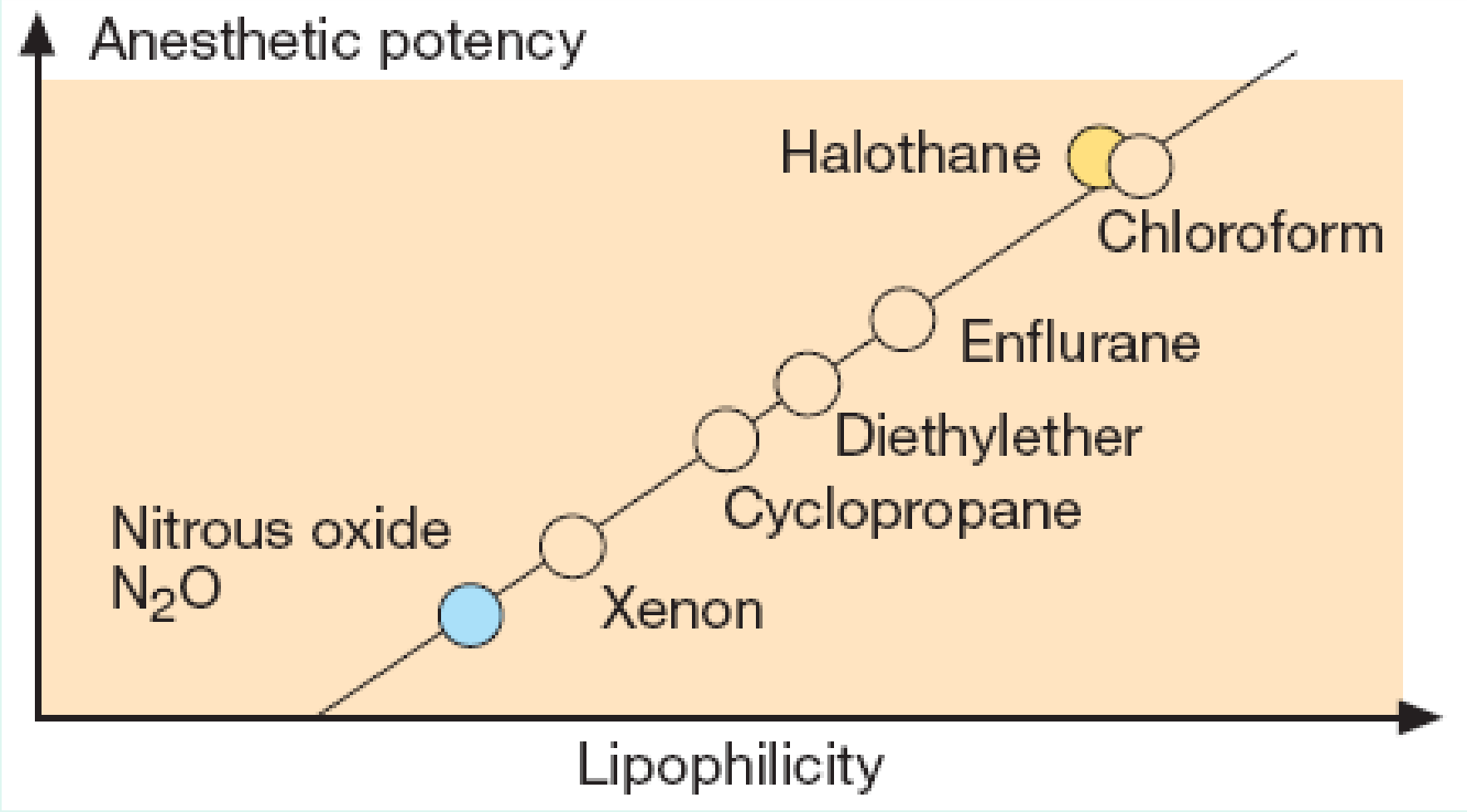
1. Volatile liquids:

- **Ether for narcosis (Aether pro narcosi)**
- **Halothane (Phthorothanum)**
- **Isoflurane**
- **Sevoflurane**

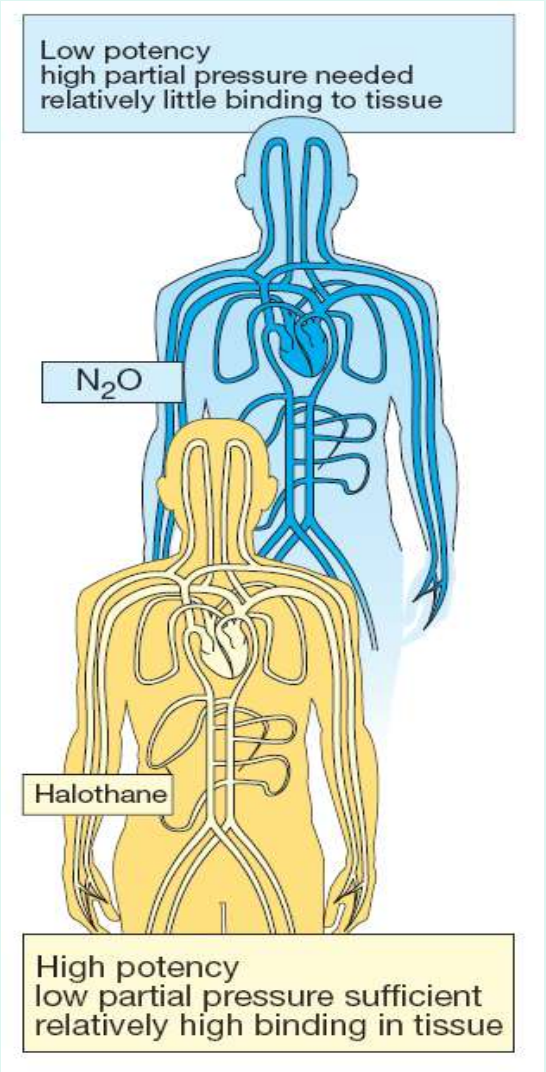
2. Gaseous anesthetics:

- **Nitrous oxide**
- **Xenon**

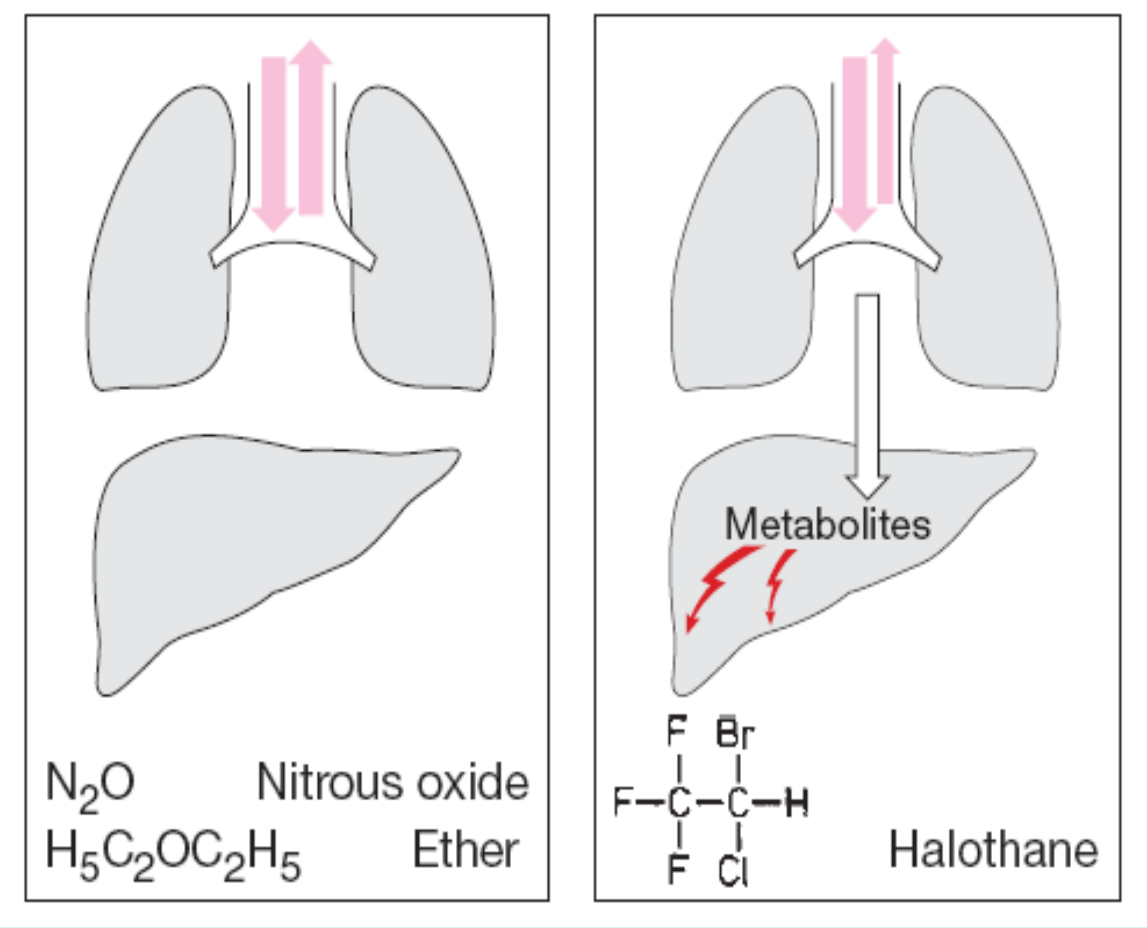
CORRELATION OF ANESTHETIC POTENCY AND LIPOPHILICITY



CORRELATION BETWEEN ANESTHETIC POTENCY AND BINDING TO TISSUES



ROUTES OF ELIMINATION OF INHALATION ANESTHETICS



STAGES OF NARCOSIS

I. ***Analgesia*** **(pain is absent; is used for short surgeries)**

II. ***Excitement*** **(many disturbances in the organism, is not used for the surgeries)**

III. ***Surgical anesthesia*****: planes *1-4*** **(pain is absent; unconsciousness, myorelaxation; majority of surgeries are carried out)**

IV. ***Recovering*** **(restoration of CNS functions if the concentration of drug is decreased) or *medulla paralysis*** **(if the concentration of general anesthetic is increased).**

ETHER FOR NARCOSIS

- **is volatile inflammable liquid with specific odor**
- **80% of a dose is excreted unchanged with air**
- **has a *wide safety margin of narcosis* action; all stages of narcosis are denominated; has a *long stage of excitement* (motor excitement, increasing of muscles tone, respiratory arrest, heart arrest, arrhythmia, changeable BP, spasm of bronchi, vomiting, hypersalivation)**
- **is used for basis mono- and combined narcosis**
- **irritates the upper respiratory pathways; may cause pneumonia after the surgery.**

HALOTHANE (PHTHOROTANUM)

- **is volatile liquid, contains fluorine, is not inflammable**
- **has a *strong narcosis action*, but *weak analgesic action***
- **has a long stage of analgesia; *excitement stage is absent***
- **dilates bronchi (may be used for termination of severe bronchial asthma attack), dilates blood vessels, lowers BP, *increases myocardium sensitivity to catecholamines* (adrenaline and noradrenaline are contraindicated during this narcosis), decreases the tone of uterus**
- **is metabolized in the liver and may cause liver lesions**
- **is used for combined general anethesia.**

ISOFLURANE

- is similar to halothane
- displays good myorelaxation and rapid recovery
- has less negative influence on the heart and liver
- is the best agent in pediatric patients.

NITROUS OXIDE

- **is a gaseous anesthetic, is biologically inert**
- **has a *weak narcosis action* (is not used as sole anesthetic for surgeries), does not cause good myorelaxation, has a *strong analgesia, rapid onset of action and recovery***
- **is used for analgesia in traumas, myocardium infarction, or labor as well as for inductive and combined narcosis**
- ***is not toxic*: may cause hypoxia in a concentration of about 80%.**

DRUGS FOR INTRAVENOUS ANESTHESIA

Intravenous anesthetics **are drugs for general anesthesia which are administered IV.**

PROCEDURE OF IV ANESTHESIA

DRUGS FOR IV ANESTHESIA:
classification

On duration of action

1. Long-acting (more than 60 min)

– Sodium oxibutyrate (Natrii oxybutiras)

2. Intermediate- acting (20-30 min)

– Thiopental-sodium

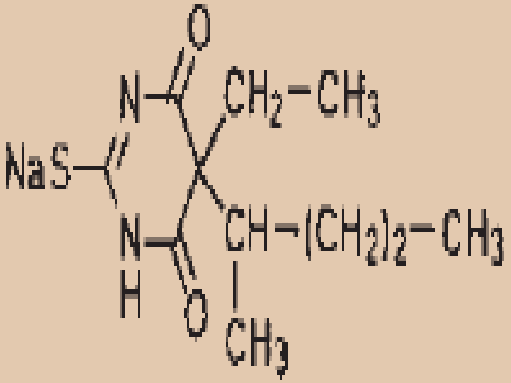
3. Short-acting (10-20 min)

– Ketamine (Kalipsol)

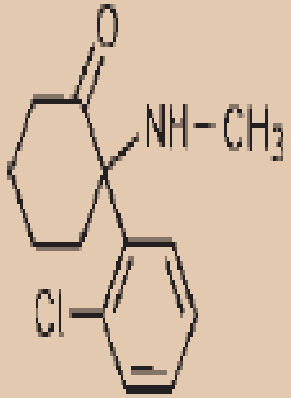
4. Ultra-short-acting (3-5 min)

– Propofol

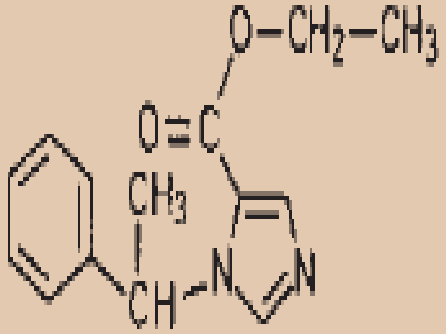
CHEMICAL STRUCTURE OF IV ANESTHETICS



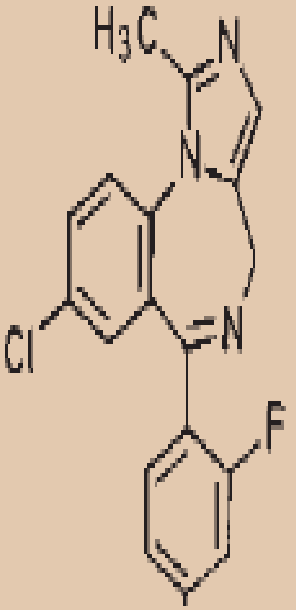
Sodium thiopental



Ketamine

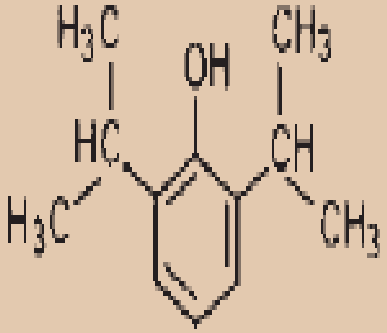


Etomidate



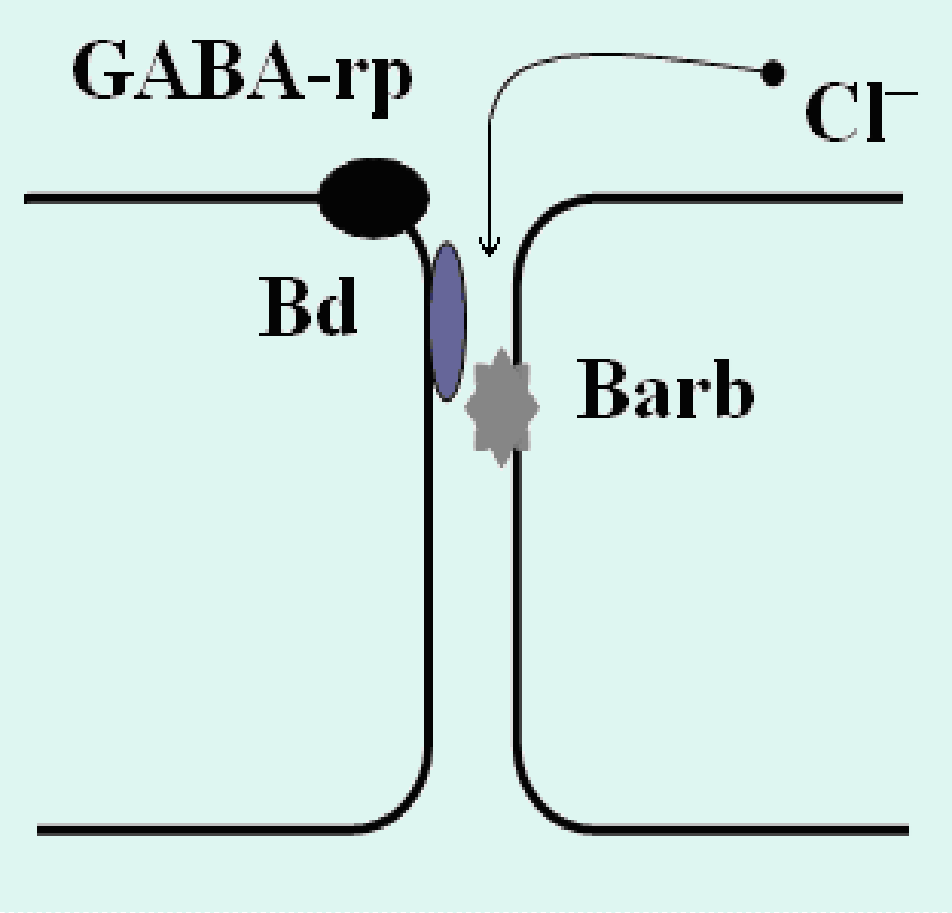
Midazolam

Sodium methohexital



Propofol

CHLORIDE CHANNEL



SODIUM OXIBUTYRATE
STRUCTURE AND PHARMACOKINETICS

On its chemical structure is *similar to GABA* (natural inhibiting neuro-transmitter).

Pharmacokinetics

- **is administered IV, IM, orally**
- **begins to act in 5-7 min after IV administration**
- **acts during 2-4 hrs**
- **is completely metabolized in the body.**

SODIUM OXIBUTYRATE
PHARMACODYNAMICS AND INDICATIONS

PHARMACODYNAMICS	INDICATIONS
1. General anesthesia 2. Sedative action 3. Hypnotic action 4. Anti-seizure action 5. Antihypoxic action 6. Nootropic action (after the long-term treatment)	1. Induction to general anesthesia 2. Basis narcosis in uncavitary surgeries 3. Seizures 4. Edema of brain

THIOPENTAL SODIUM

- **is administered IV, begins to act in 1-3 min, acts during 20-30 min;**
- **is destroyed in microsomes of the liver, is accumulated in the fat tissue**
- **stimulates barbiturate receptors of CL-ion channels**
- **displays rapid onset of action; has a *potent anesthesia, poor analgesia, and little myorelaxation***
- **is used for induction to narcosis, general anesthesia in short-term surgeries and diagnostic investigations**
- **side effects are oppression of respiration, apnea, bronchospasm, laryngospasm, decrease of BP, arrhythmia, liver lesions; decrease in body temperature, thrombophlebitis**
- **contraindications are heart incompetence, bronchial asthma, diseases of upper respiratory pathways, shock, acidosis**
- ***should be used only in clinic***

KETAMINE

- **is administered IV IM; begins to act in 30-60 sec, acts during 15-30 min**
- **stimulates opioid receptors, serotonin receptors, GABA receptors, cholinoreceptors and adrenoceptors, inhibits aspartate (NMDA)-receptors**
- **causes "dissociate narcosis"**
- **produces general anesthesia, *strong analgesia* during narcosis and after it (6-8 hrs), *stimulates blood circulation* (increases heart rate, minute volume of the heart and BP), *does not inhibit respiration; does not cause myorelaxation*, has psychotomimetic action at the start and at the end of narcosis**
- **is indicated for short-term surgeries, inductive narcosis, diagnostic investigations, endoscopy, cateterization of the cavities of the heart;**
- ***is suitable under the conditions of shock***
- ***may be used in children***
- ***may be used in polyclinic***
- **Side effects are muscles regidity, block of upper respiratory pathways, psychomotor excitement**
- **is contraindicated for patients with hypertension and disturbances of cerebral blood circulation.**

PROPOFOL

- **is administered IV, begins to act in 10-30 sec, acts during 3-5 min, is metabolized by cholinesterase in blood**
- **causes *ultra-short general anesthesia*, increases the rate of respiration and heart rate at the beginning of narcosis; decreases BP at the beginning of narcosis (insignificantly) without depressing of myocardium**
- **is used for short-term surgeries, diagnostic investigations and painful bandaging**
- ***may be used in a polyclinic***
- **may cause such side effects, as vomiting, nausea, headache, thrombophlebitis.**

ANALGESICS

Analgesics are drugs reversibly and selectively inhibiting pain in the body without significant changing of consciousness.

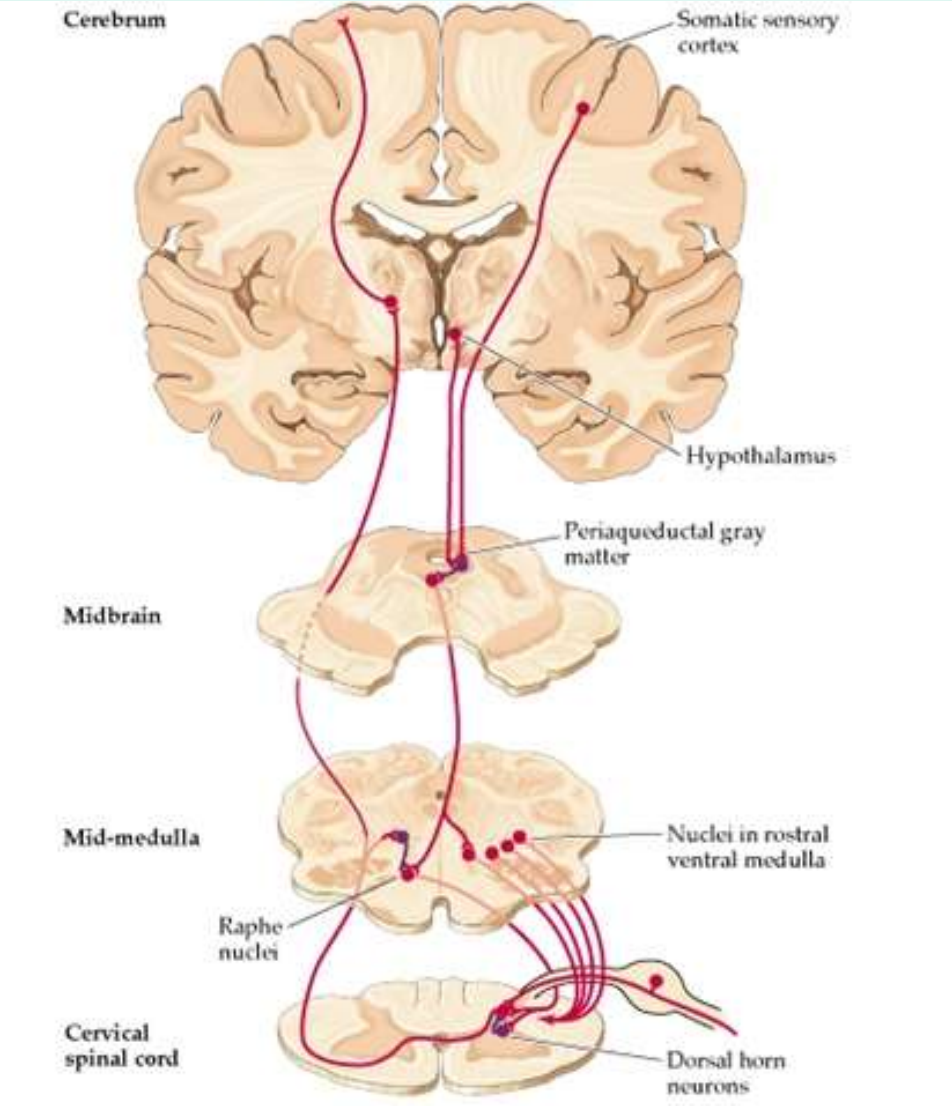
There are two groups of analgesics:

- ***opioid (narcotic) analgesics***
- ***non-opioid (non-narcotic) analgesics.***

PROBLEM OF PAIN

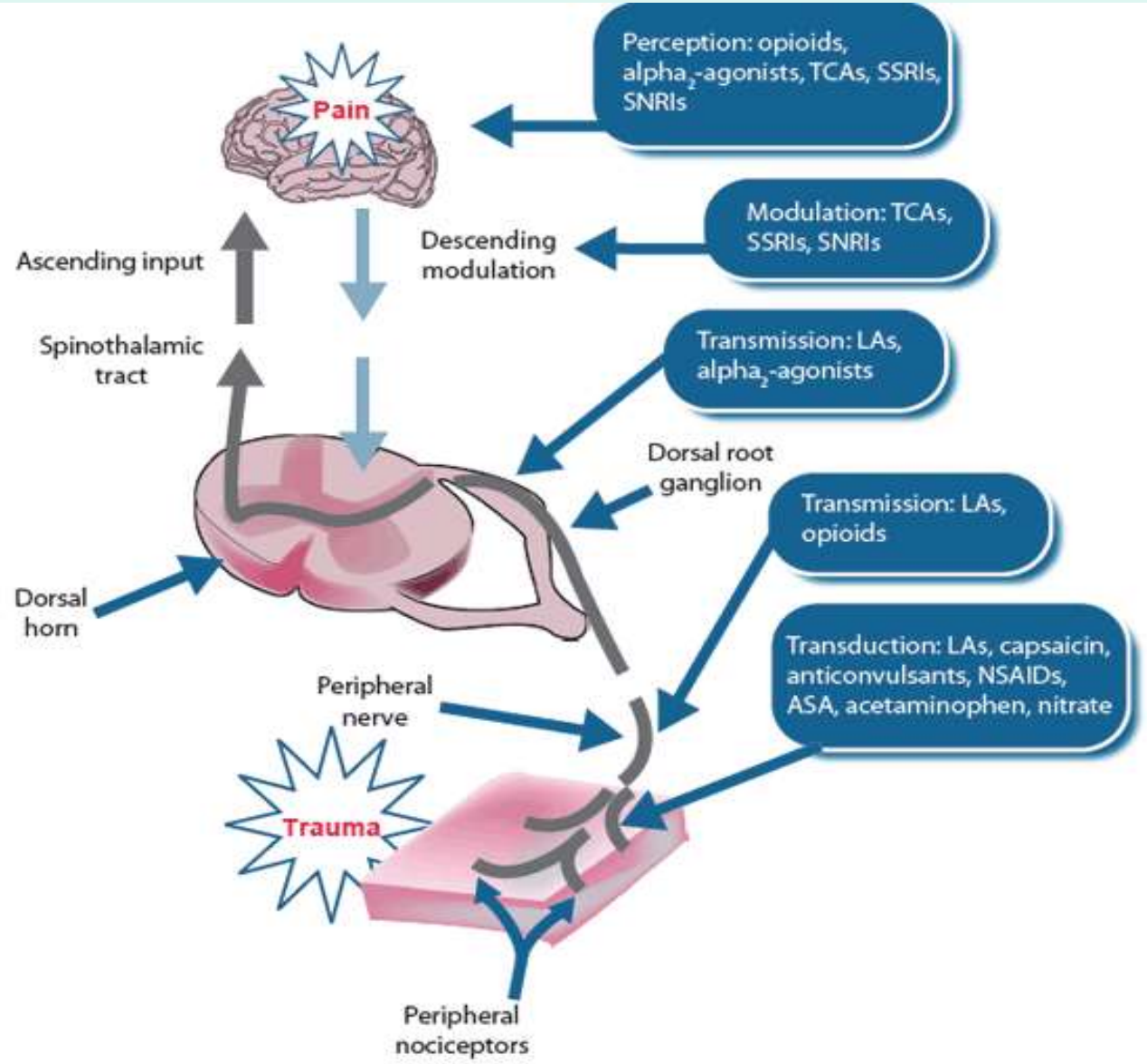
- Pain is a complex perceptual experience when it is acute.
- It is often psychologically inseparable from fear and general distress.
- When it is chronic, can be focal element of suffering that involves depression, somatic pre-occupation, sleep disturbances, despair and physical limitations.

PAIN SENSATION AND LIMITATION OF PAIN

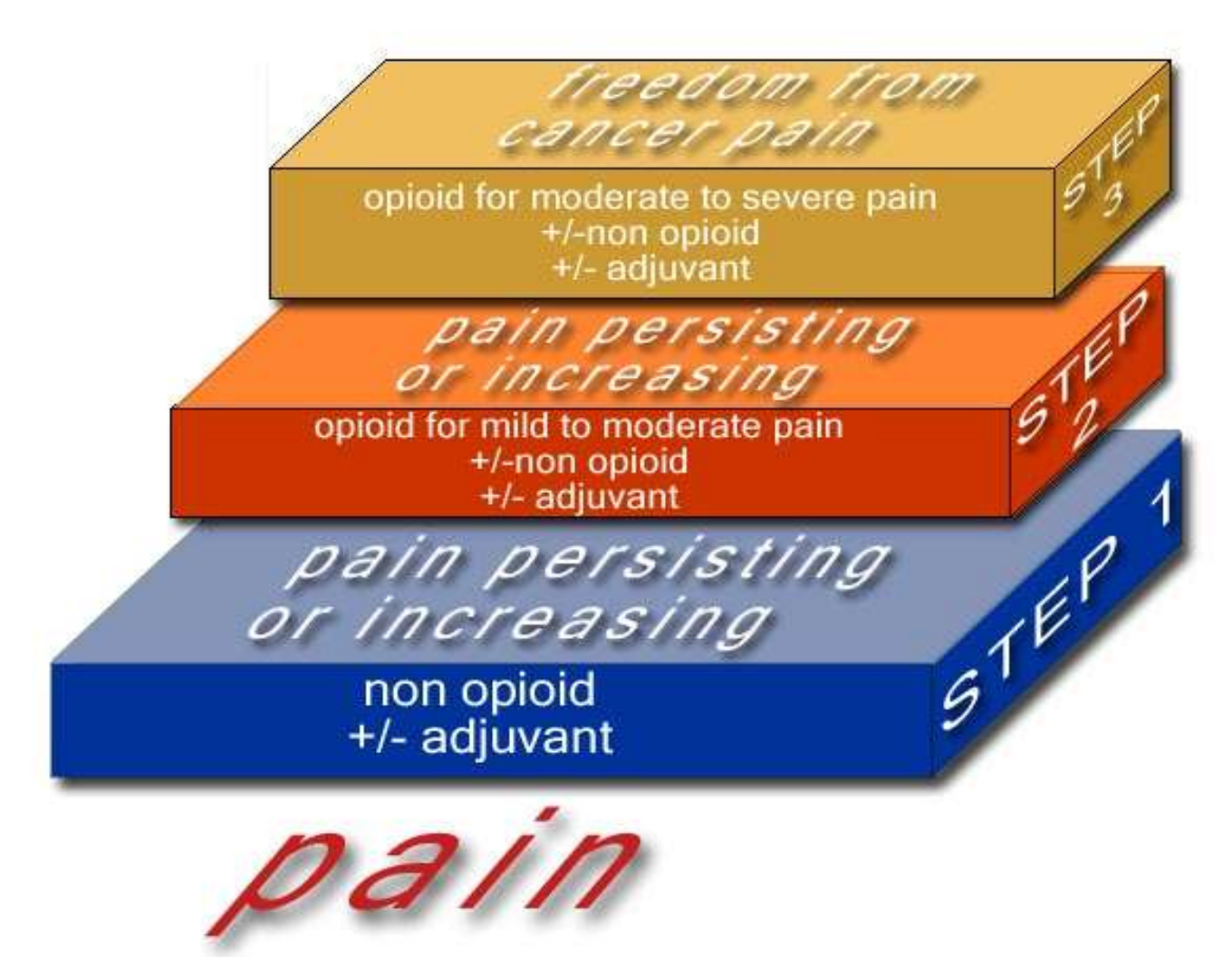


- ***Nociception*** is pain sensation. It includes sensative nerve endings, afferent nerves, afferent pathways in spinal cord, thalamus and cortex of brain. Thalamus is the main collector of pain impulses. Strong nociceptive stimuli may cause irradiation of excitement on medulla of brain resulting in pain shock.
- ***Antinociception*** is limitation of pain in the body. It is realized by opioid receptors (mu = **μ**, Kappa = **κ**, sigma = **σ**) and their ligands.

OPTIONS FOR PAIN MANAGEMENT



INTERNATIONAL STANDARDS FOR CHRONIC PAIN CONTROL



OPIOID ANALGESICS

OPIOID (NARCOTIC) ANALGESICS

Opioid analgesics are the drugs to relieve intense pain, which mimic the action of endogenous opiopeptides and may cause drug dependence..

There are strong agonists of opioid receptors, partial agonists and agonist-antagonists of these receptors.

- Strong agonists have high affinity for μ-receptors, varying affinities for δ- and κ- receptors and low affinity for σ-receptors.
- Partial agonists have low intrinsic activity.
- Agonists-antagonists act as agonists at one subtype and as partial agonists or as pure antagonists at another.

OPIOID ANALGESICS: classification

A. Strong agonists of opioid receptors

1. Natural compounds

– Morphine (morphine hydrochloride)
– Codeine (codeine phosphate)
– Omnopon

2. Synthetic compounds

– Tremeperidine (Promedol)
– Fentanyl

B. Mixed agonists-antagonists and partial agonists of opioid receptors

– Pentazocine
– Buprenorphine
– Nalorphine hydrochloride

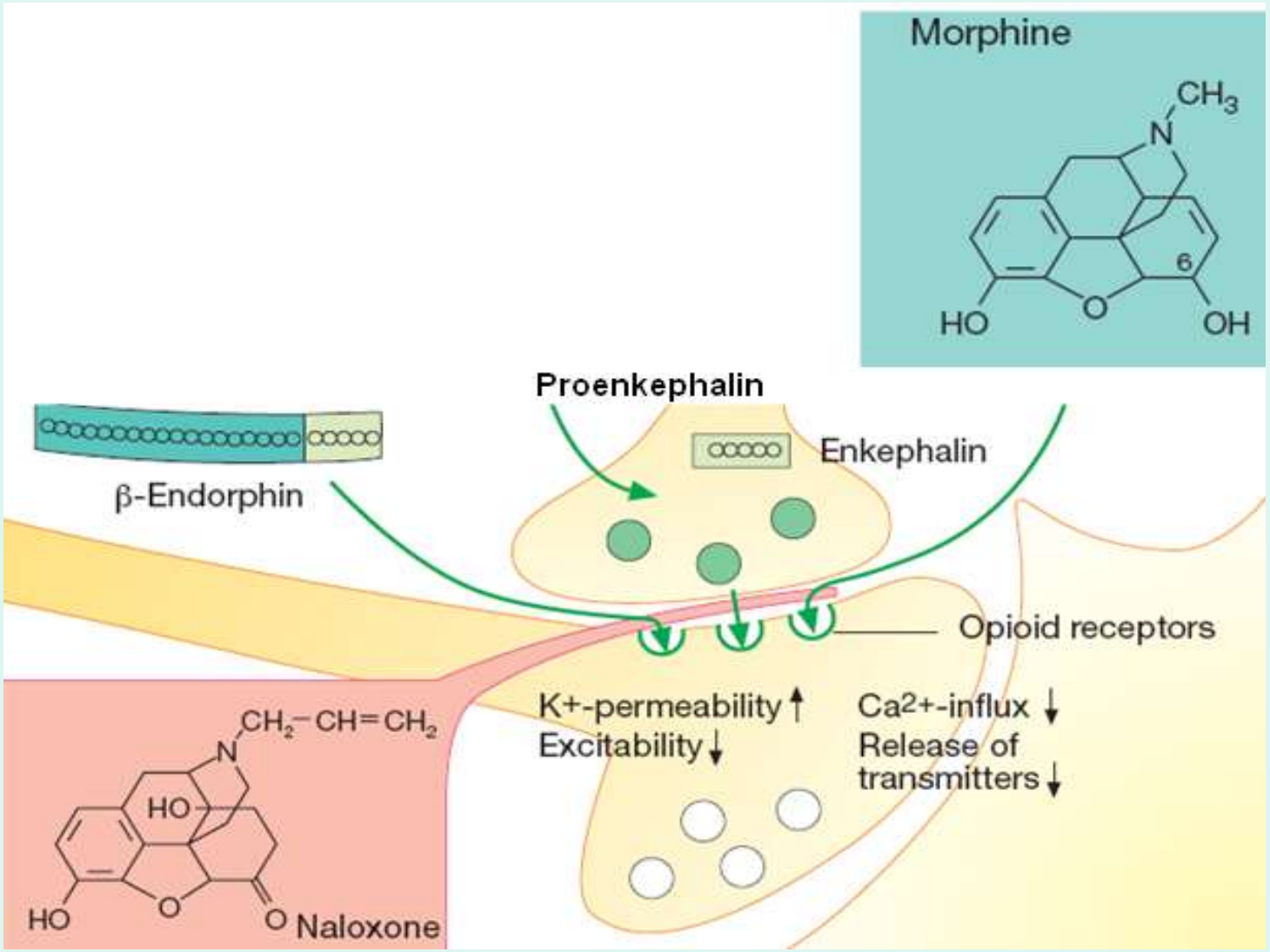
C. Analgesic with opioid and non-opioid mechanism of action

– Tramadol (tramadol hydrochloride)

D. Antagonists of opioid receptors

– Naloxone (naloxone hydrochloride)
– Naltrexone

MECHANISM OF ACTION OF OPIOIDS AND THEIR ANTAGONISTS

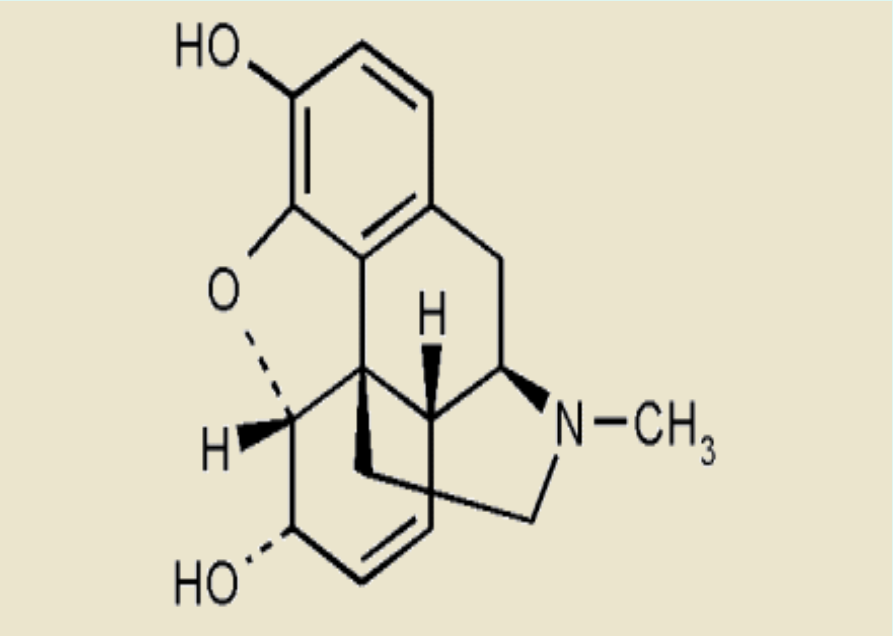


MORPHINE: origin

- ***Morphine*** is an alkaloid of opium.
- ***Opium*** is a dried juice from the unripe semen capsules of poppy (Papaver somniferum). It contains more than 20 alkaloids. Among them there are phenanthrene derivatives (morphine, codeine) and isoquinoline derivatives (papaverine).

MORPHINE: chemical structure

Morphine is a phenanthrene derivative



MORPHINE: pharmacokinetics

- is administered orally, SC, IM, IV, epidurally, intrathecally in the spinal cord
- penetrates blood-brain barrier
- is metabolized in the liver by conjugation with a glucuronic acid
- is excreted by gastric epithelium and adsorbed once more
- finally is excreted with urine
- begins to act in 10-20 min after the injection or in 20-30 min after the oral administration
- acts during 3-5 hrs.

MORPHINE: pharmacodynamics

- analgesia (a decrease in all kinds of pain; changes in the pain perception)
- euphoria (sense of well being), then sleeping
- sedation
- potentiation of other drugs inhibiting CNS
- inhibition of the respiratory center and respiratory depression
- inhibition of the tussive center and a decrease in cough
- inhibition of the vomiting center
- inhibition of the thermoregulation center in hypothalamus
- stimulation of the n. vagus center and bradycardia
- stimulation of the trigger zone of emetic reflex (vomiting in some patients after the 1st administration of morphine)
- stimulation of n. oculomotorius center and miosis
- stimulation of vasopressin production
- dilation of peripheral veins
- an increase in the tone of sphincters in GI tract, bile and urinary pathways
- an increase in the tone of bronchi.

MORPHINE: indications

- Traumatic shock
- Myocardial infarction (together with atropine)
- Colic (together with atropine)
- Pain associated with cancer
- Pain after surgeries
- Pre-anesthetic medication
- Pulmonary edema
- Cough dangerous for life (danger of pulmonary bleeding or pneumothorax).

MORPHINE: side effects and contraindications

Side effects:

1. *Depression of respiration*
2. *Sleeping*
3. *Euphoria*
4. *Vomiting*
5. *Hypotension*
6. *Elevation of intracranial pressure*
7. *Increase in cerebral ischemia*
8. *Constipation*
9. *Tolerance (to the respiratory depressant, analgesic, euphoric and sedative effects)*
10. *Drug dependence*
11. *Changes in effects of other drugs acting on CNS.*

Contraindications

1. *Insufficience of respiration*
2. *Cranial trauma*
3. *Acute abdomen*
4. *Cachexia*
5. *Children till 3 (due higher sensitivity of respiratory center to morphine in such patients)*
6. *Elderly patients after 65 years old (due higher sensitivity of respiratory center to morphine).*

ACUTE POISONING WITH MORPHINE

Signs of poisoning:

State of sleep, un-consciousness; reflexes are present; muscles tone is normal; miosis, bradycardia, Cheyne-Stocks' breathing, retention of urination, spasm of the intestine and bowel.

Emergence help:

1. Lavage of stomach by 0,5% solution of potassium permanganate
2. Naloxone, IV (an antagonist of narcotic analgesics)
3. Atropine (for decreasing in vagal action of morphine).

OPIATE ABUSE

- ***Opiate abuse*** is physical and psychical dependence on morphine (or other opioid analgesic). In opiate abuse, “smark” is self administered by injection to achieve a faster peak concentration in brain and intense psychic effect.
- Quick abolishing of narcotic substance causes ***abstinence*** (insomnia, nausea, vomiting, spastic pains in the abdomen, joint pains). Abstinence results from back-cross decrease in synthesis of endogenous ligands of opioid receptors during long-term use of exogenous opioids.
- ***Compositions of naltrexone with buprenorphine as well as antibodies to morphine are used to treat opiate abuse.***

CODEINE

- is an opium alkaloid; is taken orally
- is less potent analgesic than morphine; ***is active inhibitor of tussive center at doses that do not cause analgesiais used as antitussive*** and as ingredient of combined analgesic or sedative drugs
- may cause oppression of respiration, constipation, tolerance, drug dependence.

TRIMEPIRIDINE (PROMEDOLUM)

- Is a synthetic preparation with a structure unrelated to morphine
- is administered orally, SC, IM, IV; action begins in 10 min after IV administration and lasts 3-4 hrs
- ***yields morphine in 2-4 times on analgesic activity***; causes less inhibition of respiratory center, less stimulation of n. vagus and emetic centers; has ***spasmolytic action*** on the GI tract; ***stimulates uterus contractions*** is indicated in acute severe pains, premedication, myocardial infarction, colic, labor.

FENTANYL

- Is a synthetic preparation with a structure unrelated to morphine
- is administered IV, IM; ***action begins in 1-3 min after administration and lasts 15-30 min***
- ***exceeds morphine in 100-400 times; when combined with droperidol it produces dissociative anesthesia***
- is used for ***neuroleptanalgesia***, premedication, analgesia in myocardial infarction, colic
- side effects are oppression of respiration, motor excitement, rigidity of muscles of chest and extremities, hypotension, bradycardia, an increase in blood pressure in the small cycle of blood circulation

BUPRENORPHINE

- Is a synthetic preparation
- is administered orally and parenterally and has long duration of action
- ***is a partial agonist of μ-receptors***
- ***is suitable to control of chronic severe pains***
- ***is used in combined preparations to treat opiate abuse***
- may cause respiratory depression, decrease in BP, nausea, dizziness

TRAMADOL

- is a synthetic preparation
- is administered orally, IV, IM, rectally; acts during 3-6 hrs
- ***has mixed mechanism of action (opioid + non-opioid): 1). It is weak agonist of μ-receptors; 2). It inhibits the re-uptake of noradrenaline and serotonin that leads to reinforcement of spinal inhibition of pain impulses***
- ***is less potent than morphine; does not influence respiration and GI functions, rarely causes drug dependence***
- is indicated for control of intermediate and severe acute and chronic pains
- side effects: headache, vertigo, dormancy, sweating, a decrease in BP, tachycardia, dry mouth, allergy, seizures (in overdose).

ANTAGONISTS OF OPIOIDS

NALOXONE

- Is a synthetic preparation
- is administered: ***IV,IM***; has rapid start of action and half-life of 1-1,5 hrs
- ***is non-selective antagonist of opioid receptors: it is competitive antagonist at μ-, κ- and δ-receptors***
- avoids effects of opioid analgesics, reverses the coma and respiratory depression in opioid overdose***is used in acute poisoning with narcotic analgesics.***

NALTREXONE

- is non-selective antagonist of opioid receptors similar to naloxone
- is more stable than naloxone and ***is taken orally; has long duration of action (to 48 hrs)***
- ***is used in opiate-dependence maintenance programs and in treatment of chronic alcoholism.***

NON-OPIOD ANALGESICS

CLASSIFICATION

On chemical structure

1. Salicylate
   – Acetylsalicylic acid (Aspirin)
2. Pyrazoles
   – Metamizole (Analgin)
   – Phenylbutazone (Butadion)
3. Fenamates
   – Mefenamic acid
4. Indolacetic acid derivatives
   – Indomethacin
5. Phenylacetic acid derivatives
   – Diclofenac-sodium
6. Propionic acid derivatives
   – Ibuprofen
7. Para-aminophenol derivatives
   – Paracetamol (Acetominophen)
8. Oxicams
   – Piroxicam
   – Meloxicam (Movalis)
9. Coxibs
   – Celecoxib

On mode of action

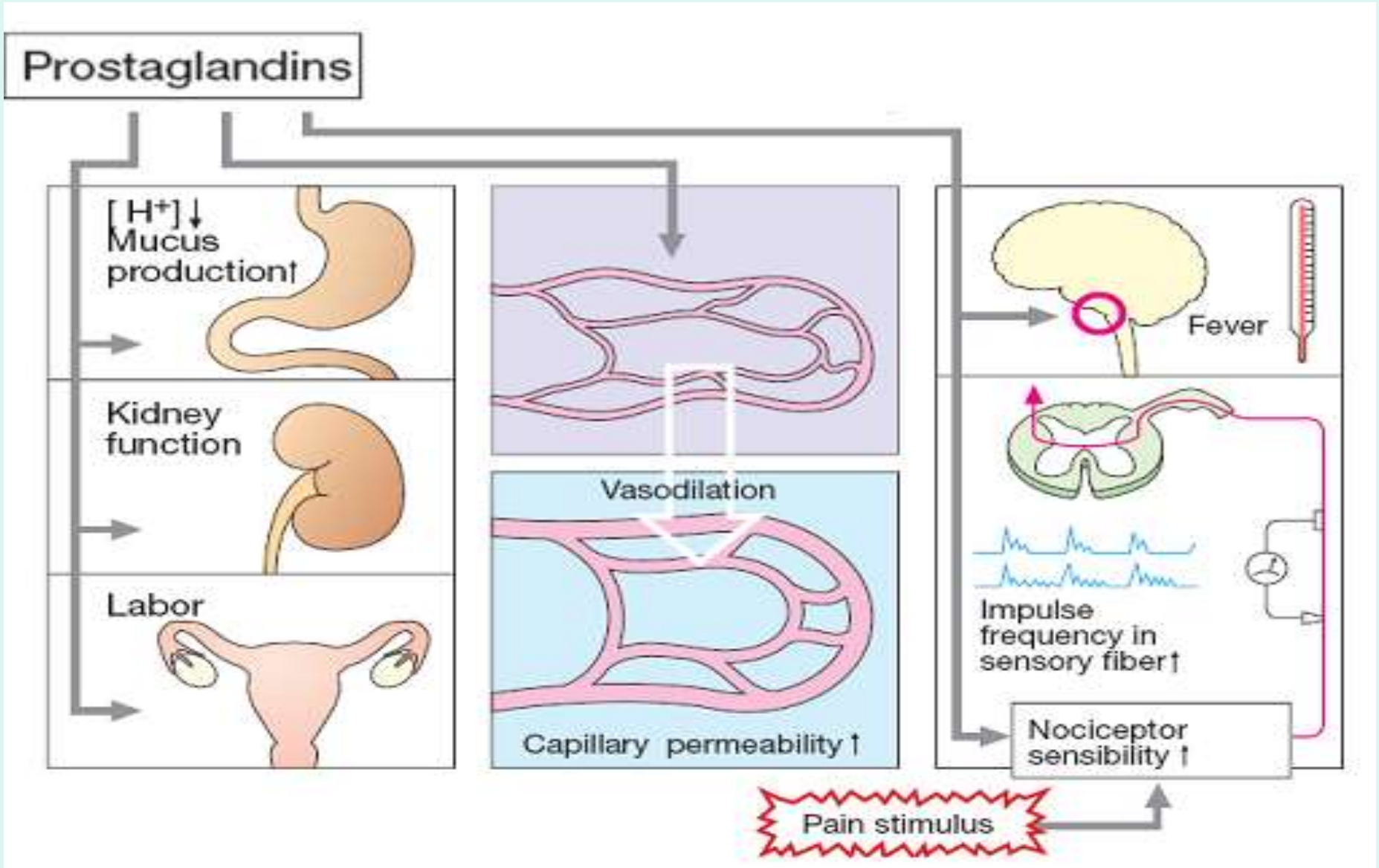
A. Non-selective inhibitors of COX-1 and COX-2

1. Mainly with peripheral action
– Acetylsalicylic acid
– Phenylbutazone
– Metamizole
– Mefenamic acid
– Indometacin
– Diclofenac-sodium
– Ibuprofen
– Piroxicam
2. Mainly with central action
– Paracetamol

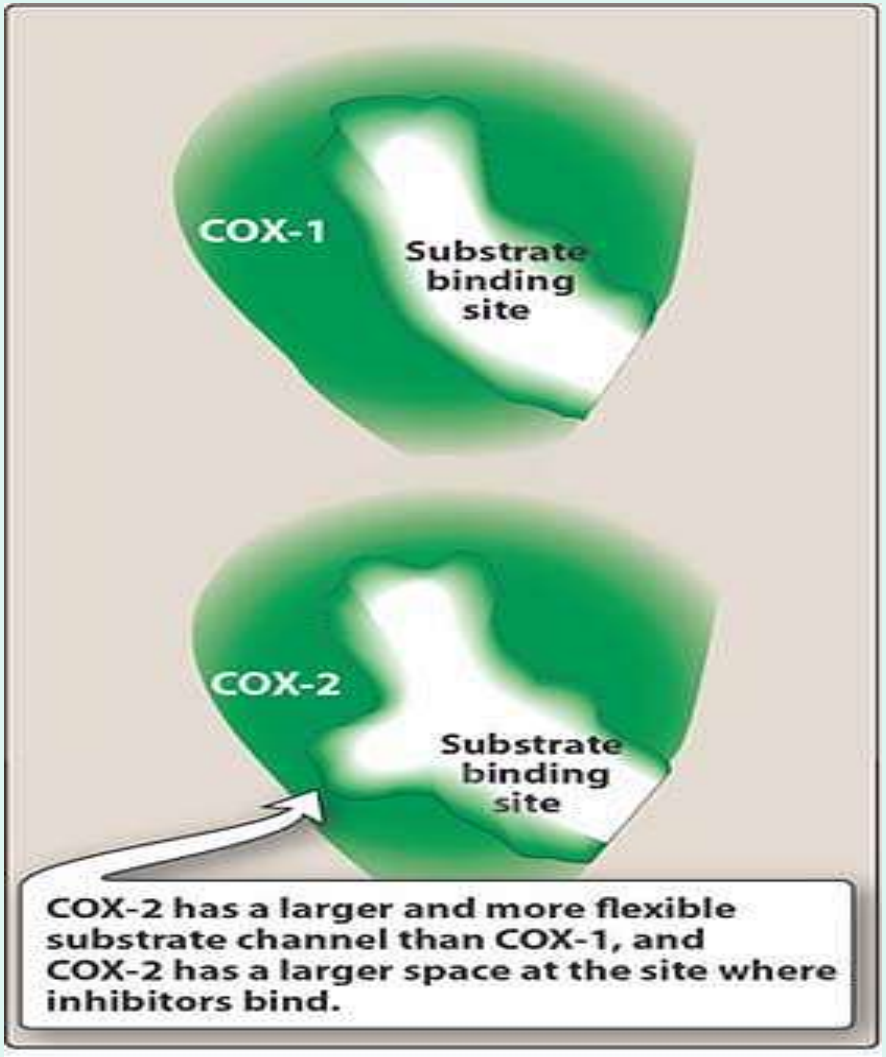
B. Selective inhibitors of COX-2

– Meloxicam
– Celecoxib.

PROSTAGLANDINS AND PAIN

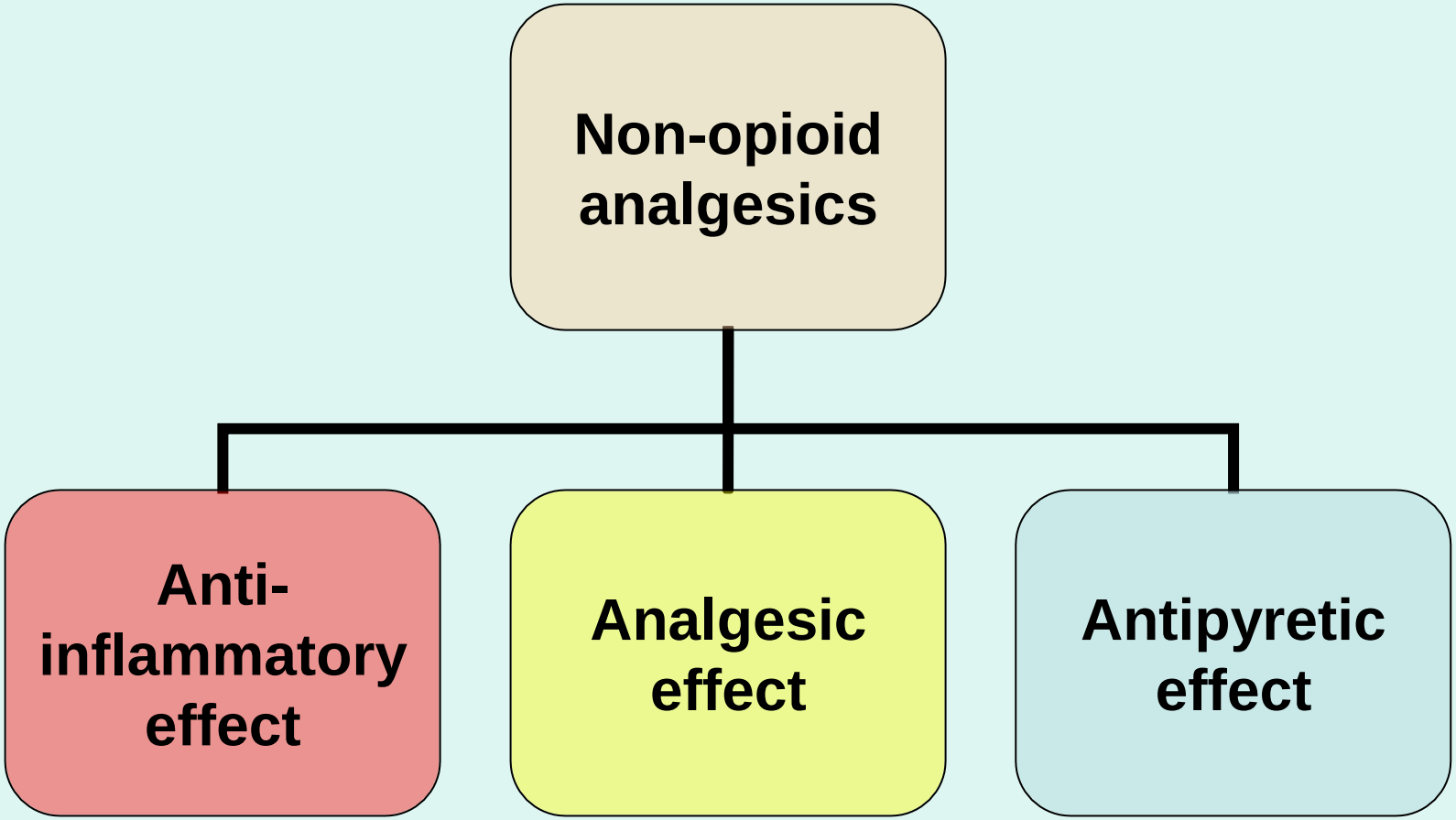


COX-1,2 AS A TARGET FOR NON-OPIOID ANALGESICS



COX=cyclo-oxygenase, an enzyme in synthesis of prosta-glandins (Pg)

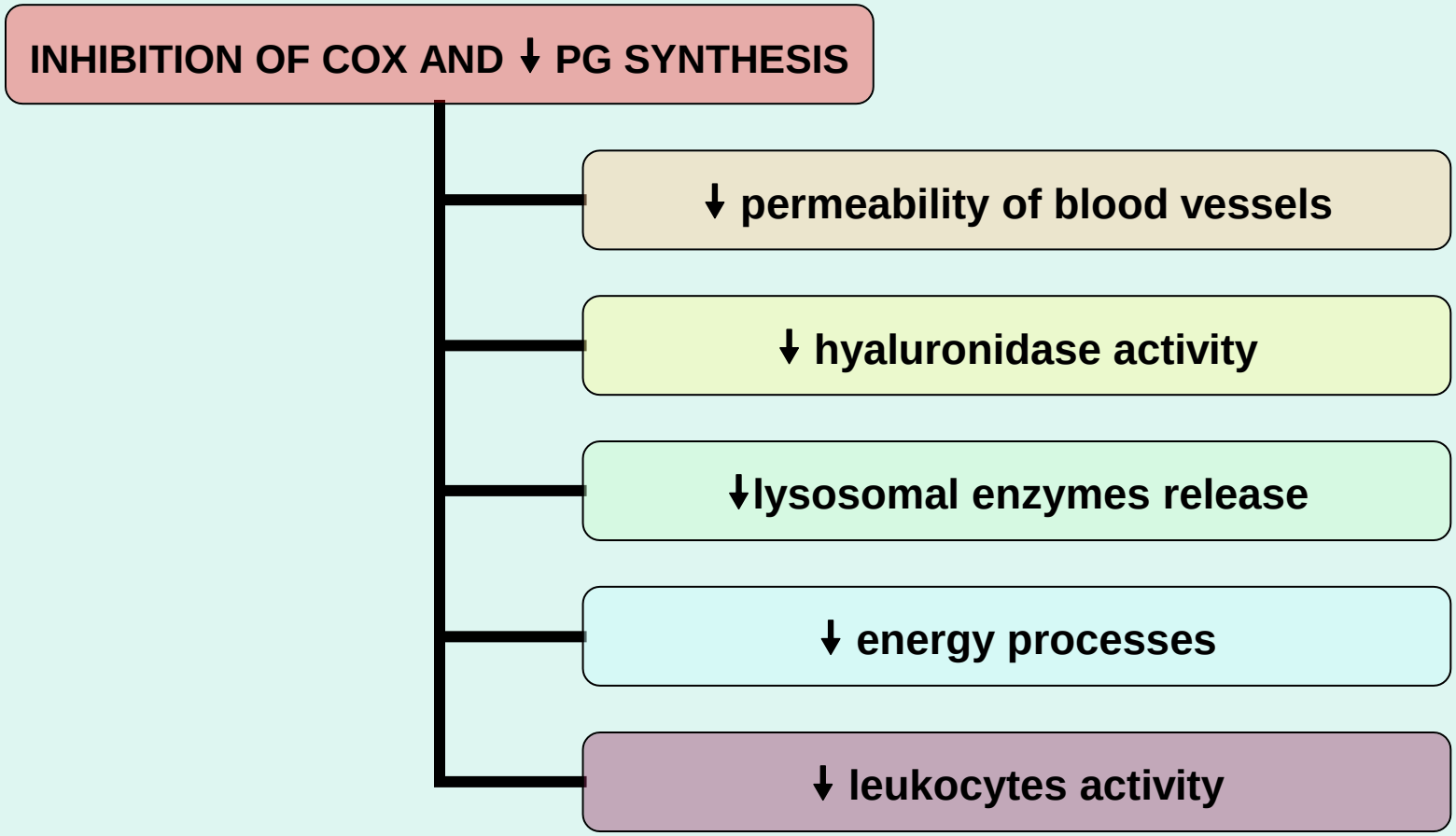
EFFECTS OF NON-OPIOID ANALGESICS



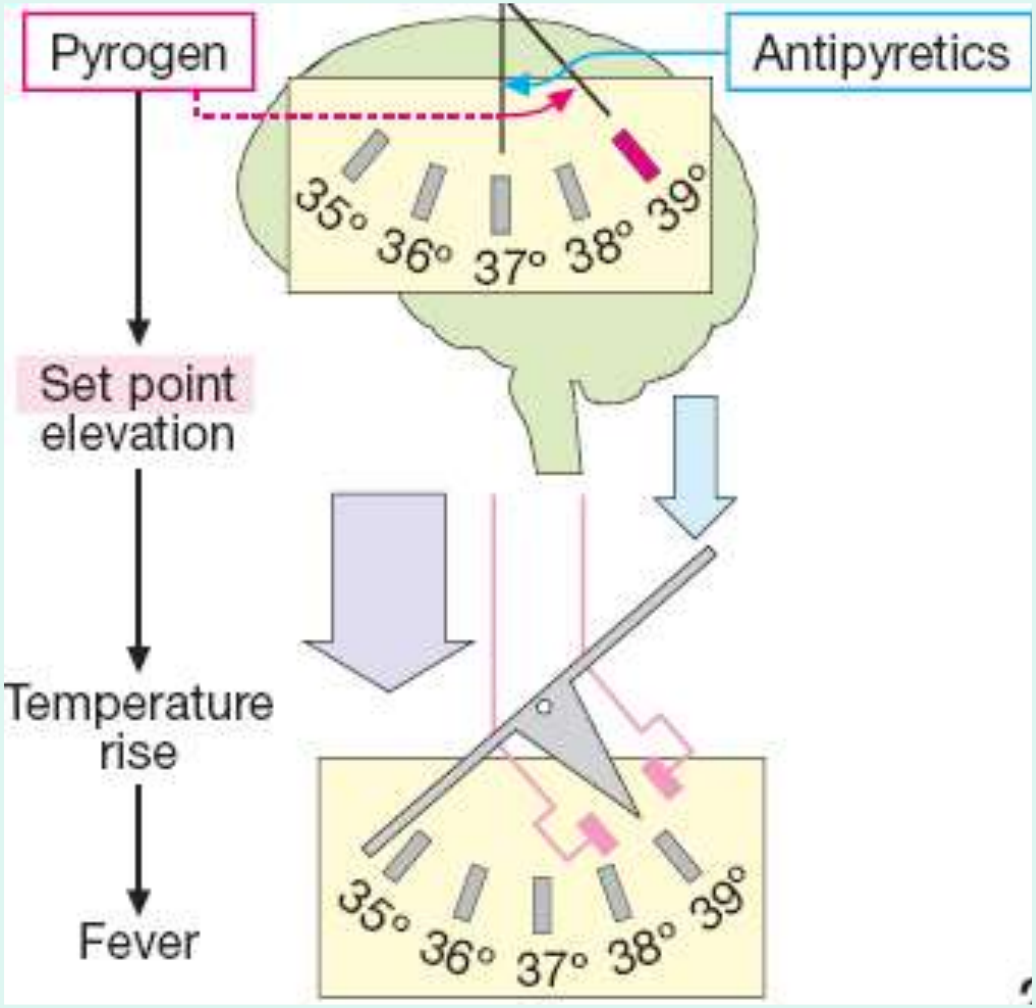
NON-OPIOID ANALGESICS:

- Non-steroidal anti-inflammatory drugs (NSAIDs) = prevalence of anti-inflammation
- Analgesics-antipyresics = prevalence of analgesia and apyrexia

NON-OPIOID ANALGETHICS:
ANTI-INFLAMMATORY ACTION



NON-OPIOID ANALGETHICS:
ANTIPYRETIC ACTION



NON-OPIOID ANALGETHICS:
ANALGESIC ACTION

inhibition of COX

↓

a decrease in the synthesis of prostaglandins

↓

a decrease of sensitivity of nociceptors to inflammatory mediators

↓

an increase of the pain threshold,

a decrease in the transmission of pain impulses in CNS

↓

relief of pain.

NON-OPIOID ANALGETHICS:
COMMON INDICATIONS

Headache, toothache, pain in muscles and joints

Neuralgia, radiculitis

Pain associated with inflammation

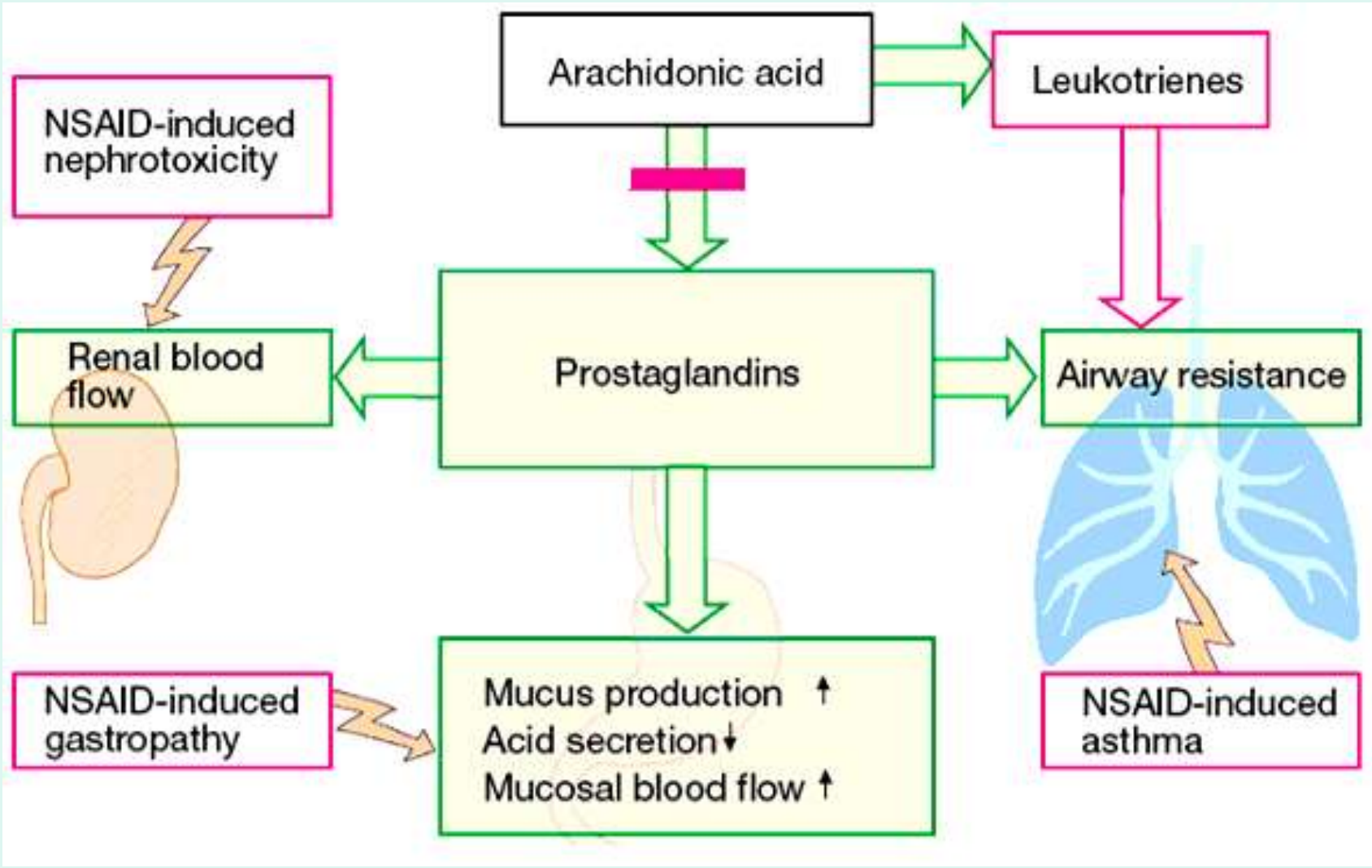
Fever

Arthritis, arthosis

Rheumatism

Collagenic diseases

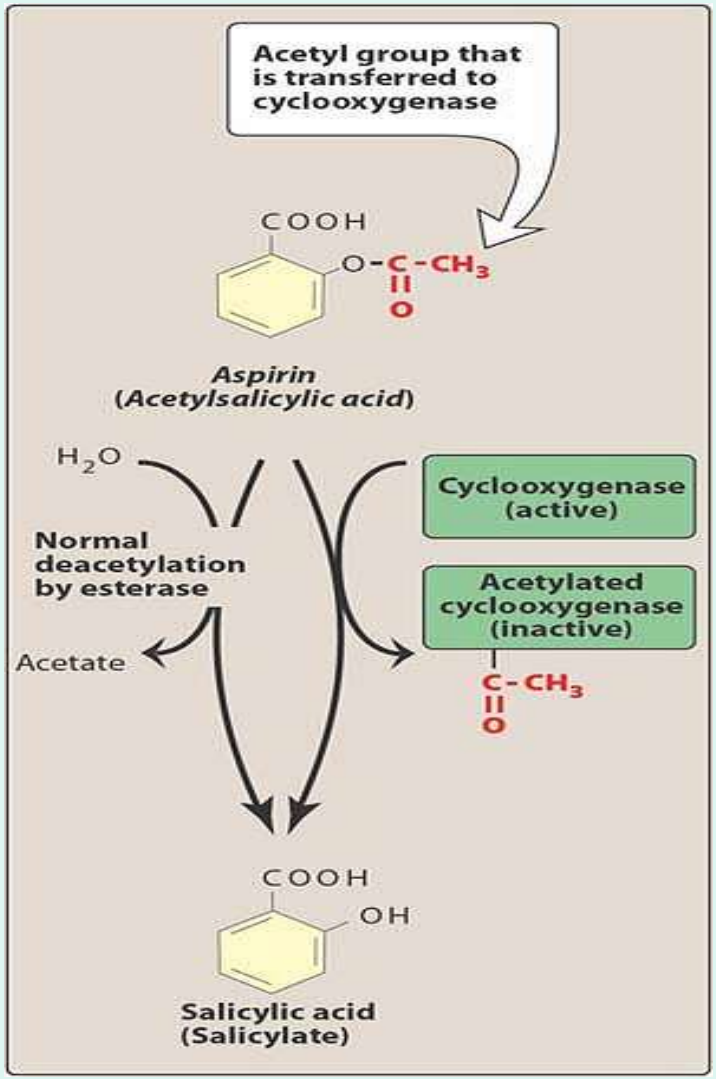
NON-OPIOD ANALGESICS:
GROUP-SPECIFIC SIDE EFFECTS



ACETYLSALICYLIC ACID (ASPIRIN): PHARMACOKINETICS

- is taken orally, sometimes IM, IV (Acelysin)
- is absorbed in the stomach and small intestine by passive diffusion
- binds with albumins in blood plasma
- crosses the blood-brain barrier and placenta
- displays maximal concentration in blood in 2 hrs after administration
- concentrates in the adrenal glands, liver, heart, lungs
- is metabolized in the liver
- is excreted with urine
- acts during 4-6 hrs; has duration of anti-platelet action of 7 days

ACETYLSALICYLIC ACID (ASPIRIN): MECHANISM OF ACTION



ACETYLSALICYLIC ACID (ASPIRIN): PHARMACODYNAMICS

- anti-inflammatory action (decrease in exudation)
- anti-pyrexia (decrease in high body temperature)
- analgesia (decrease in intermediate and weak pain)
- anti-platelet action (irreversible decrease in platelet aggregation)
- anti-gout action (increase in output of urates)
- stimulation of respiration
- dilation of blood vessels (in higher doses)
- stimulation of synthesis of glucocorticoids (in higher doses)
- an increase in secretion and excretion of bile
- changes in pH of blood (in higher doses)
- hypoglycemia (in higher doses).

ACETYLSALICYLIC ACID (ASPIRIN): INDICATIONS

- Rheumatism
- Fever
- Arthritis
- Headache, toothache, myalgia, neuralgia
- Gout
- Prophylaxis of re-thrombosis, myocardial infarction, or stroke
- Thombophlebitis
- Prevention of colorectal cancer

ACETYLSALICYLIC ACID:
SIDE EFFECTS AND CONTRAINDICATIONS

SIDE EFFECTS

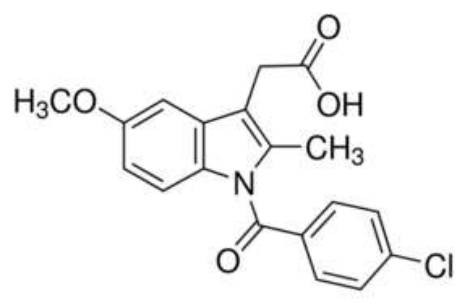
1 Allergy
2. Skin rash
3. Spasm of bronchi
4. Gastric ulceration
5. Vertigo
6. Thrombocytopenia
7. Hypocoagulation, bleeding
8. A decrease in the renal blood flow, retention of sodium and water
8. Disturbances in normal development of pregnancy, prolonged labor
9. Reye's syndrome in children (hepatitis and cerebral edema).

CONTRAINDICATIONS

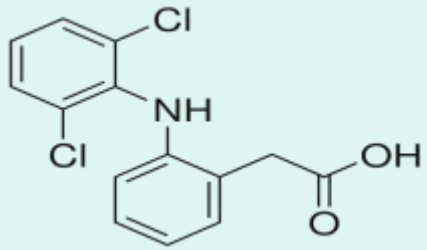
1. Allergy to salicylates
2. Ulcerative disease of the stomach and duodenum
3. Ulcerative colitis
4. Bleeding
5. Bronchial asthma
6. Inhibition of hemopoiesis
7. Hepatic and renal impairment
8. Pregnancy.

INDOMETHACIN

- Is an indolacetic acid derivative
- is one of the most active non-narcotic analgesics, ***NSAID***
- anti-inflammation is the strongest effect: it inhibits exudation as well as proliferation
- exceeds aspirin in anti-inflammation, analgesia and anti-pyrexia
- routes of administration: oral, rectal, topical; maximal concentration 2 hrs after oral administration; half-life is 2-3 hrs
- indications: rheumatism, collagenosis, arthritis, gout, glomerulonephritis, trauma of joints and soft tissues, thrombophlebitis, myositis, myalgia, neuralgia, toothache
- Side effects: headache, vertigo, dormancy, depression, pain in epigastric area, ulcer of stomach, nausea, a decrease in appetite, gastro-intestinal bleeding, skin rash, leucopenia, disturbances in renal function, acute pancreatitis, hepatitis and jaundice



DICLOFENAC-SODIUM



- Is a phenylacetyc acid dervative
- anti-inflammation is the strongest effect
- ***NSAID***, exceeds aspirin and indomethacin
- routes of administration: oral, IM, topical (gel, ointment)
- maximal concentration in plasma 1-2 hrs after the oral administration; is metabolized in the liver and excreted with urine and bile
- indications are similar to indications to application of indomethacin; is approved for long-term use in the treatment of rheumatoid arthritis, osteoarthritis and ankylosing spondilitis
- is less toxic than indomethacin, but may cause loss of appetite, pain in the epigastric area, meteorism, constipation, diarrhea, rarely ulceration in stomach, gastro-intestinal bleeding, headache, drowsiness, thrombocytopenia, nasal bleeding, microhematuria, allergy, skin rash

MELOXICAM (MOVALIS)

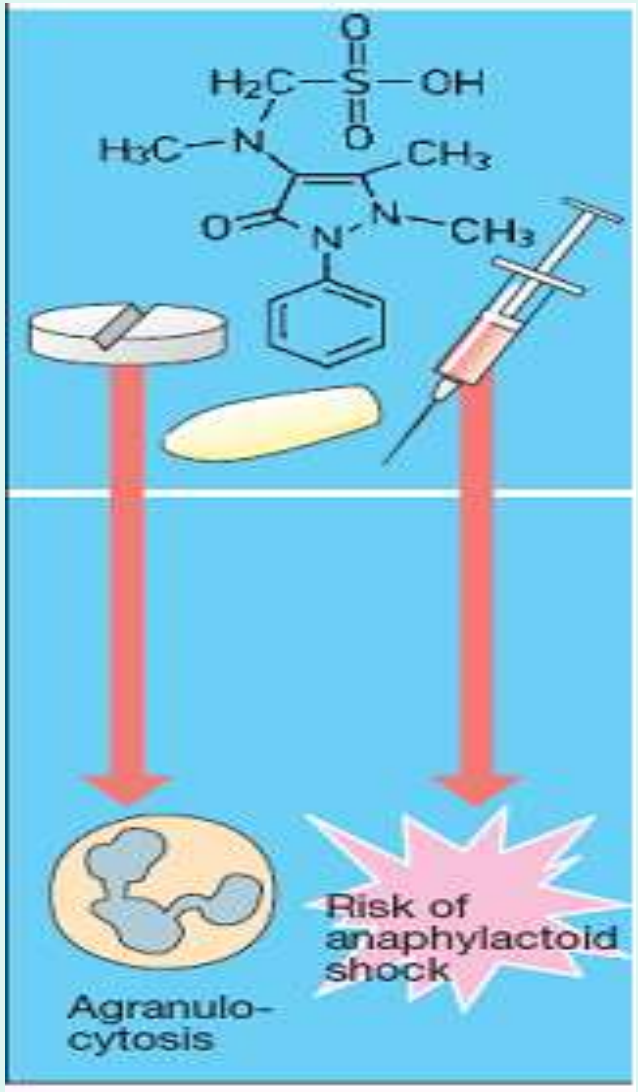
- is a drug from oxicams
- ***is a selective inhibitor of COX-2; NSAID***
- has mainly peripheral action
- routes of administration: oral, IM
- indications: arthritis, arthrosis, spondilitis, rheumatoid arthritis
- side effects: dyspepsia, gastric ulceration, gastro-intestinal bleeding, hepatic and hematological disturbances, skin rash, headache

CELECOXIB

- belongs to the group of coxibs
- is a ***selective inhibitor of COX-2; NSAID***
- is taken orally
- indications: rheumatoid arthritis, osteoarthrosis
- side effects: pain in the epigastrium, dyspepsia; very rarely: gastritis, stomatitis, ulcer of the stomach, dysphagia, gastro-intestinal bleeding, headache, vertigo, insomnia, depression, hypertension, tachycardia

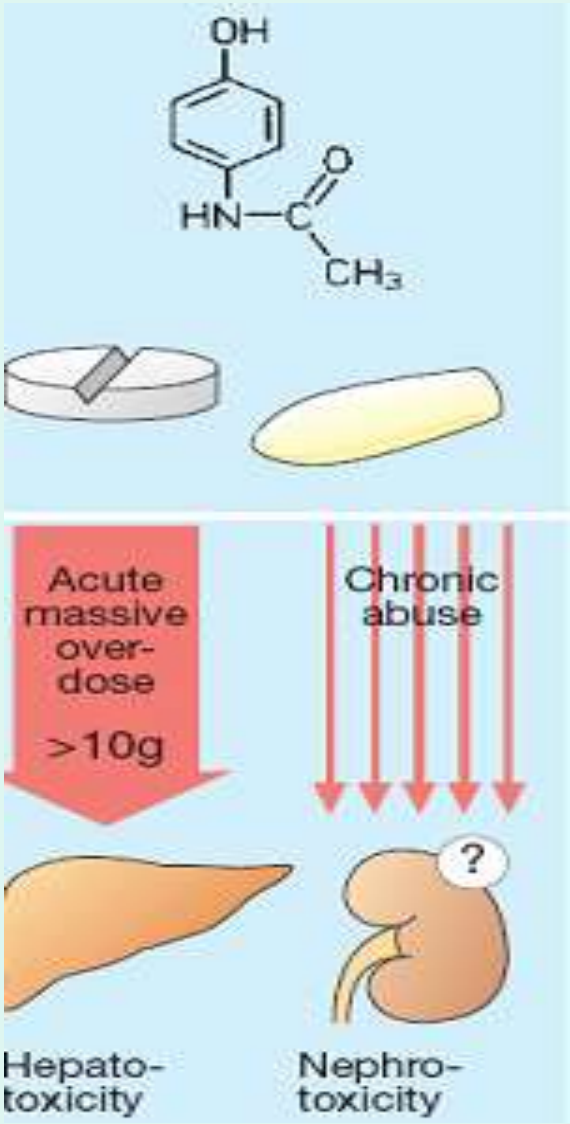
ANALGESICS-ANTIPYRETICS

METAMIZOLE (ANALGINUM)



ANALGESICS-ANTIPYRETICS

PARACETAMOL (ACETAMINOPHEN)



USE OF GENERAL ANESTHETICS AND ANALGESICS IN DENTISTRY

General anesthetics:

- Surgeries in the maxilla-facial area
- Treatment of teeth in children (halothane)

Opiod analgesi/cs:

- Trauma of the maxilla-facial area
- After the surgeries the maxilla-facial area
- Pain caused by cancer in the oral cavity and maxilla-facial area

Non-opioid analgesics:

- Toothache (metamizole, acetylsalicylic acid, indomethacin)
- Arthritis of the temporo-mandibular joint (NSAIDs)
- Inflammation of the oral mucosa (NSAIDs topically)

CONTROL TASKS

- Morphine hydrochloride has been administered to a patient with traumatic shock to provide analgesia. What is the mechanism of analgesic effect of this drug?

A. Interaction with opioid receptors B. Inhibition of pain impulses conduction C. Blockade of sensitive nerve endings D. Change of pain perception E. Inhibition of algogens formation in peripheral tissues. (A)

- An unconscious patient has been taken to a hospital. His skin is cold, pupils are miotic, breathing is of Cheyne-Stokes type. The diagnosis is: Acute morphine poisoning. What drug is necessary to give as antagonist of opioid analgesic? (C)

A. Naltrexone B. Nalorphine C. Naloxone D. Buprenorphine. E, Pentazocine.

- A patient with headache, caused by high body temperature, was relieving his pain with the help of metamizole. Point out other effect of this drug that contributes to the improvement of patient's condition.

A. Anti-pyretic effect B. Sedative effect C. Anti-platelet effect D. Antioxidant effect E. Antimicrobial effect. (A)

- A child with hyperthermia has been prescribed with non-opioid analgesic which has strong antipyretic action. In toxic doses it can damage liver cells. What drug is this?

A. Meloxicam B. Acetylsalicylic acid C. Metamizole D. Indometacin E. Paracetamol. (E)

CONTROL TASKS

- Injection of non-opioid analgesic, a pyrazole derivative, is used for the control of non-severe post-operative pain. This drug is:

A. Analgin B. Aspirin C. Paracetamol D. Fentanyl E. Pentazocine. (A)

- Nitrous oxide is used for analgesia in labor. This general anesthetic is characterized by the following properties, except:

A. High liver toxicity B. Good analgesia C. Quick action D. Poor muscle relaxation E. Usage in obstetrics. (A)

- Sodium oxibutyrate is used for IV general anesthesia in a patient with endoscopic surgery. Its action is realized by:

A. Serotonin receptors B. Opiod receptors C. Barbiturate receptors D. Gamma-aminobutyric acid-receptors E. Dopamine receptors. (D)

THANK YOU FOR ATTENTION!