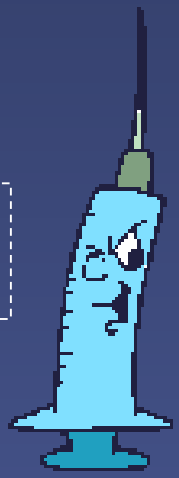
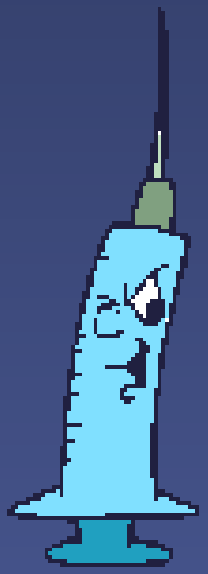

Good Morning

Local anaesthesia

How SHOULD BE MY TREATMENT!!!



LOCAL ANAESTHESIA

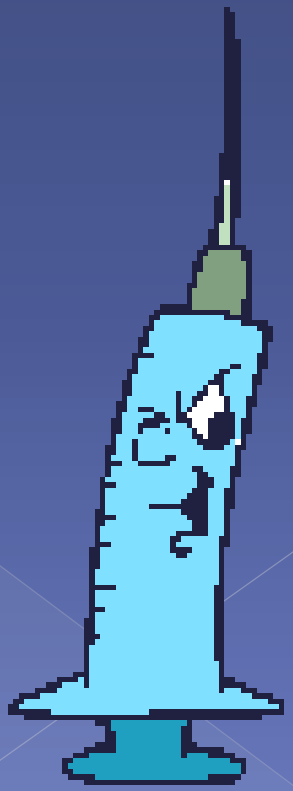


Contents

- CLASSIFICATION OF LA
- COMPOSITION OF LA
- MECHANISM OF ACTION

PAIN:

An unpleasant emotional experience usually initiated by a noxious stimulus and transmitted over a Specialized neural network to the CNS where it is interpreted as such.



METHODS OF PAIN CONTROL:

A. Removing the cause.

B. Blocking the pathways of pain impulses.

C. Raising the pain threshold.

D. Preventing pain reaction by cortical depression.

E. Using psycho-somatic methods.

ANALGESIA:

IT IS A CONDITION IN WHICH PATIENT CANNOT APPRECIATE PAIN BUT IS AWARE OF WHAT IS HAPPENING.

ANAESTHESIA:

IT IS COMPLETE LOSS OF ALL SENSATION INCLUDING THAT OF PAIN.

LOCAL ANALGESIA:

IT IS LOSS OF SENSATON OF PAIN IN A LIMITED REGION AND CAN BE INDUCED BY SURFACE APPLICATION OR INFILTRATION OR REGIONAL INJECTION.

LOCAL ANAESTHESIA:

IT IS TEMPORARY LOSS OF ALL MODALITIES OF SENSATION IN A LIMITED REGION OF BODY.

DENTAL USES OF LOCAL ANAESTHETICS

- ELIMINATION OF PAIN DURING TREATMENT.
- DIAGNOSTIC PURPOSES.
- REDUCE HEMORRHAGE.
- IN CONJUCTION WITH SEDATION TECHNIQUE.

ADVANTAGE OF LOCAL ANAESTHESIA OVER GENERAL ANAESTHESIA

- SAFETY.
- EASE OF ADMINISTRATION.
- REDUCED BLEEDING DURING TREATMENT.
- COOPERATION OF PATIENT.
- UNLIMITED OPERATING TIME.
- WHEN PATIENT IS UNFIT FOR G.A.

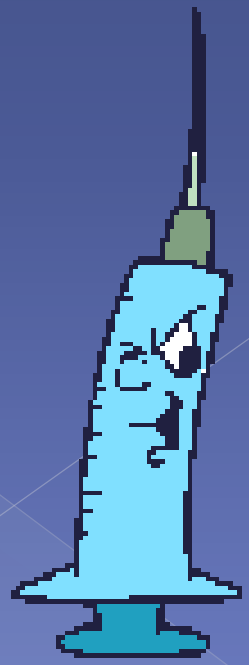
CLASSIFICATION

Naturally occurring local anaesthetic:- Ex- Cocaine (ester).

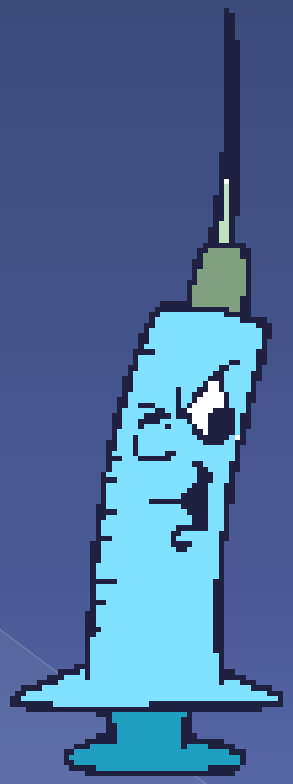
ESTERS: -

a) P-aminobenzoic acid derivative (PABA)- CHLORPROCAINE,
PROCAINE
PROPOXYCAINE.

b) Esters of benzoic acid- BUTACAINE
COCAINE
BENZOCAINE
HEXYLCAINE
PIPEROCAINE
TETRACAINE.



AMIDES: ARTICAINE
BUPIVACAINE
DIBUCAINE
ETIDOCAINE
LIDOCAINE
MEPIVACAINE
PRILOCAINE
ROPIVACAINE .



PIPERIDINE OR TROPANE DERIVATIVES :-

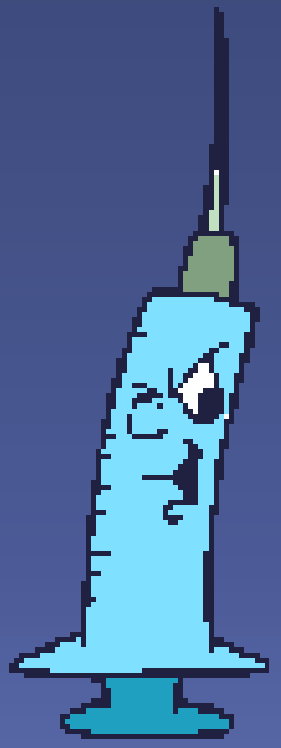
ALPHA- EUCAINE, BENZAMINE, EUPHTHALMIN.

QUINOLINE DERIVATIVES :-

DIBUCAINE (CHINCOCAINE), CENTBUCRIDINE.

ISOQUINOLINE DERIVATIVE:-

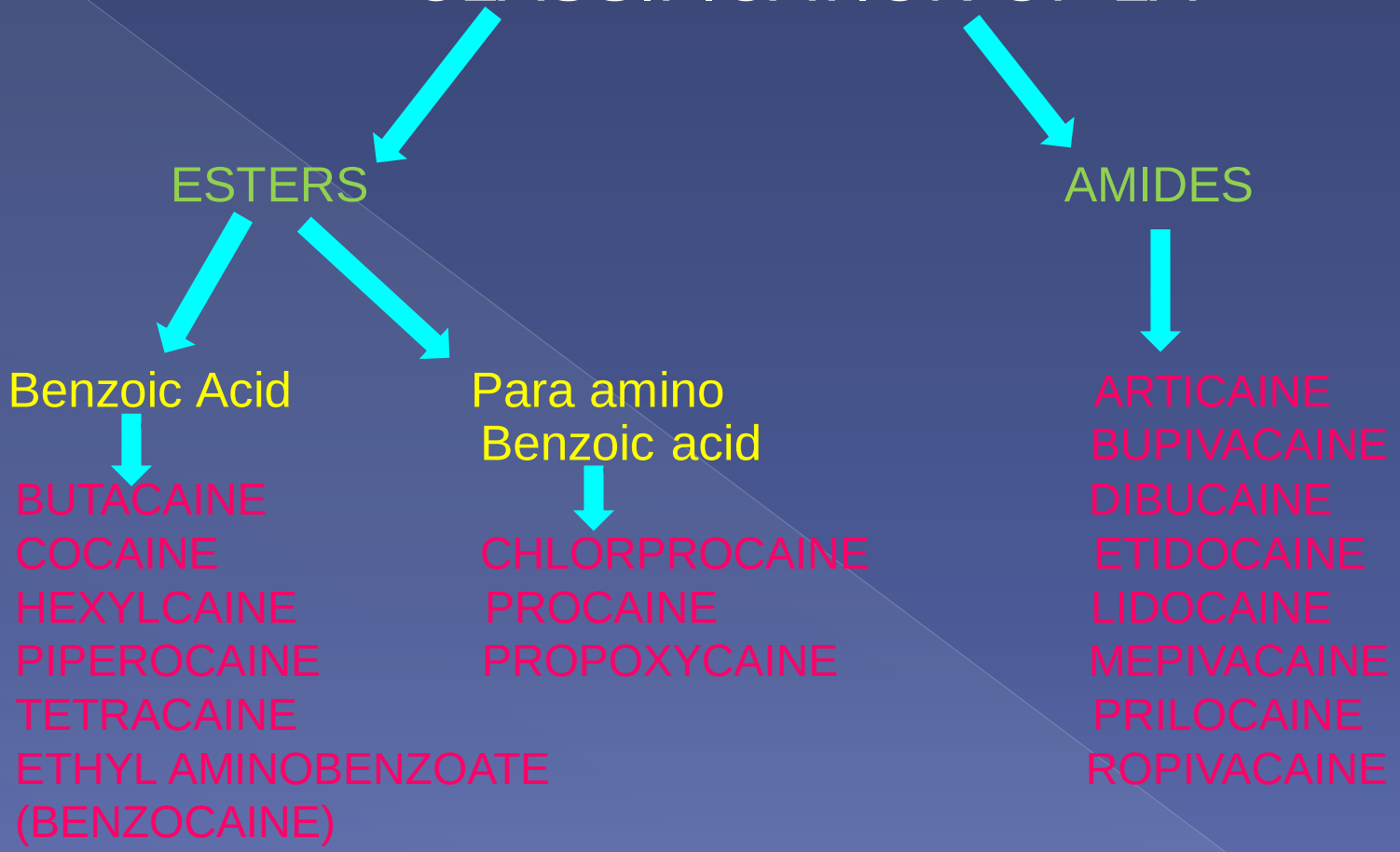
DIMETHISOQUINE.



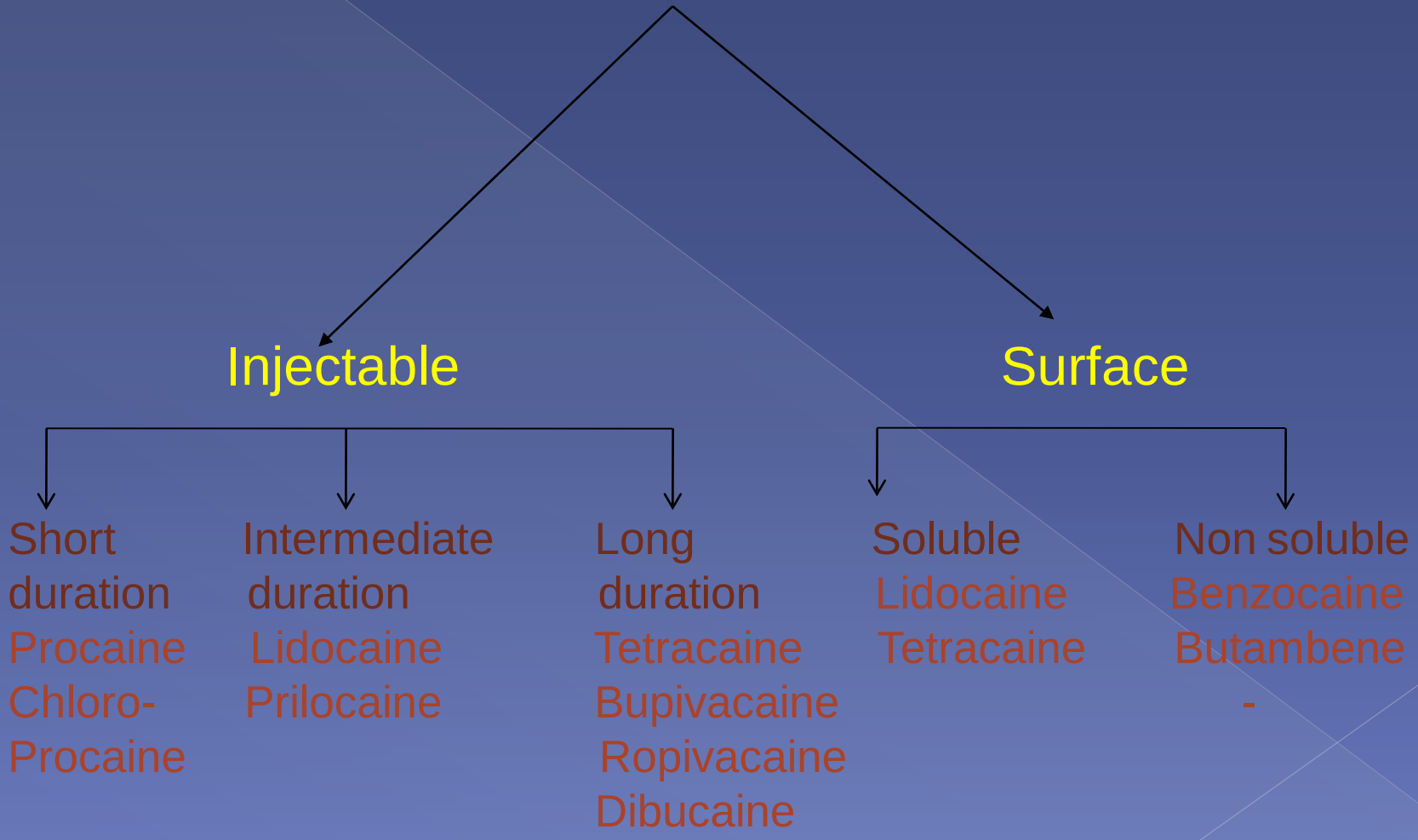
MISCELLENEOUS :-

PHENACAINE (AMIDINE), PRAMOXINE, EUGINOL, BENZYL ALCOHOL, PHENOL, DYCLOMINE, SALIGENIN.

CLASSIFICATION OF LA



LOCAL ANESTHETICS



PROPERTIES OF AN IDEAL LA AGENT:

1. Specific action on nerves.
2. Reversible action i.e. capable of inducing temporary interference in nerve conduction.
3. Non injurious to tissues with low or no systemic toxicity.
4. Onset should be rapid & for long duration.
5. Must undergo biotransformation in body when injected.
6. Should be stable in solution form.
7. Adequate safety margin.
8. Sterilizable without losing its potency.
9. Economical.

COMPOSITION OF LA –

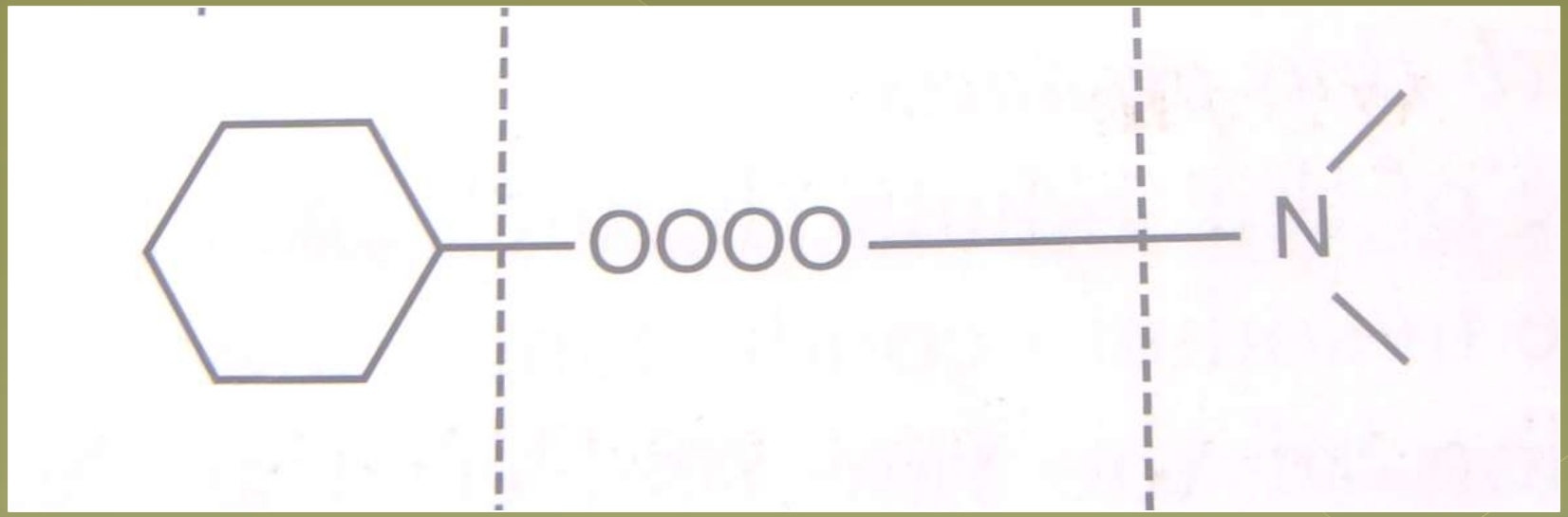
COMPONENT	FUNCTIONS
1. LA Agents-	Blockage of nerve conduction.
2. sodium Chloride	Isotonicity of the solution.
3. Sterile water	Volume, Diluent.
4. Vasoconstrictor (Epinephrine etc)	Increases Depth & duration. Decreases absorption of drugs.
5. Sodium metabisulfite	Antioxidant.
6. Methyl paraben	Bacteriostatic and preservative.

TYPICAL LOCAL ANAESTHETIC

INTERMEDIATE CHAIN

LIPOPHILIC PART

HYDROPHILIC PART



LIPOPHILIC PART

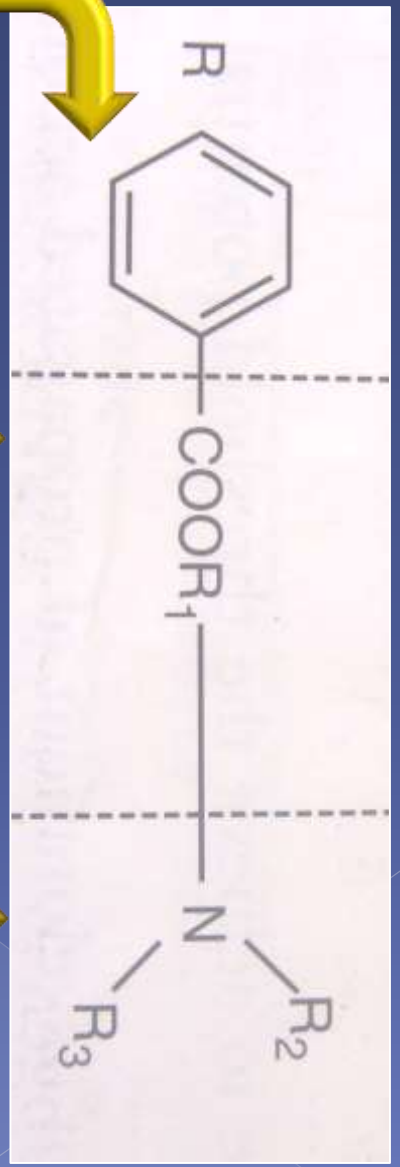
CONSIST OF A BENZENE RING, LIPID SOLUBILITY ENABLES THE LA SOLUTION TO DIFFUSE THROUGH LIPOPHILIC NERVE MEMBRANE.
THUS LIPOPHILICITY IS DIRECTLY PROPORTIONAL TO POTENCY.

INTERMEDIATE CHAIN,

WHICH CONNECTS THE AROMATIC AND AMINE PORTIONS, IS COMPOSED OF EITHER AN ESTER OR AN AMIDE LINKAGE .
THIS INTERMEDIATE CHAIN CAN BE USED IN CLASSIFYING LOCAL ANESTHETICS.

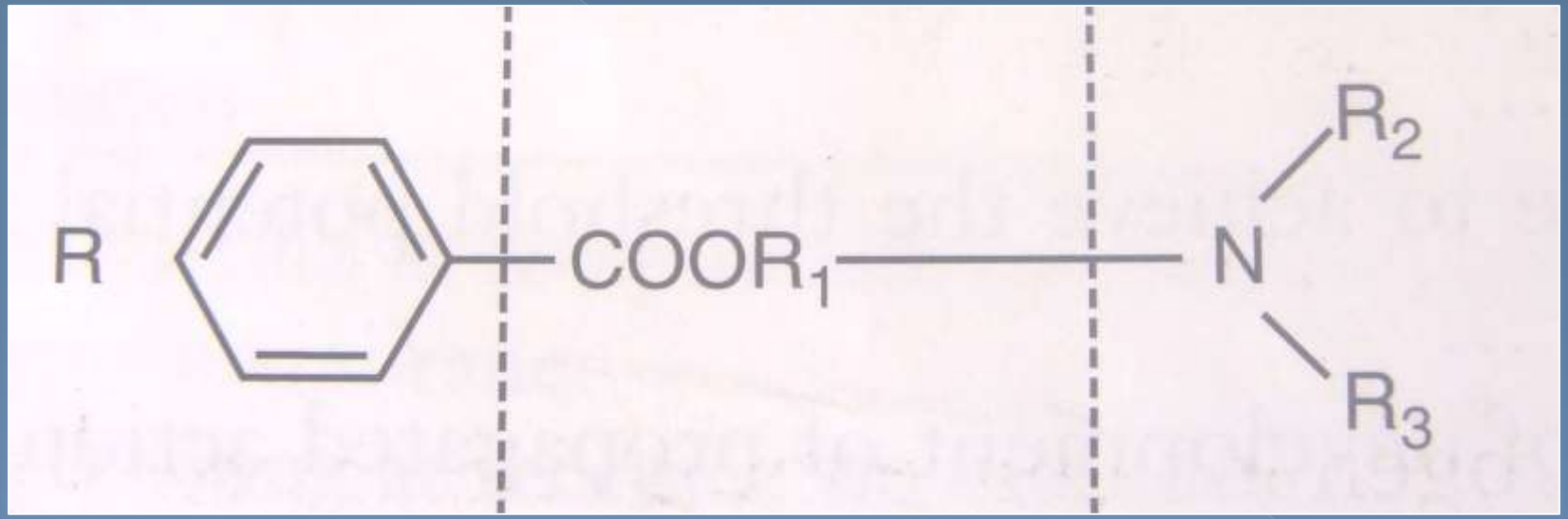
HYDROPHILIC PART

IS AN AMINO DERIVATIVE OF ETHYL ALCOHOL OR ACETIC ACID.

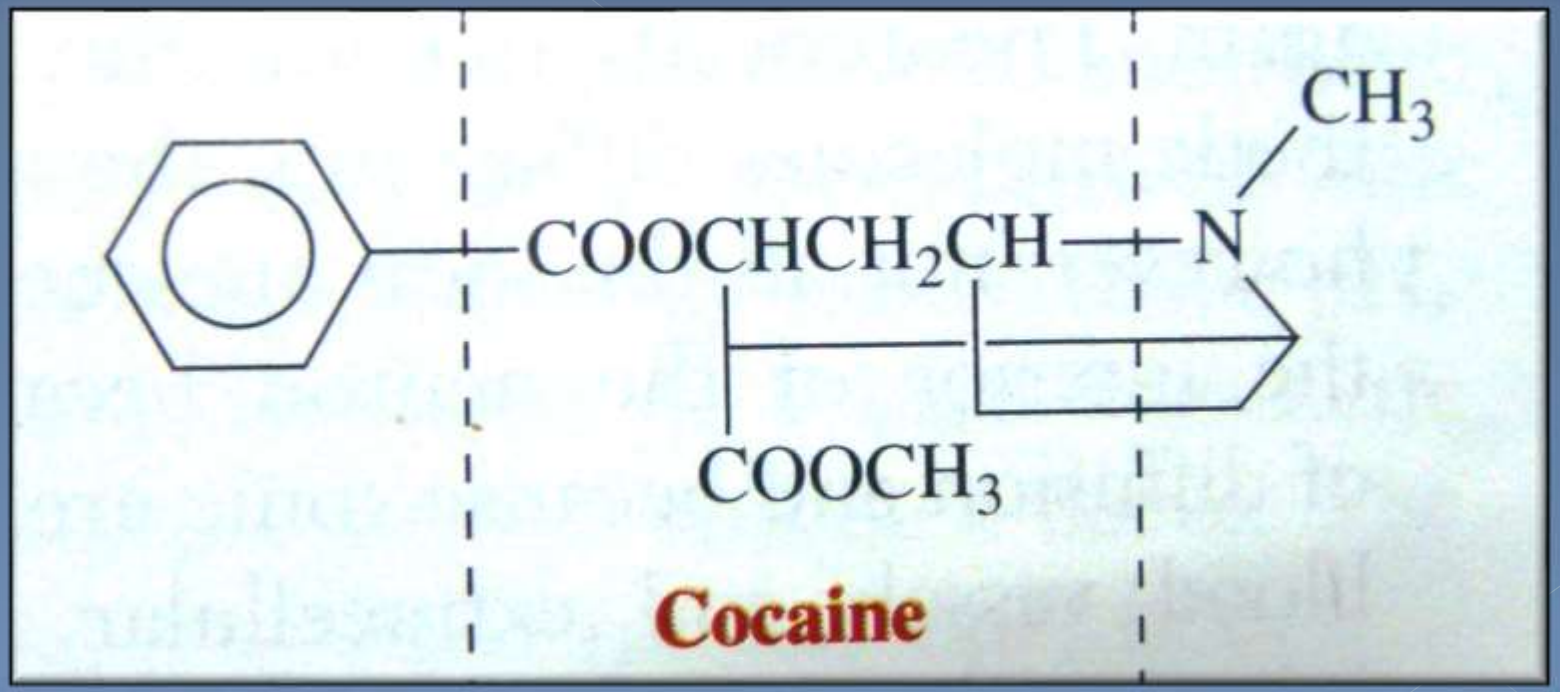


ESTER-TYPE LOCAL ANAESTHETIC

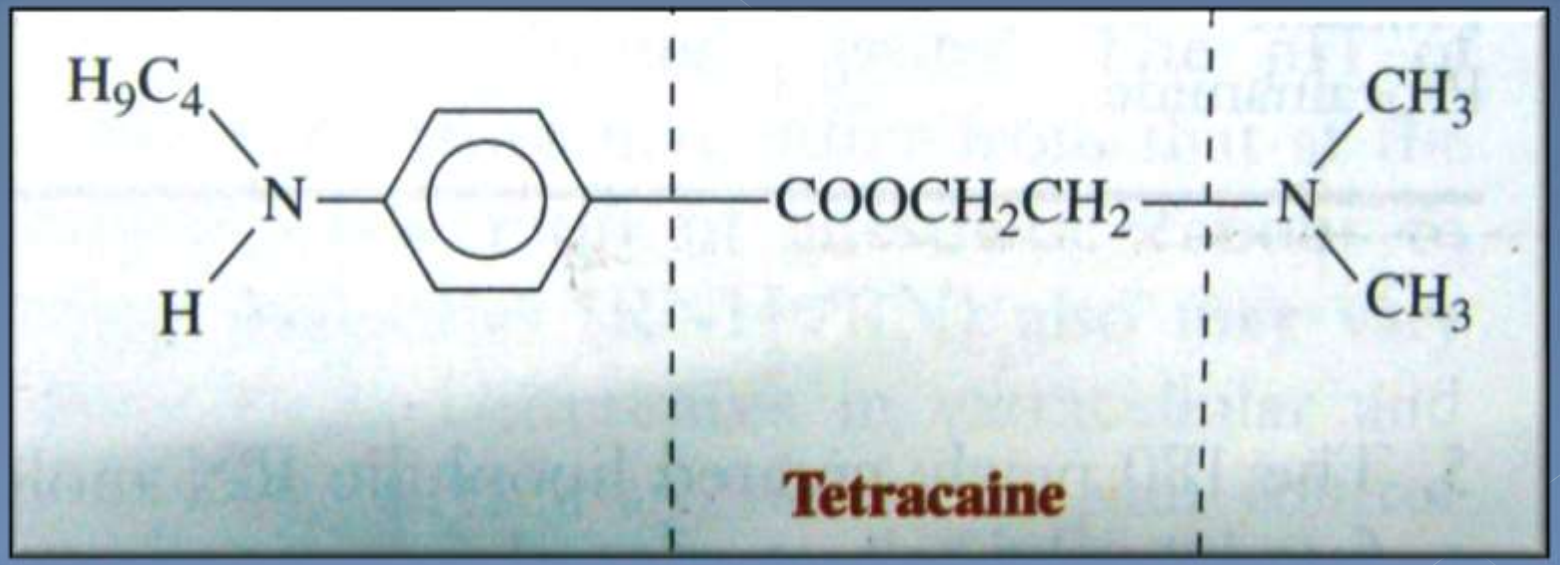
LIPOPHILIC PART	INTERMEDIATE CHAIN	HYDROPHILIC PART



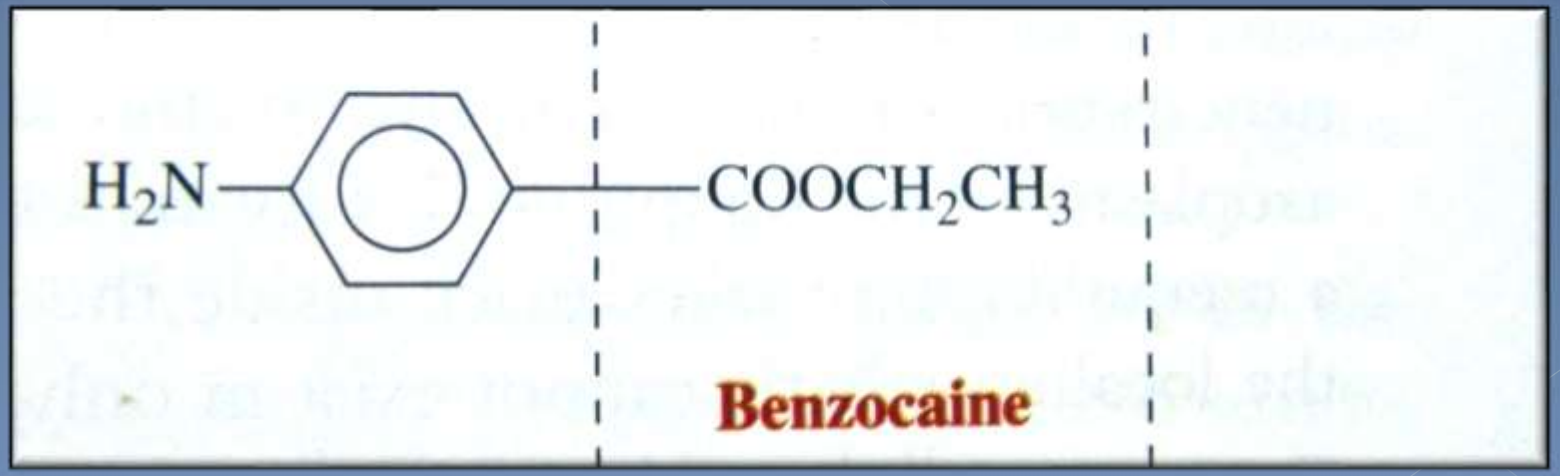
COCAINE



TETRACAINE

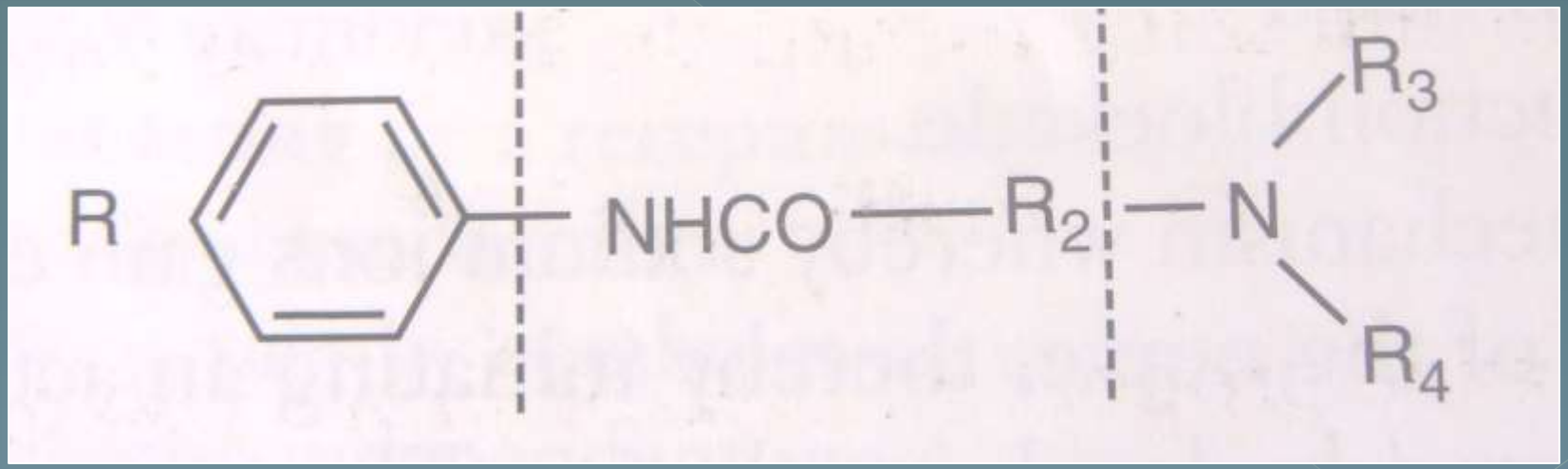


BENZOCAINE

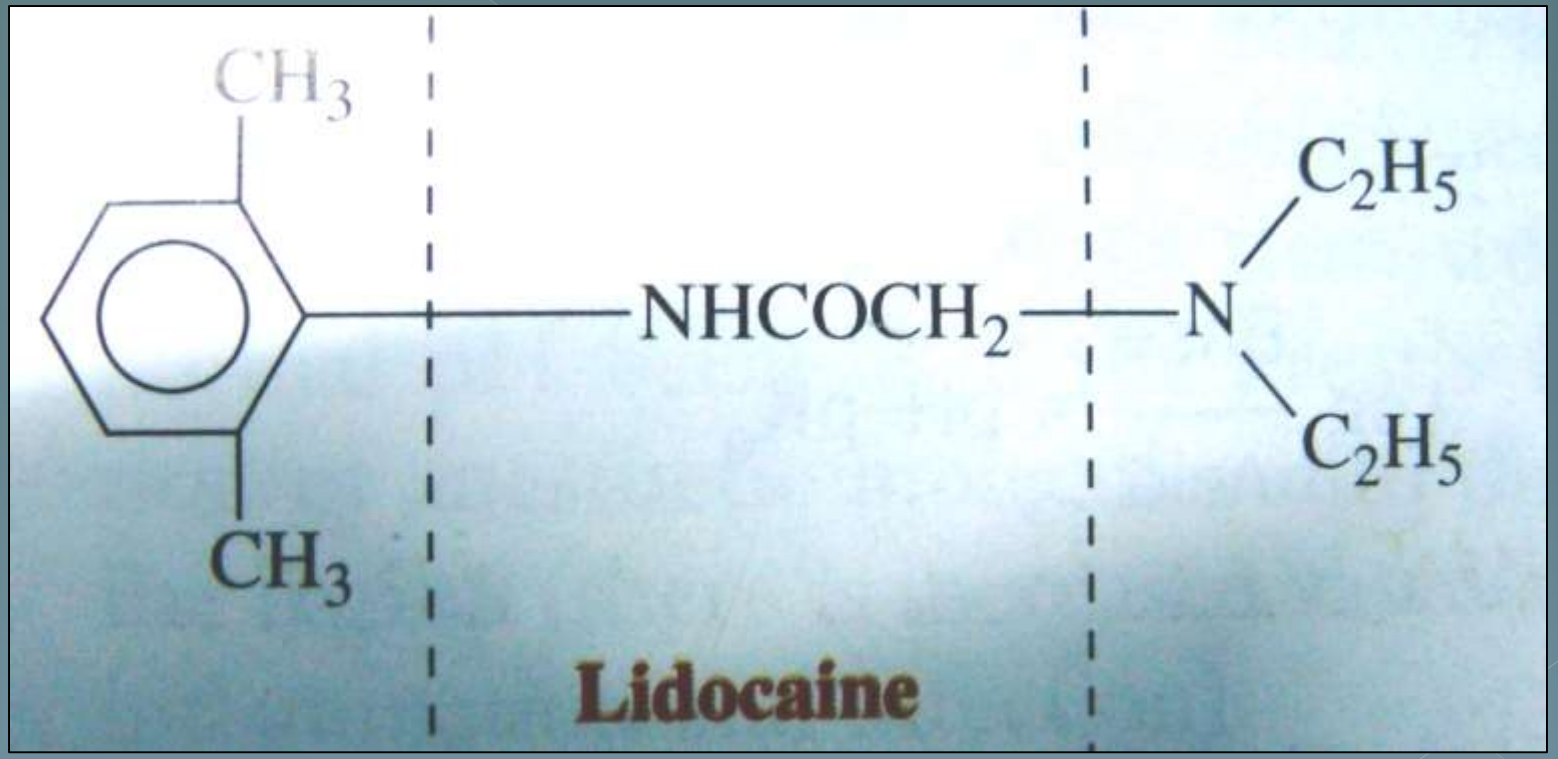


AMIDE-TYPE LOCAL ANAESTHETIC

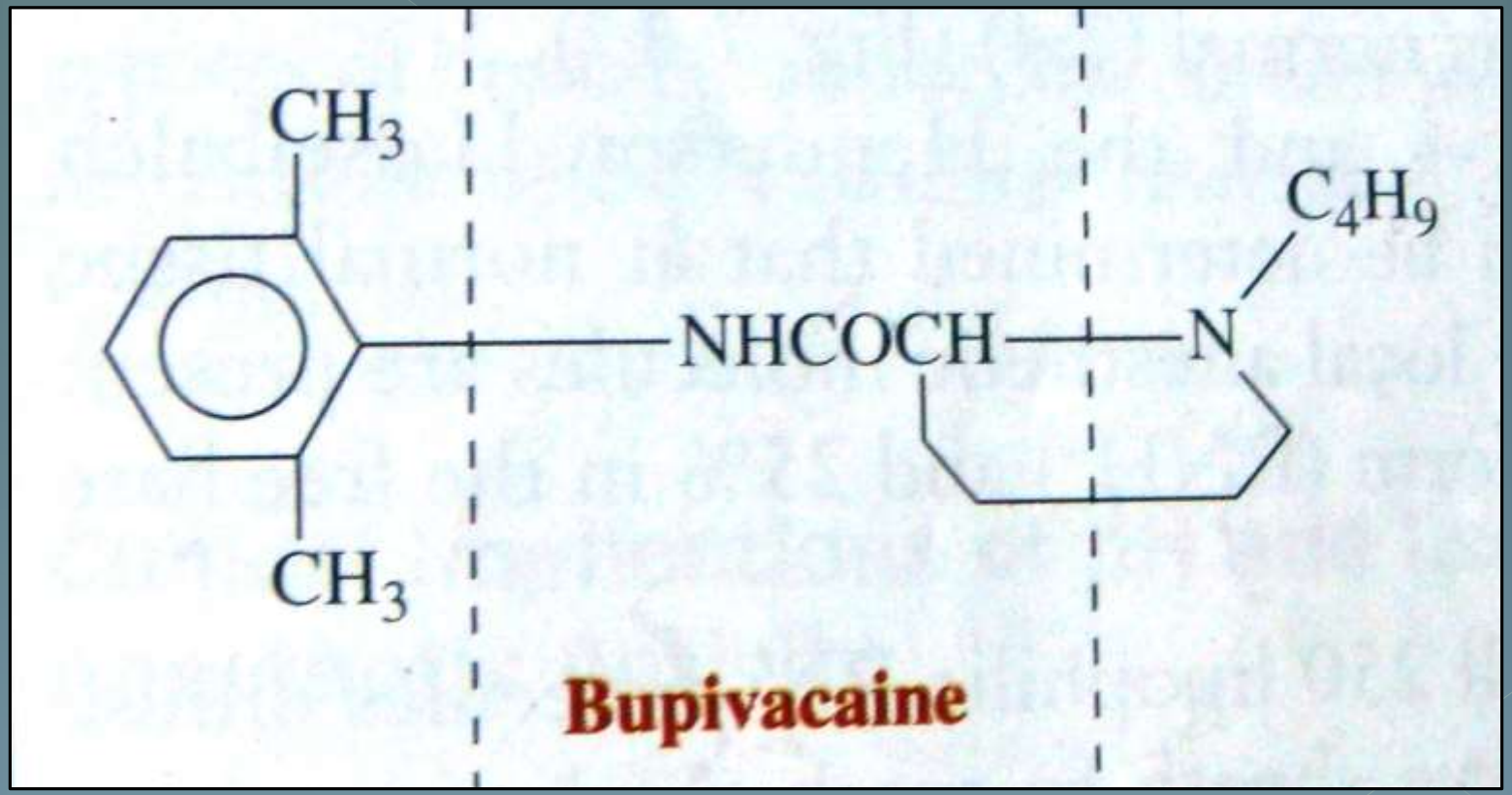
LIPOPHILIC PART	INTERMEDIATE CHAIN	HYDROPHILIC PART



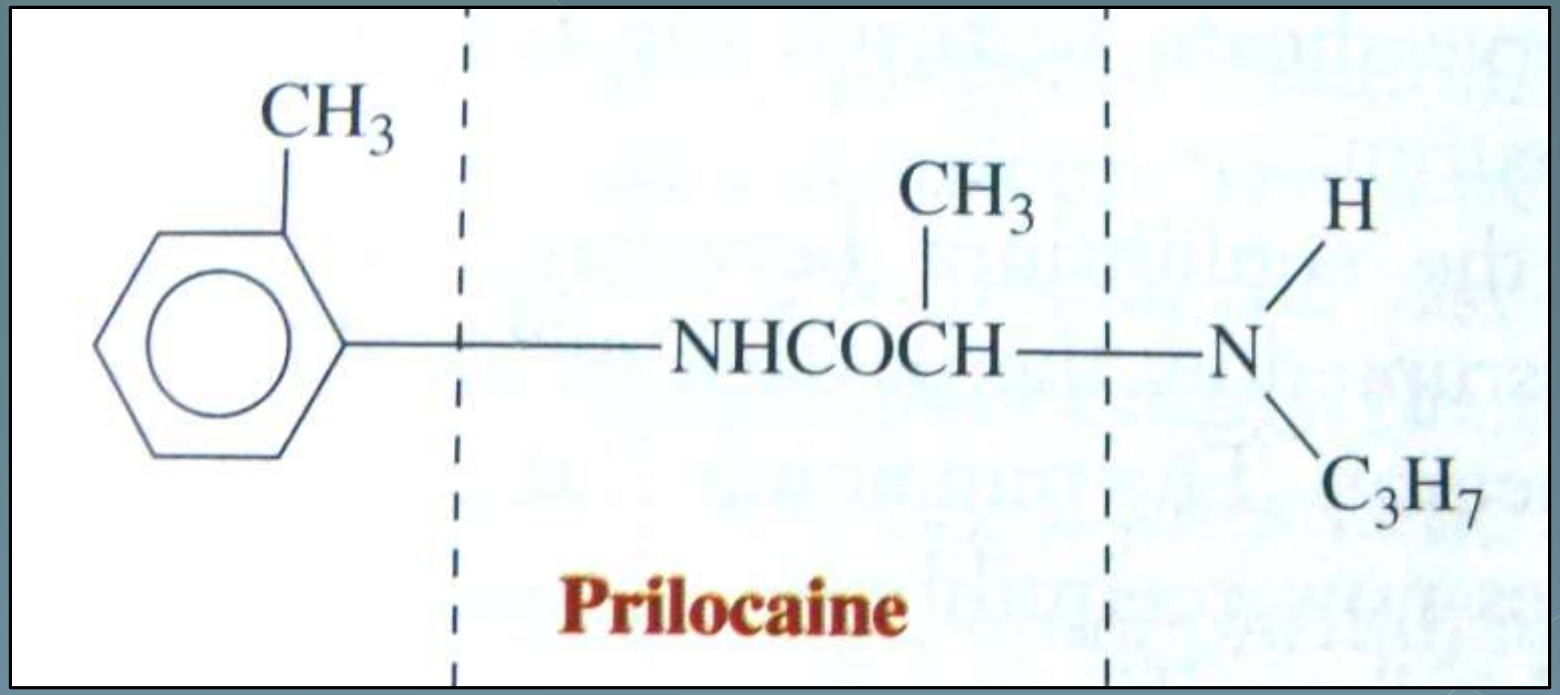
LIDOCAINE



BUPIVACAINE



PRILOCAINE



THEORIES OF LOCAL ANAESTHETIC ACTION

1. THE ACETYLCHOLINE THEORY.

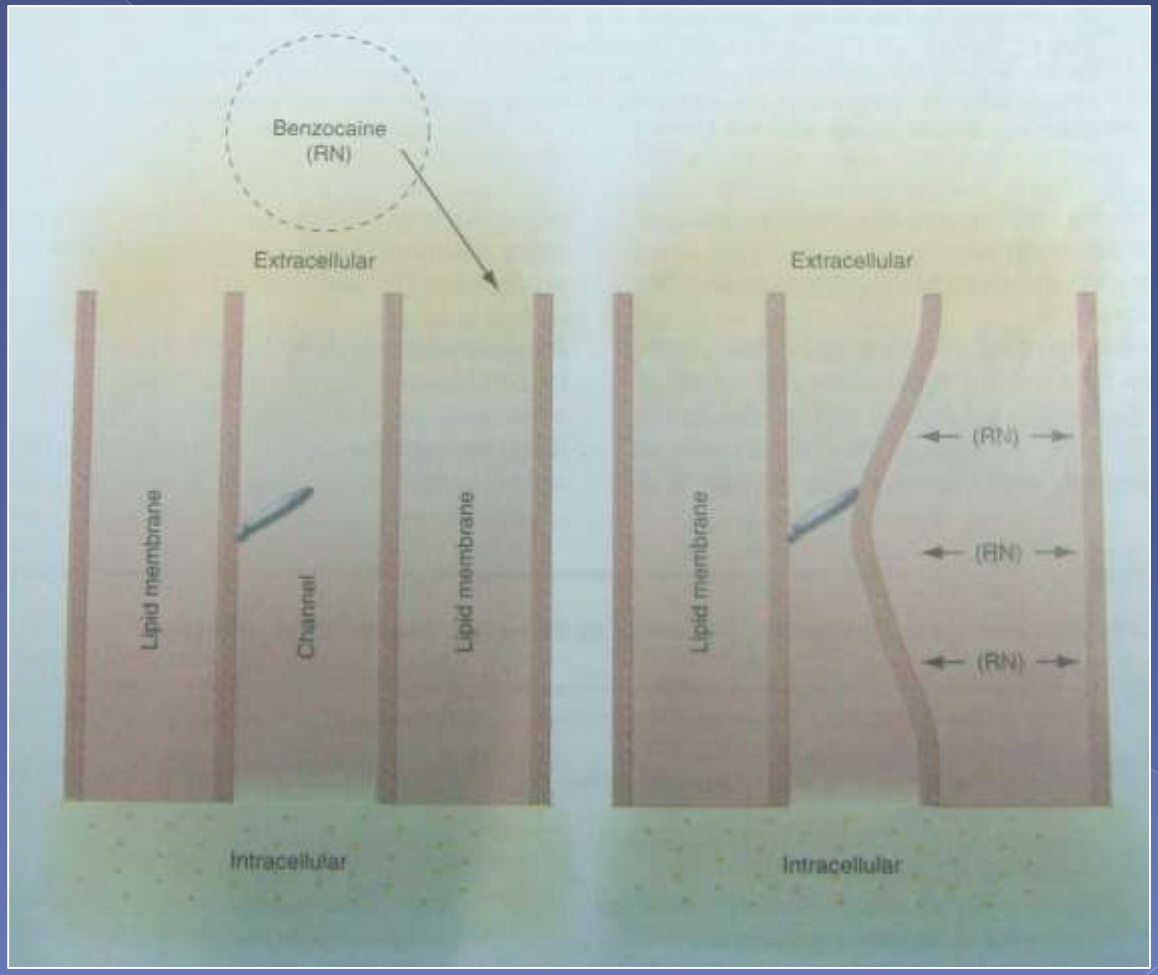
2. CALCIUM DISPLACEMENT THEORY.

3. SURFACE CHARGE (REPULSION) THEORY.

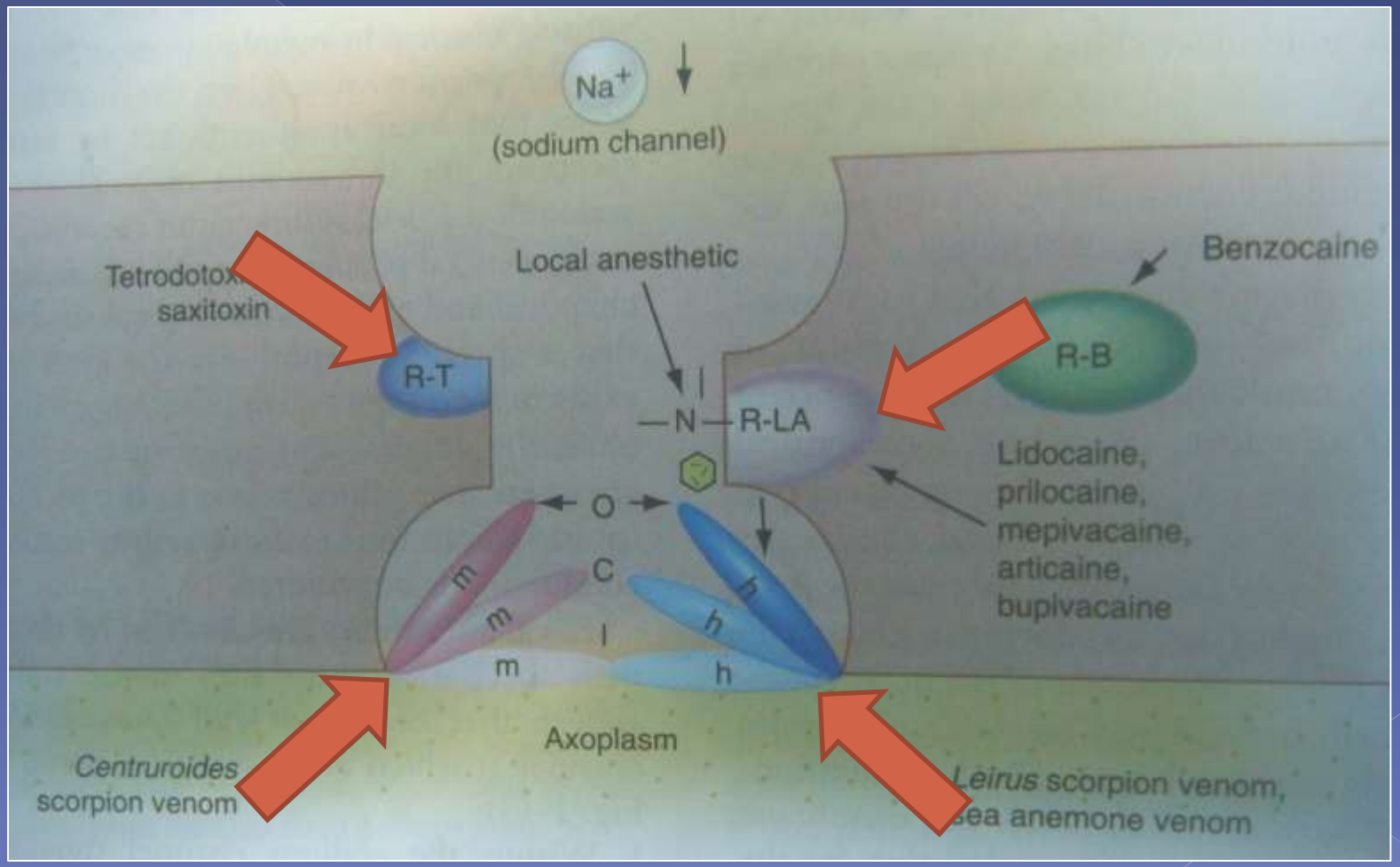
4. MEMBRANE EXPANSION THEORY.

5. SPECIFIC RECEPTOR THEORY.

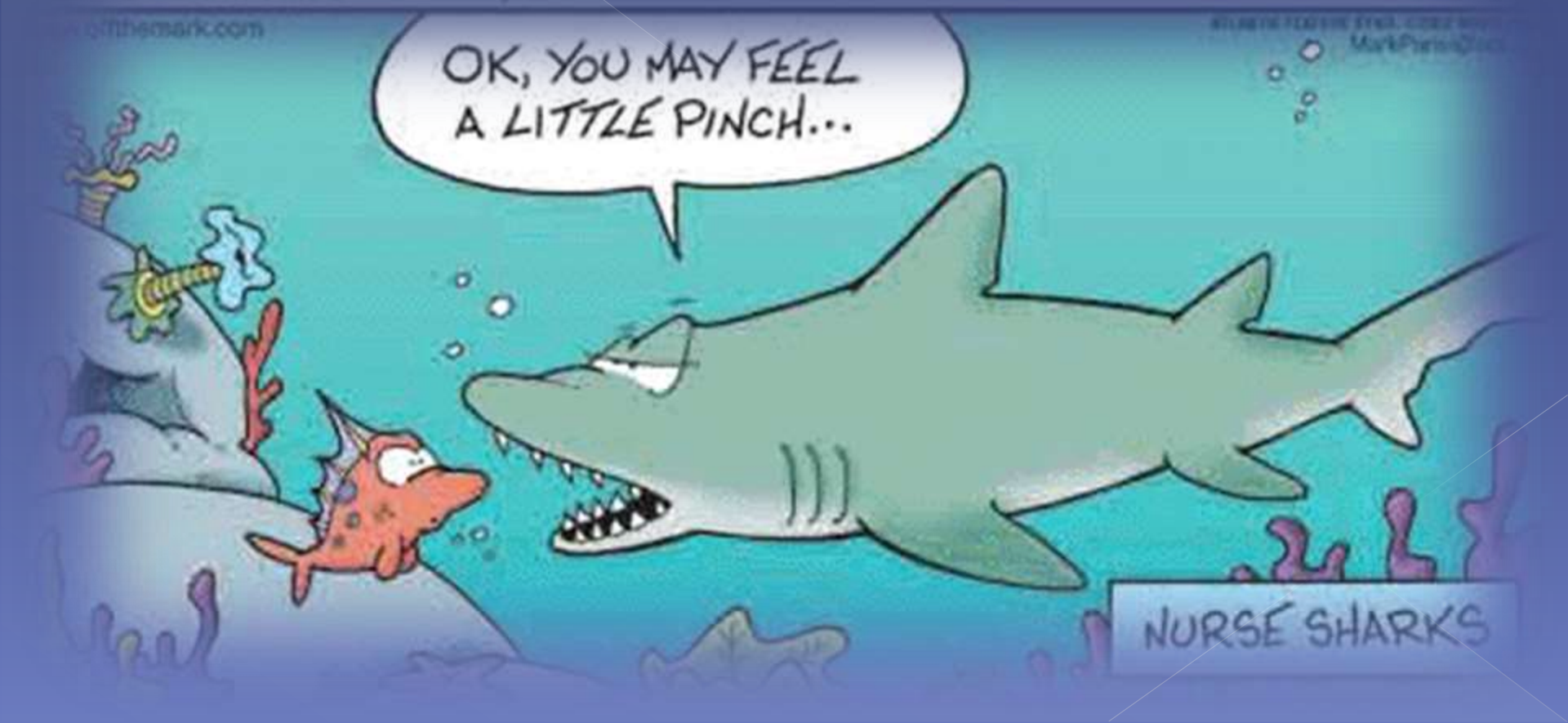
MEMBRANE EXPANSION THEORY

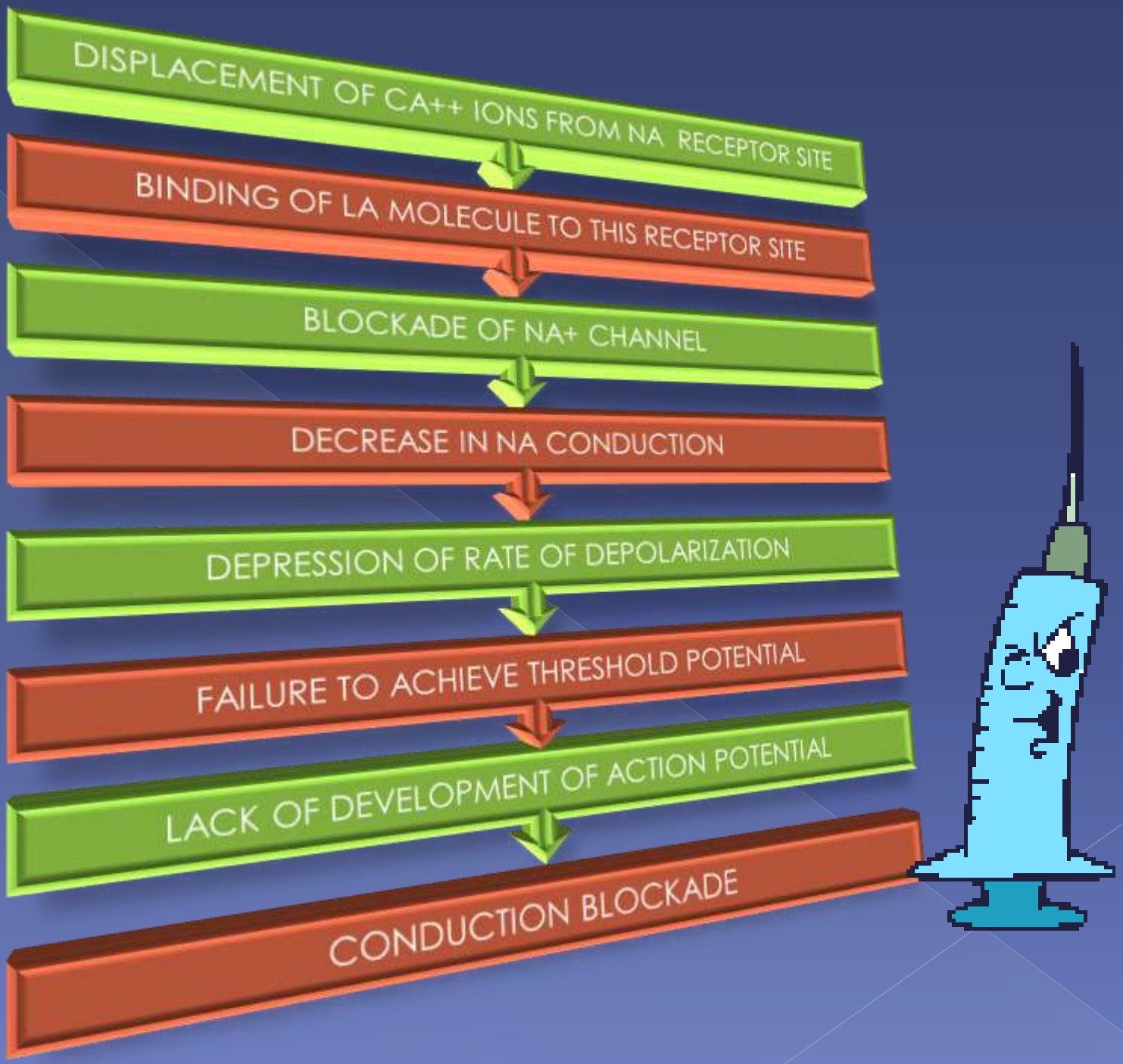


SPECIFIC RECEPTOR THEORY

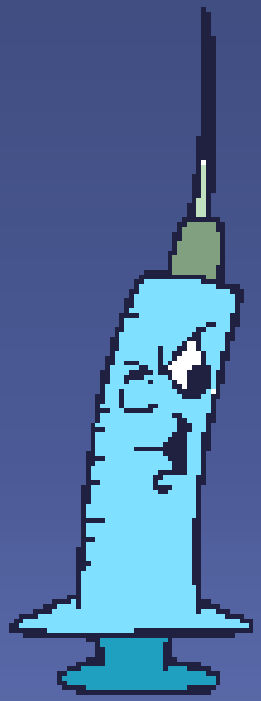


How does LA act???

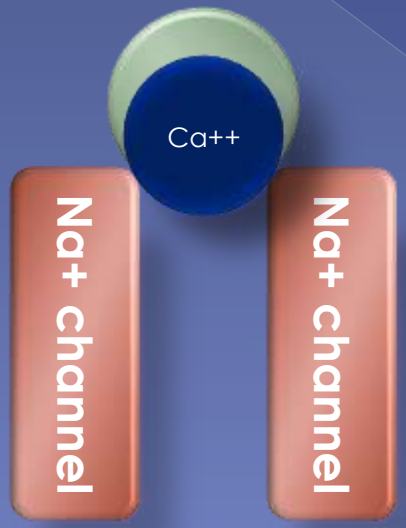


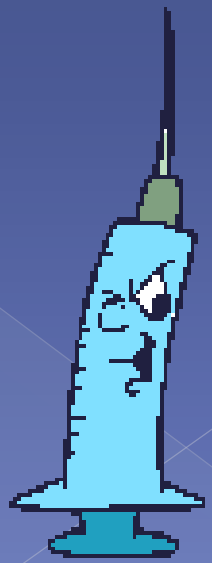

DISPLACEMENT OF CA++ IONS FROM NA RECEPTOR SITE
BINDING OF LA MOLECULE TO THIS RECEPTOR SITE
BLOCKADE OF NA+ CHANNEL
DECREASE IN NA CONDUCTION
DEPRESSION OF RATE OF DEPOLARIZATION
FAILURE TO ACHIEVE THRESHOLD POTENTIAL
LACK OF DEVELOPMENT OF ACTION POTENTIAL
CONDUCTION BLOCKADE

NORMAL NA CONDUCTION



ACTION OF LOCAL ANAESTHETIC





WHY ACIDS ARE ADDED TO LOCAL ANAESTHETICS ???

* LA's are basic compounds poorly soluble in water and unstable on exposure to air.
*Their pKa value range from 7.5-10 in this form they have little or no clinical value.
*They combine readily with acids to form LA salts in which form they are water soluble and comparatively stable.

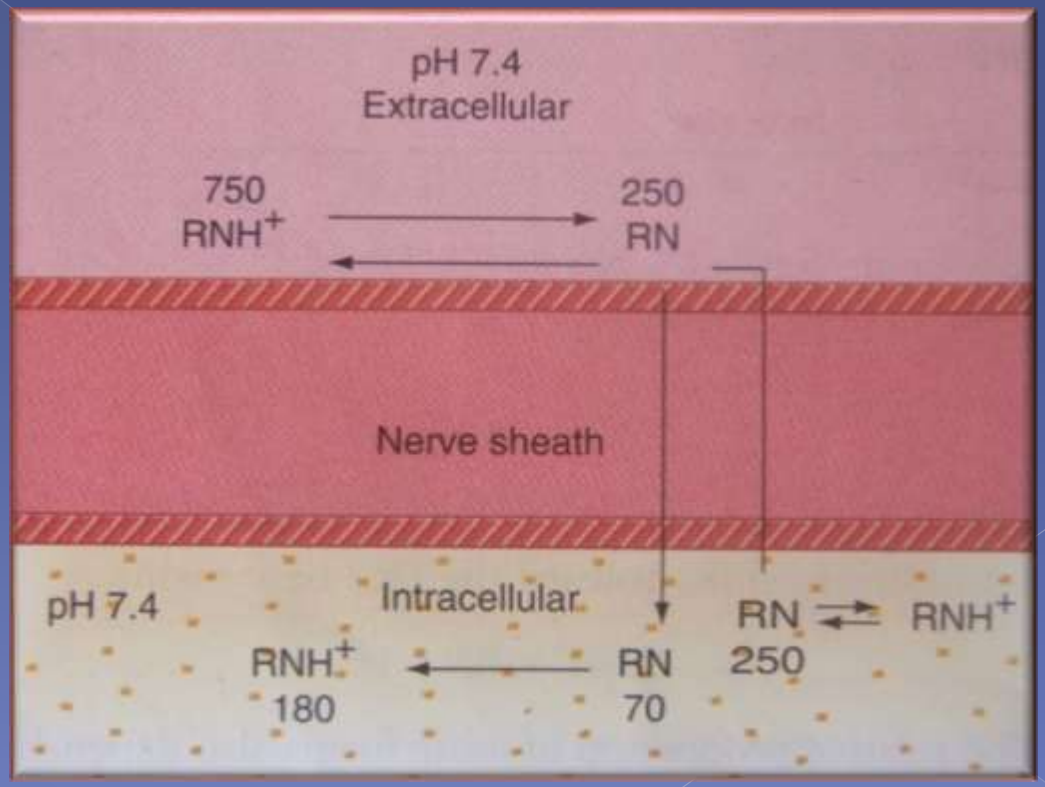
CARBONATED LOCAL ANAESTHETICS !!!

LA EXISTS SIMULTANEOUSLY AS UNCHARGED MOLECULES (RN) (BASE)AND POSITIVELY CHARGED MOLECULES (RNH+) (CATION)

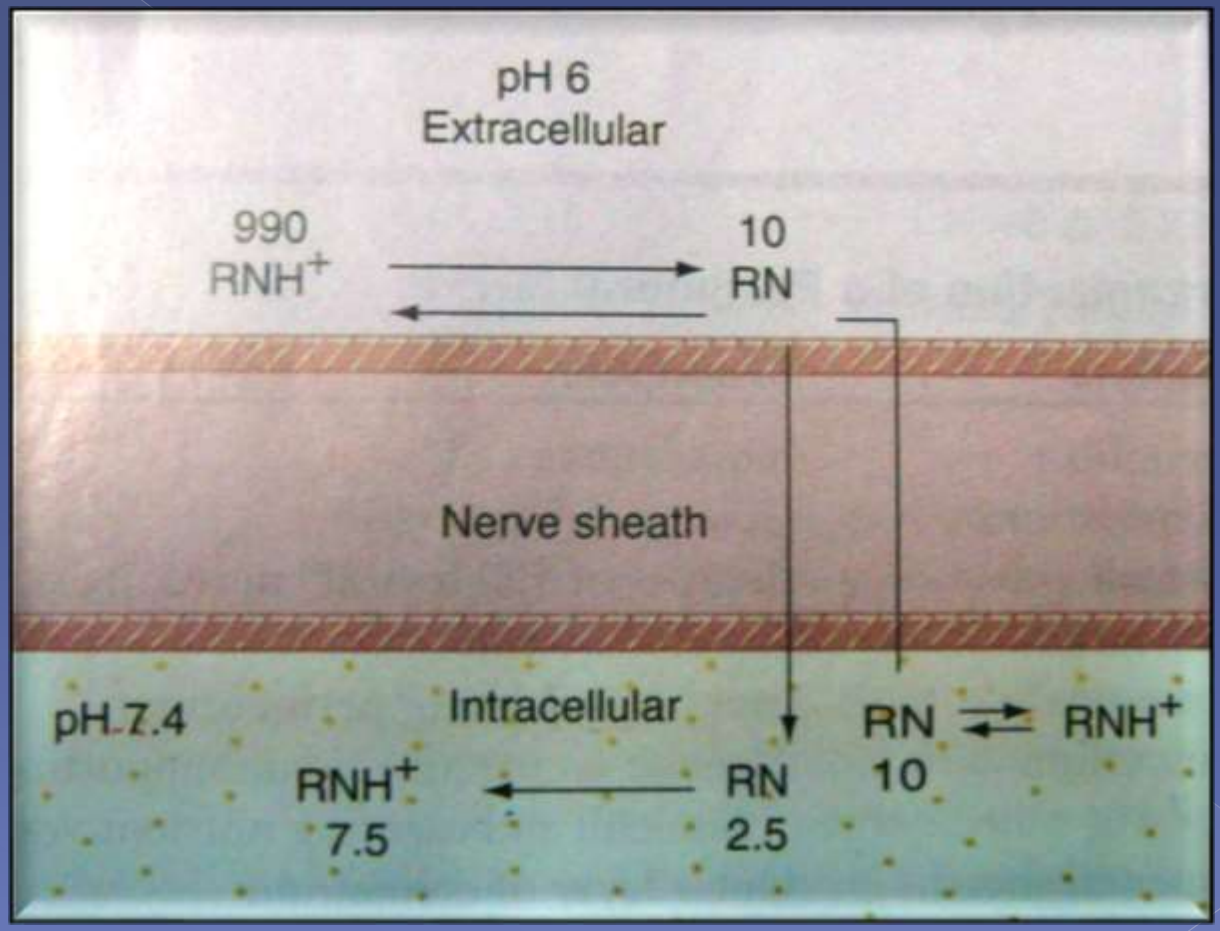
EFFECT OF pH ON LOCAL ANAESTHETIC SOLUTION

pH OF LA SOLUTION.

pH OF TISSUE.

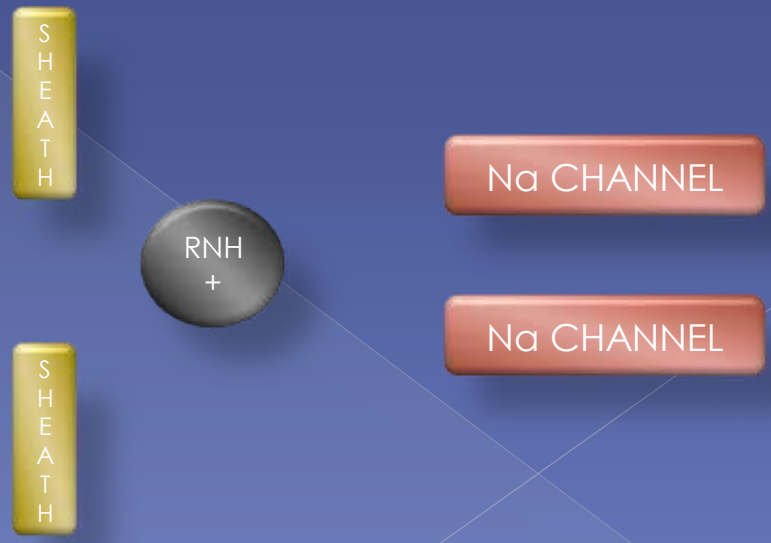


WHY LA IS INEFFECTIVE IN INFLAMMED TISSUE ???

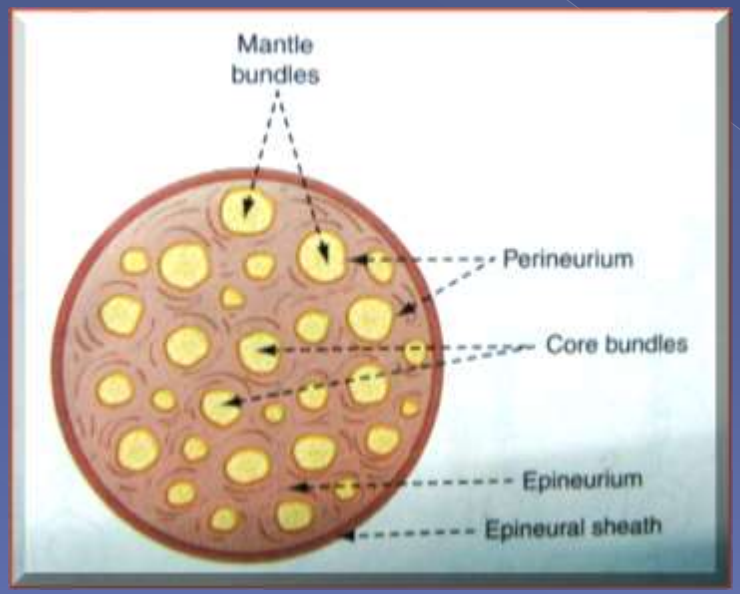


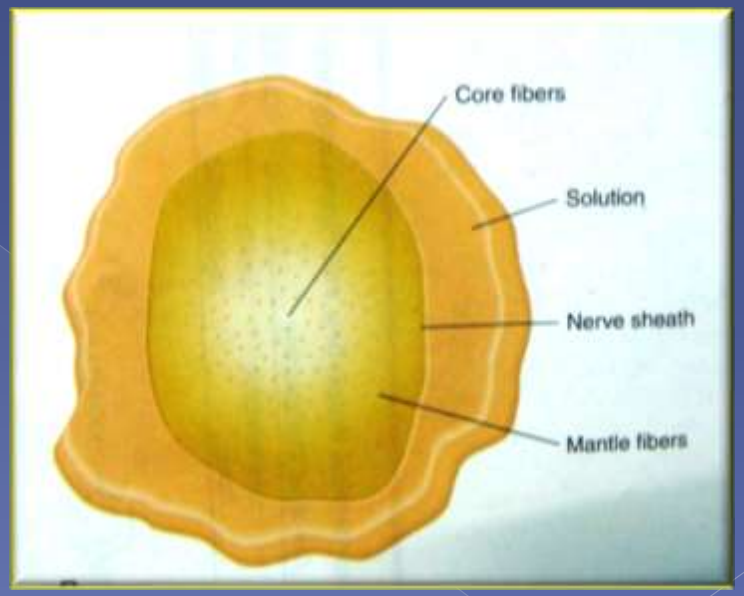
DIFFUSION :

BINDING:



IN SPITE OF HAVING ADEQUATE SOFT TISSUE ANAESTHESIA THE PATIENT MAY FEEL INADEQUATE PULPAL ANAESTHESIA. WHY ???





IN NO CLINICAL SITUATION ARE 100 % OF FIBRES BLOCKED EVEN IN CASES OF GOOD PAIN CONTROL

INDUCTION TIME:

DEFINED AS THE PERIOD FROM THE DEPOSITION OF THE ANAESTHETIC SOLUTION TO COMPLETE CONDUCTION BLOCKADE.

FACTORS CONTROLLING INDUCTION TIME:

1. CONCENTRATION OF THE DRUG.
2. PH OF THE LA SOLUTION.
3. DIFFUSION CONSTANT OF THE LA SOLUTION.
4. ANATOMICAL DIFFUSION BARRIERS OF THE NERVE.

PHYSICAL PROPERTIES AND CLINICAL ACTIONS:

Dissociation constant (pKa): Lower The Pka More Rapid Is Onset.

Lipid solubility: Related To Potency

Protein binding: Related To Duration Of Action

Vasoactivity: Affects Both Potency And Duration

RECOVERY FROM LOCAL ANAESTHETIC BLOCK:

ANAESTHESIA WEARS OFF IN THIRD MOLARS BEFORE THE CENTRAL INCISORS.

RECOVERY IS USUALLY S L O W E R THAN INDUCTION.

REINJECTION OF LA SOLUTION:

RECURRENCE OF PROFOUND ANAESTHESIA.

DIFFICULTY ACHIEVING ANAESTHESIA.

TACHYPHYLAXIS

BIOTRANSFORMATION

- ESTER TYPE LA:

  HYDROLYSIS BY PSEUDOCHOLINESTERASES

- AMIDE TYPE LA:

  IN LIVER BY ENZYME

TOPICAL ANESTHESIA

- REFERS TO THE MODIFICATION OF PAIN SENSATION OR THE LOSS OF SENSATION CAUSED BY AN AGENT THAT IS APPLIED TOPICALLY TO THE SKIN. TOPICAL ANESTHESIA INCLUDES THE ADMINISTRATION OF CRYOANESTHETICS AND THE APPLICATION OF LOCAL ANESTHETIC COMPOUNDS, WHICH MUST PENETRATE THE EPIDERMIS TO HAVE A PHYSIOLOGIC EFFECT.
- RECENT ADVANCES IN LASER TECHNOLOGY AND THE SUBSEQUENT INCREASE IN THE USE OF LASER TREATMENTS HAVE FUELED THE NEED FOR IMPROVED TOPICAL ANESTHETIC AGENTS AND THE DEVELOPMENT OF SUCH AGENTS.

CRYOANESTHETICS

APPLICATIONS:

BIOPSIES, SUPERFICIAL LESIONS, CURRETAGE PROCEDURES, DRAINAGE OF CYSTS OR FURUNCLES, PATIENTS WITH FEAR OF NEEDLES.

AGENTS:

ICE, LIQUID NITROGEN AND REFRIGERATION SPRAYS SUCH AS ETHYL CHLORIDE DICHLOROTETRAFLUOROETHANE,

TOPICAL ANAESTHETICS

EMLA cream (Astra USA, Westborough, Mass): eutectic mixture of 2.5% lidocaine and 2.5% prilocaine in an oil-in-water emulsion.

APPLICATIONS: superficial curettage, dermabrasion, several laser procedures, epilation, and cryosurgery.

EMLA is the most widely used topical agent and has proven efficacy based on results from several clinical trials.

EMLA cream must be applied directly to the surgical site and placed under occlusion for 1-3 hours. The anesthetic effects of EMLA may persist for as long as 2 hours.

DISADVANTAGES:

reported to cause systemic toxicity in children.

Both CNS manifestations and Methemoglobinemia are reported with the use of EMLA cream.

FURTHER METHODS OF PAIN CONTROL

1.ACUPUNCTURE ANALGESIA:

- ORIGINATED IN CHINA ABOUT 3000 YRS AGO.
- LATIN WORD *(ACUS- NEEDLES, PUNCTURA-A PUNCTURE)*. SPECIFIC POINTS IN BODY WHERE NEEDLES SHOULD BE APPLIED.
- EXCITE A DELTA FIBRES THE INPUTS REACH THE PERI AQUEDUCTAL GREY MATTER STIMULATING ENDOGENOUS OPIOID PRODUCTION (ENDORPHINS).

2.HYPNOTISM.

PRODUCES A TRANS-LIKE STATE IN WHICH PATIENTS ATTENTION IS FOCUSED SO THAT AWARENESS FOR OTHER STIMULI IS MARKEDLY REDUCED

DISADVANTAGE:

INITIALLY TIME CONSUMING AND NOT EFFECTIVE FOR ALL PATIENTS

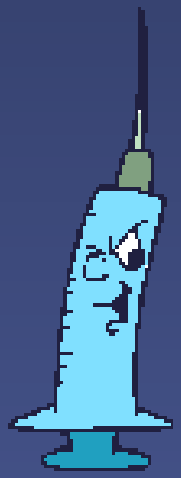
3.AUDIO-ANALGESIA:

- DESCRIBED BY GARDNER AND LICKLIDER (1959).
- USE OF LOUD SOUNDS TO PRODUCE INSENSITIVITY TO PAIN AS PAIN AND AUDITORY PATHWAYS ARE CLOSELY ASSOCIATED.

4.ELECTRIC ANAESTHESIA:

- DESCRIBED BY PROF K.SUZUKI IN 1950.
- PAIN IMPULSE IS ACCOMPANIED BY NEGATIVE POTENTIAL AND DEPOLARIZATION OF THE NERVE FIBRES IS PREVENTED BY A POSITIVE POTENTIAL DUE TO DIRECT ELECTRIC CURRENT.

5.ANAESTHESIA BY COLD AIR.



VASO CONSTRICTORS

FUNCTIONS

1. CONSTRICTION OF BLOOD VESSELS, DECREASES BLOOD FLOW.

2. DECREASES ABSORPTION OF LA IN CARDIOVASCULAR SYSTEM.

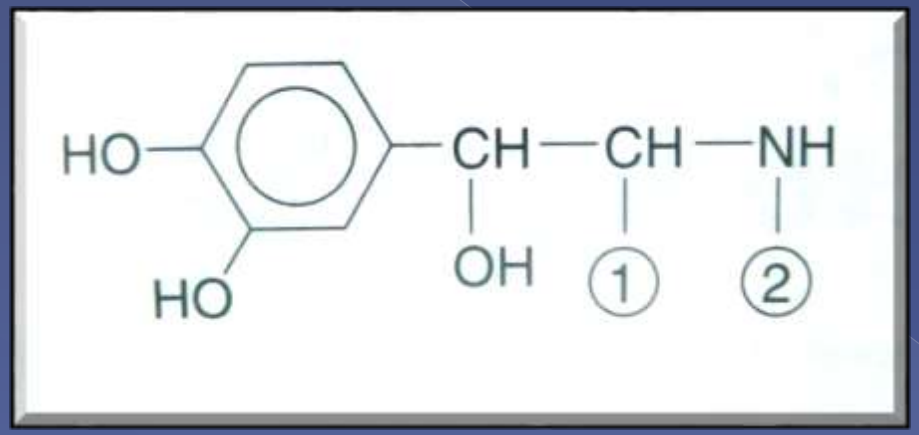
3. MINIMIZES RISK OF LA TOXICITY BY DECREASING DOSE.

4. INCREASE IN DURATION OF LA.

5. DECREASES BLEEDING.

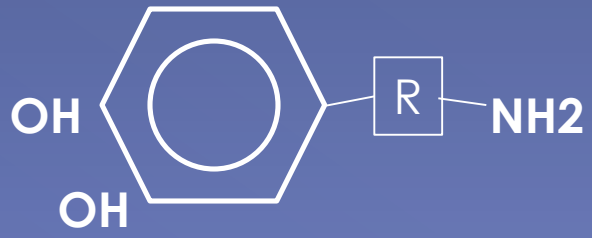
-ACTION RESEMBLES THAT OF ADRENERGIC NERVES, THUS CALLED AS SYMPATHOMIMETICS.

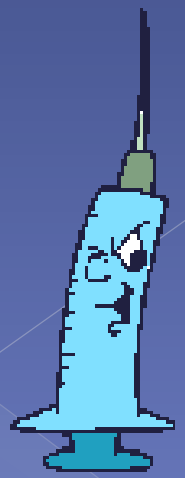
CHEMICAL STRUCTURE



	1	2
EPINEPHRINE	H	CH_3
LEVONORDEFRIN	CH_3	H
NOREPINEPHRINE	H	H

CATECHOLAMINE





MODES OF ACTION:

THERE ARE THREE CATEGORIES OF SYMPATHOMIMETIC AMINES:

- DIRECT ACTING WHICH EXERT ACTION ON ADRENERGIC RECEPTORS
- INDIRECT ACTING WHICH ACT BY RELEASING NOREPINEPHRINE FROM ADRENERGIC NERVE TERMINALS
- MIXED ACTING WITH BOTH DIRECT AND INDIRECT ACTIONS.

ADRENERGIC RECEPTORS:

ADRENERGIC RECEPTORS ARE FOUND IN MOST TISSUES OF THE BODY.

THERE ARE TWO TYPES OF RECEPTORS BASED ON THE ACTION OF CATECHOLAMINES ON THE SMOOTH MUSCLES

I.E. ALPHA (α) AND BETA (β) RECEPTORS.

ACTIVATION OF α RECEPTORS CAUSES SMOOTH MUSCLE CONTRACTION IN THE BLOOD VESSELS.

BASED ON THE FUNCTION AND LOCATION DIFFERENCES THEY ARE SUB-CATEGORIZED AS

α_1 (EXCITATORY POST-SYNAPTIC) AND

α_2 (INHIBITORY POST-SYNAPTIC).

ACTIVATION OF β RECEPTORS PRODUCES SMOOTH MUSCLE RELAXATION AND CARDIAC STIMULATION.

β RECEPTORS ARE FURTHER DIVIDED AS β_1 AND β_2.

β_1 CAUSES CARDIAC STIMULATION AND LIPOLYSIS,

β_2 CAUSES BRONCHODILATION AND VASODILATATION

RELEASE OF CATECHOLAMINES

DRUGS SUCH AS TYRAMINE AND AMPHETAMINE ACT INDIRECTLY BY CAUSING RELEASE OF CATECHOLAMINE NOREPINEPHRINE FROM STORAGE SITES IN THE ADRENERGIC NERVE TERMINALS;

IN ADDITION THEY MAY ALSO EXERT A DIRECT ACTION ON α AND β RECEPTORS.

THE CLINICAL ACTION OF THESE DRUGS IS QUITE SIMILAR TO NOREPINEPHRINE.

ADRENERGIC RECEPTOR ACTIVITY OF VASOCONSTRICTORS:

DRUG	α_1	α_2	β_1	β_2
EPINEPHRINE	+++	+++	+++	+++
NOREPINEPHRINE	++	++	++	+
LEVONORDEFRIN	+	++	++	+

DILUTION OF VASOCONSTRICTORS:

- THE DILUTION OF VASOCONSTRICTORS IS COMMONLY REFERRED TO AS THE RATIO (E.G. 1 TO 1000 AS 1:1000).
- A CONCENTRATION OF 1:1000 MEANS THAT THERE IS 1 GRAM(1000mG) OF SOLUTE CONTAINED IN 1000mL OF SOLUTION.
- HENCE 1:1000 DILUTIONS CONTAIN 1000mG IN 1000mL OR1mG/mL OF SOLUTION (1000 MICROG/mL).
  THUS 1:10,000 MEANS 0.1mG/mL.
  1:100,000 MEANS 0.01mG/mL.

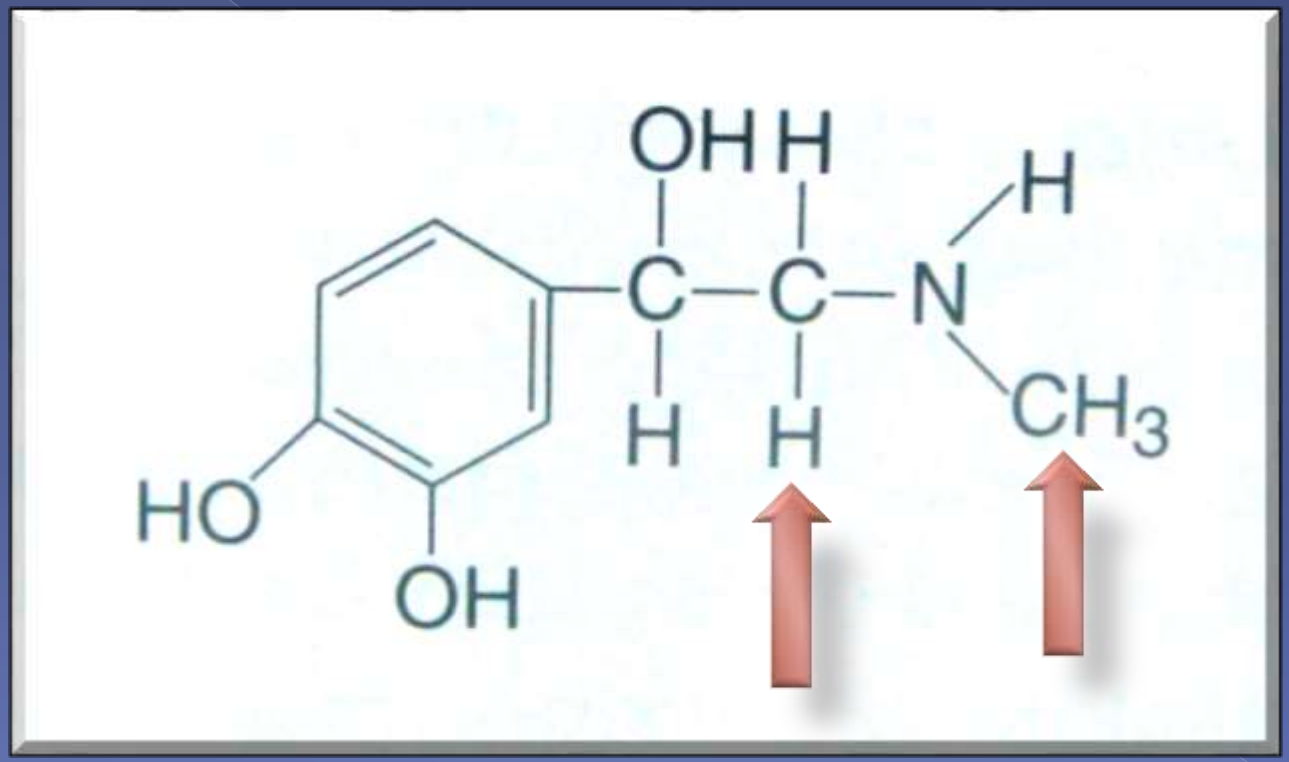
ADRENALINE WAS DISCOVERED BY ABEL IN 1897

BRAUN IN 1903 SUGGESTED USING ADRENALINE TO PROLONG THE ACTION OF LA.

ADRENALINE IN THE CONCENTRATION OF 1:200000 PROVIDES COMPARABLE RESULTS WITH FEWER SIDE EFFECTS.

PHARMACOLOGY OF SPECIFIC AGENTS

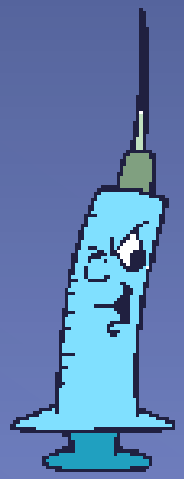
EPINEPHRINE:



CHEMICAL PROPERTY:

- IT IS HIGHLY SOLUBLE IN THE ACID SALT FORM.
- SLIGHTLY ACID SOLUTIONS ARE RELATIVELY STABLE IF THEY ARE PROTECTED FROM AIR.
- OXIDATION IS HASTENED BY HEAT AND **HEAVY** METAL IONS.
- *SODIUM BISULFITE* IS ADDED TO EPINEPHRINE SOLUTIONS TO DELAY OXIDATION

THE SHELF LIFE OF LA CARTRIDGE CONTAINING A VASOCONSTRICTOR IS SHORTER (18MONTHS) THAN THAT OF CARTRIDGE CONTAINING NO VASOCONSTRICTORS (36MONTHS).



SOURCE:

- EPINEPHRINE IS AVAILABLE AS A SYNTHETIC AND IS ALSO OBTAINED FROM THE ADRENAL MEDULLA OF ANIMALS
- (APPROX 80% OF ADRENAL SECRETION BEING EPINEPHRINE).
- IT EXISTS BOTH AS LEVOROTATORY AND DEXTROROTATORY FORMS.
- LEVOROTATORY FORM IS APPROX 15 TIMES AS POTENT AS DEXTROROTATORY FORM.

SYSTEMIC ACTIONS:

- STIMULATES β_1 RECEPTORS OF MYOCARDIUM WITH A POSITIVE INOTROPIC AND A POSITIVE CHRONOTROPIC ACTIVITY.
  BOTH CARDIAC OUTPUT AND HEART RATE ARE INCREASED.

- INCREASES THE IRRITABILITY OF PACEMAKER CELLS, LEADING TO INCREASED DYSRHYTHMIAS.
  VENTRICULAR TACHYCARDIA AND PREMATURE VENTRICULAR CONTRACTIONS ARE COMMON.

- CAUSES DILATION OF CORONARY ARTERIES INCREASING CORONARY ARTERY BLOOD FLOW.

- SYSTOLIC BLOOD PRESSURE IS INCREASED DIASTOLIC PRESSURE IS DECREASED DUE TO STIMULATION OF β_2 RECEPTORS THAN OF α RECEPTORS IN VESSELS SUPPLYING SKELETAL MUSCLES.

- DIASTOLIC PRESSURE IS INCREASED WITH LARGE EPINEPHRINE DOSES AS A RESULT OF CONSTRICTION CAUSED BY α RECEPTORS.

- THE OVERALL ACTION OF EPINEPHRINE ON HEART AND CVS IS DIRECT STIMULATION
  I.E. INCREASED SYSTOLIC AND DIASTOLIC PRESSURE,
  INCREASED CARDIAC OUTPUT,
  INCREASED STROKE VOLUME,
  INCREASED HEART RATE,
  INCREASED STRENGTH OF CONTRACTION AND
  INCREASED MYOCARDIAL OXYGEN CONSUMPTION.

THESE ACTIONS LEAD TO OVERALL *DECREASE IN CARDIAC EFFICIENCY*.

THE INITIAL RESPONSE IS ON SYSTOLIC PRESSURE AND HEART RATE.

VASCULATURE:

PRIMARY ACTION IS ON SMALLER ARTERIOLES AND PRE-CAPILLARY SPHINCTERS.

β_2 RECEPTORS ARE MORE SENSITIVE THAN α RECEPTORS.

SMALL DOSES ACTIVATE THE β_2 RECEPTORS WHILE LARGER DOSES PRODUCE VASOCONSTRICTION DUE TO STIMULATION OF α RECEPTORS.

NON-SKELETAL MUSCLES CONTAIN α RECEPTORS WHILE SKELETAL MUSCLES CONTAIN BOTH α AND β_2 RECEPTORS WITH β_2 RECEPTORS PREDOMINATING.

HEMOSTASIS:

THE INJECTION OF EPINEPHRINE DIRECTLY INTO THE SURGICAL SITE PRODUCES α RECEPTOR STIMULATION AND HEMOSTASIS,

AS EPINEPHRINE TISSUE LEVELS DECREASES OVER TIME, β_2 RECEPTOR ACTIVITY PREDOMINATES CAUSING VASODILATATION.

HENCE IT IS COMMON FOR SOME BLEEDING TO BE NOTED AT ABOUT 6 HRS AFTER SURGICAL PROCEDURE.

REBOUND PHENOMENON OF ADRENALINE

RESPIRATORY SYSTEM:

EPINEPHRINE IS A POTENT DILATOR (β_2 RECEPTOR EFFECT) OF BRONCHIOLE SMOOTH MUSCLE

HENCE DRUG OF CHOICE FOR MANAGEMENT OF ACUTE ASTHMATIC EPISODES.

CNS:

IT CAUSES CNS STIMULATING ACTIONS ONLY WHEN EXCESS DOSE IS ADMINISTERED AND NOT UNDER NORMAL DOSES.

TERMINATION OF ACTION AND ELIMINATION:

THE ACTION OF EPINEPHRINE IS TERMINATED PRIMARILY BY ITS UPTAKE BY ADRENERGIC NERVES.

EPINEPHRINE THAT ESCAPES UPTAKE IS RAPIDLY INACTIVATED BY ENZYMES CATECHOL-O-METHYLTRANSFERASE (COMT) AND MONOAMINEOXIDASE (MAO)

BOTH OF WHICH ARE PRESENT IN LIVER.

SMALL AMOUNT (APPROX 1%) IS EXCRETED UNCHANGED IN URINE.

SIDE EFFECTS AND OVERDOSES:

CNS STIMULATION:

FEAR, ANXIETY, TENSION, RESTLESSNESS, THROBBING HEADACHE, TREMOR, WEAKNESS, DIZZINESS, PALLOR, RESPIRATORY DIFFICULTY AND PALPITATION.

CVS EFFECTS:

DYSRHYTHMIAS WITH DRAMATIC INCREASE IN SYSTOLIC (>300mmHG) AND DIASTOLIC (>200mmHG) PRESSURES LEADING TO CEREBRAL HEMORRHAGE.

CLINICAL APPLICATIONS:

- MANAGEMENT OF ACUTE ALLERGIC REACTIONS.
- MANAGEMENT OF BRONCHOSPASM.
- MANAGEMENT OF CARDIAC ARREST.
- MANAGEMENT OF HEMORRHAGE.
- MANAGEMENT OF ABSORPTION OF LA IN CVS.
- TO INCREASE THE DEPTH OF ANAESTHESIA.
- TO INCREASE THE DURATION OF ANAESTHESIA.
- TO PRODUCE MYDRIASIS.

HEMOSTASIS

EPINEPHRINE CONTAINING LA IS USED VIA INFILTRATION INTO THE SURGICAL SITE TO PREVENT OR MINIMIZE HEMORRHAGE DURING THE SURGICAL PROCEDURE.

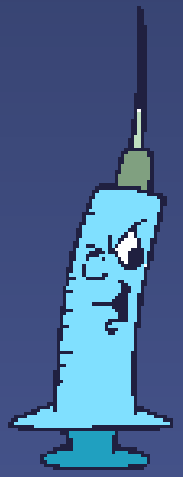
THE 1:50000 DILUTIONS ARE MORE EFFECTIVE THAN LESS CONCENTRATED 1:100000 OR 1:200000 SOLUTIONS,

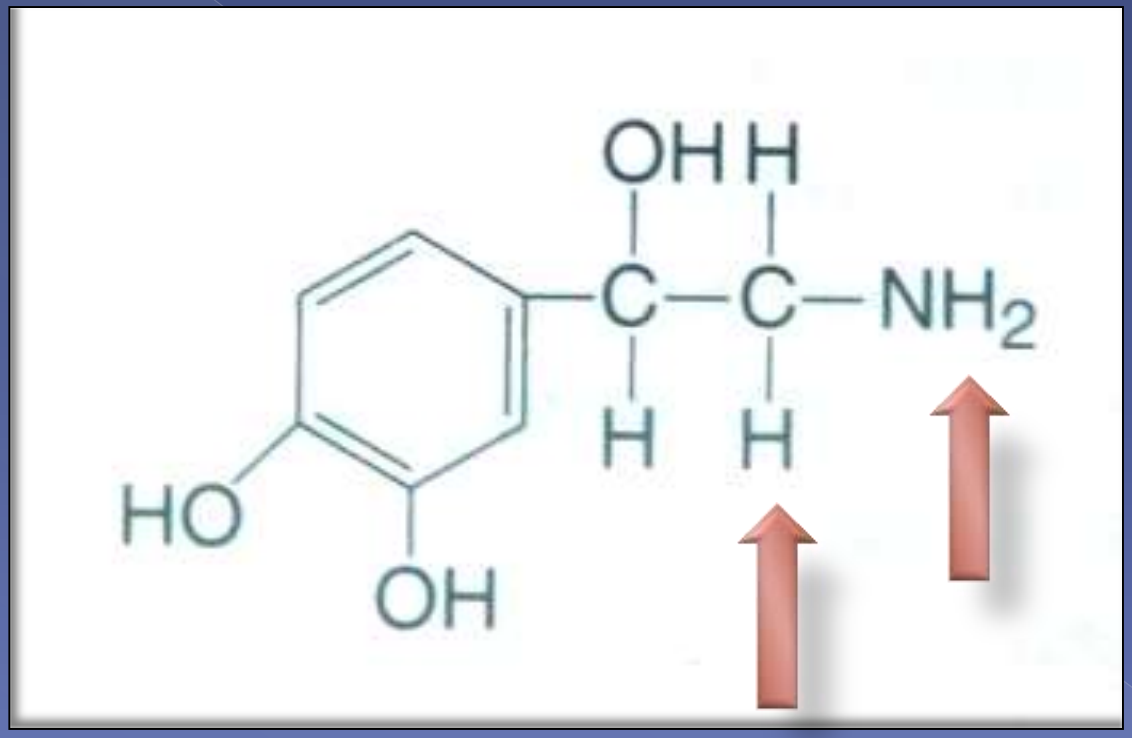
- YET THE SOLUTION WITH LESSER CONCENTRATIONS SHOULD ALWAYS BE PREFERRED FOR THE ASA III OR IV TYPE INDIVIDUALS OR GERIATRIC PATIENTS.

RECOMMENDED MAXIMUM DOSAGES OF EPINEPHRINE

Epinephrine Concentration (μg/Cartridge)	Cartridges (Rounded Off)	
	Normal, Healthy Patient (ASA I)*	Patient with Clinically Significant Cardiovascular Disease (ASA III or IV)†
1:50,000 (36)	5.5	1
1:100,000 (18)	11‡	2
1:200,000 (9)	22‡	4

NOR-EPINEPHRINE





CHEMICAL STRUCTURE:

NOR-EPINEPHRINE IS RELATIVELY STABLE IN ACID SOLUTION, DETERIORATING ON EXPOSURE TO AIR AND LIGHT.

THE SHELF LIFE OF CARTRIDGE CONTAINING NOR-EPINEPHRINE BITARTRATE IS 18 MONTHS.

ACETONE SODIUM BISULFITE IS ADDED TO RETARD DETERIORATION.

SOURCE:

NOR-EPINEPHRINE IS AVAILABLE IN BOTH NATURAL AND SYNTHETIC FORMS.

THE NATURAL FORM CONSTITUTES APPROX 20% OF CATECHOLAMINE PRODUCTION OF ADRENAL MEDULLA.

IT EXISTS IN BOTH LEVOROTATARY AND DEXTROROTATARY FORMS; THE LEVOROTATARY FORM IS 40 TIMES AS POTENT AS DEXTROROTATARY FORM.

NOR-EPINEPHRINE IS SYNTHESIZED AND IS STORED AT POST GANGLIONIC ADRENERGIC NERVE TERMINALS.

MODE OF ACTION:

IT ACTS EXCLUSIVELY ON α RECEPTORS (90%) AND IS ONE FOURTH AS POTENTIAL AS EPINEPHRINE.

SYSTEMIC ACTIONS:

CARDIAC ACTIONS:

- IT HAS A POSITIVE INOTROPIC ACTION ON THE MYOCARDIUM THROUGH β_1 STIMULATION (10%).
- IT STIMULATES PACEMAKER CELLS AND INCREASES THE INCIDENCE OF CARDIAC DYSRHYTHMIAS (β_1 ACTION).
- IT INCREASES THE CORONARY BLOOD FLOW THROUGH A VASODILATORY EFFECT.
- IT PRODUCES A DECREASE IN THE HEART RATE BY A REFLEX ACTION ON THE CAROTID AND AORTIC BARO-RECEPTORS AND THE VAGUS NERVE.
- BOTH SYSTOLIC & DIASTOLIC PRESSURES ARE INCREASED, THIS IS MEDIATED BY α RECEPTOR STIMULATION, LEADING TO PERIPHERAL VASOCONSTRICTION & INCREASED PERIPHERAL RESISTANCE.

THUS THE OVERALL ACTION OF NA ON CVS CAN BE SUMMARISED AS FOLLOWS

- INCREASED SYSTOLIC PRESSURE.
- INCREASED DIASTOLIC PRESSURE.
- DECREASED HEART RATE.
- INCREASED STROKE VOLUME.
- INCREASED TOTAL PERIPHERAL RESISTANCE.

VASCULATURE:

CONSTRICTION OF CUTANEOUS BLOOD VESSELS (α ACTIVITY)
INCREASED TPR AND SYSTOLIC & DIASTOLIC PRESSURE

RESPIRATORY SYSTEM:

NO ACTION ON BRONCHIAL SMOOTH MUSCLE (NO β2 ACTIVITY).
CAUSES CONSTRICTION OF LUNG ARTERIOLE AND REDUCES AIRWAY RESISTANCE.

CENTRAL NERVOUS SYSTEM:

ACTION SIMILAR TO ADRENALINE AND OCCURS AT OVERDOSES.

METABOLISM:

INCREASES BMR AND TISSUE OXYGEN CONSUMPTION.
INCREASES BLOOD SUGAR LEVEL.

TERMINATION OF ACTION AND ELIMINATION:

NA ACTION IS TERMINATED AT ADRENERGIC NERVE TERMINALS AND OXIDATION OCCURS AT MAO.
EXOGENOUS NA IS INACTIVATED BY COMT.

SIDE EFFECTS AND OVERDOSES:

MANIFESTATIONS SIMILAR TO BUT LESS SEVERE AND LESS FREQUENT THAN ADRENALINE.
ELEVATED SYSTOLIC AND DIASTOLIC PRESSURES AND INCREASED RISK OF STROKE, HEADACHE, ANGINA AND CARDIAC DYSRHYTHMIAS.

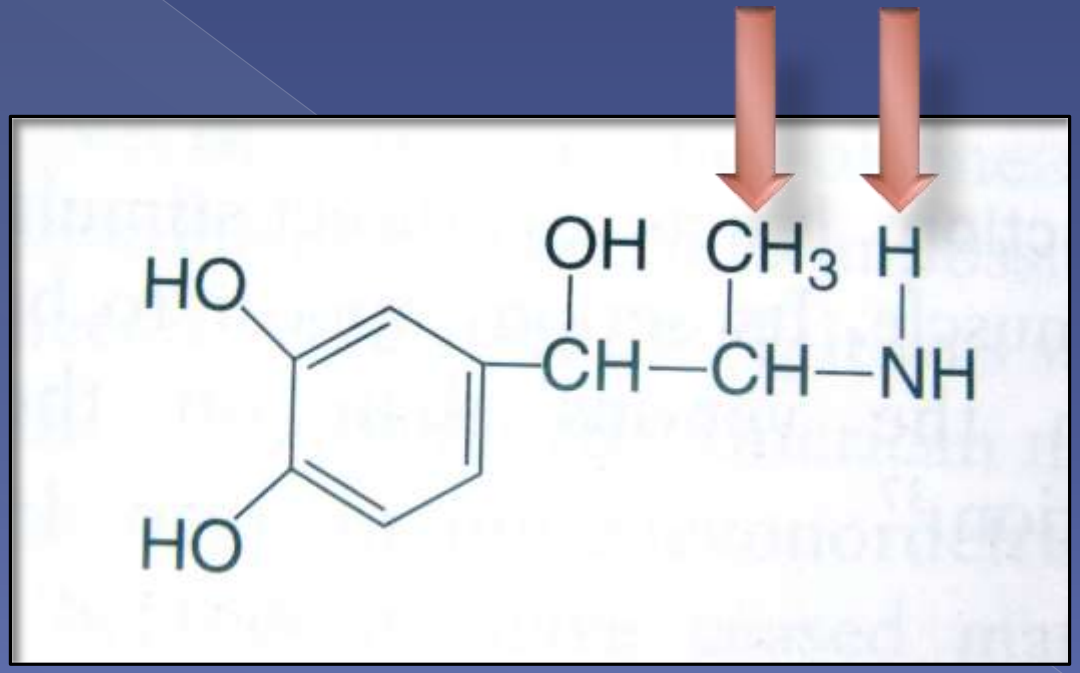
MAXIMUM DOSES:

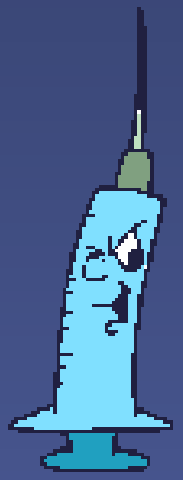
IT IS APPROX 25% AS POTENT VASOPRESSOR AS EPINEPHRINE AND USED IN DILUTION OF 1: 30,000.

NORMAL HEALTHY PT:
0.34mG PER APPOINTMENT;
10mL OF 1:30,000 SOLUTION.

COMPROMISED PT (ASA III OR IV):
0.14mG PER APPOINTMENT,
APPROX 4mL OF 1:30,000 SOLUTION.

LEVONORDEFRIN





PROPERTIES:

- FREELY SOLUBLE IN DILUTE ACIDIC SOLUTIONS.
- SODIUM BISULFITE IS ADDED TO DELAY ITS DETERIORATION
- SHELF LIFE OF LEVONORDEFRIN SODIUM BISULFITE CARTRIDGE IS 18 MONTHS

SOURCE:

PREPARED BY RESOLUTION OF NORDEFRIN INTO ITS OPTICALLY ACTIVE ISOMERS.

MODE OF ACTION:

DIRECT α RECEPTOR STIMULATION (75%) WITH SOME β ACTIVITY (25%).

IT IS 15% AS POTENT AS EPINEPHRINE.

SYSTEMIC ACTIONS:

ACTION OF LEVONORDEFRIN IS SAME AS EPINEPHRINE BUT WITH LESS INTENSITY.

THE OVERALL ACTION OF LEVONORDEFRIN ON HEART AND CVS IS DIRECT STIMULATION I.E.

INCREASED SYSTOLIC AND DIASTOLIC PRESSURE,

INCREASED CARDIAC OUTPUT,

INCREASED STROKE VOLUME,

INCREASED HEART RATE,

INCREASED STRENGTH OF CONTRACTION AND

INCREASED MYOCARDIAL OXYGEN CONSUMPTION.

RESPIRATORY SYSTEM:

LEVONORDEFRIN CAUSES DILATION (β_2 RECEPTOR EFFECT) OF BRONCHIOLE SMOOTH MUSCLE.

CNS:

IT CAUSES CNS STIMULATING ACTIONS ONLY WHEN EXCESS DOSE IS ADMINISTERED AND NOT UNDER NORMAL DOSES.

TERMINATION OF ACTION AND ELIMINATION:

- THE ACTION OF LEVONORDEFRIN IS TERMINATED PRIMARILY BY ITS UPTAKE BY ADRENERGIC NERVES.
- LEVONORDEFRIN THAT ESCAPES UPTAKE IS RAPIDLY INACTIVATED BY ENZYMES CATECHOL-O-METHYLTRANSFERASE (COMT) AND MONOAMINEOXIDASE (MAO)
- BOTH OF WHICH ARE PRESENT IN LIVER.
- SMALL AMOUNT IS EXCRETED UNCHANGED IN URINE.

SIDE EFFECTS AND OVERDOSES:

THIS IS SAME AS EPINEPHRINE BUT TO A LESSER EXTENT.

CNS STIMULATION:

FEAR, ANXIETY, TENSION, RESTLESSNESS, THROBBING HEADACHE, TREMOR, WEAKNESS, DIZZINESS, PALLOR, RESPIRATORY DIFFICULTY AND PALPITATION.

CVS EFFECTS:

DYSRHYTHMIAS WITH INCREASE IN SYSTOLIC AND DIASTOLIC PRESSURES LEADING TO CEREBRAL HEMORRHAGE.

AVAILABILITY:

IT IS AVAILABLE WITH MEPIVACAINE IN A 1:20,000 DILUTION.

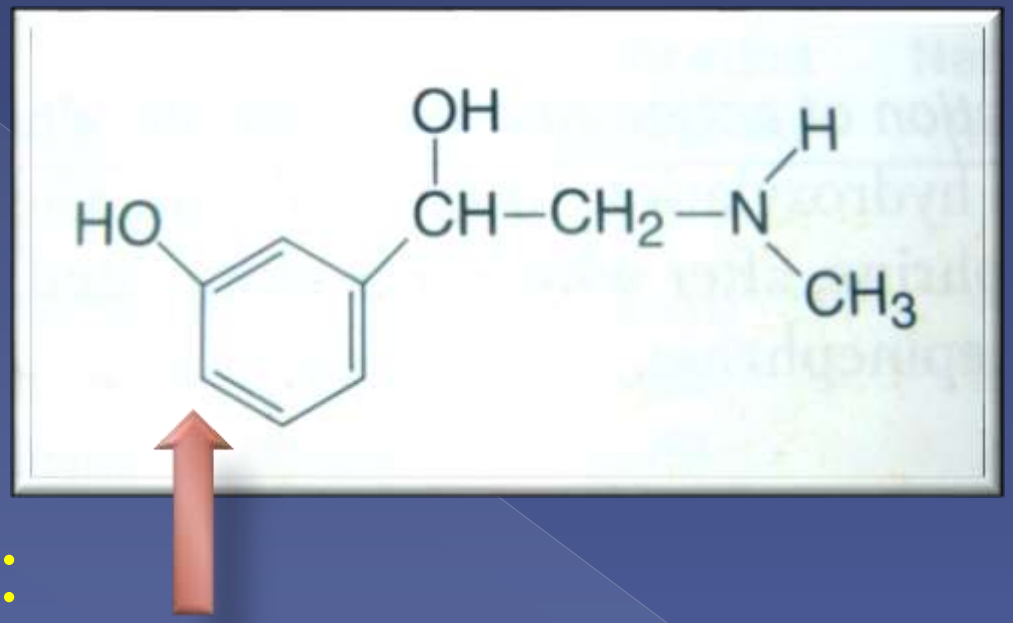
MAXIMUM DOSES:

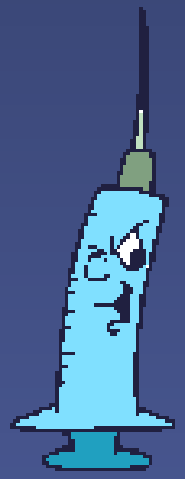
IT SHOULD BE 1mG PER APPOINTMENT ; 20mL OF 1:20,000 DILUTION I.E. 11 CARTRIDGES.

THUS

LEVONORDEFRIN (1:20,000)=EPINEPHRINE (1:50,000)/(1:1,00,000)

PHENYLEPHRINE HYDROCHLORIDE





SOURCE:

IT IS A SYNTHETIC SYMPATHOMIMETIC AMINE.

PROPERTIES:

QUITE SOLUBLE IN WATER.

IT IS THE MOST STABLE AND WEAKEST VASOCONSTRICTOR IN DENTISTRY.

MODE OF ACTION:

IT CAUSES α RECEPTOR STIMULATION (95%) WITH LITTLE OR NO β ACTION ON HEART.

IT IS ONLY 5% AS POTENT AS EPINEPHRINE.

SYSTEMIC ACTION:

CVS:

INCREASED SYSTOLIC AND DIASTOLIC PRESSURE.

REFLEX BRADYCARDIA.

POWERFUL VASOCONSTRICTION BUT WITHOUT MARKED VENOUS CONGESTION.

RARELY CAUSES CARDIAC DYSRHYTHMIAS.

RESPIRATORY SYSTEM:

BRONCHI ARE DILATED BUT NOT AS EFFECTIVELY AS EPINEPHRINE.

CNS: THERE IS A MINIMUM EFFECT ON CNS.

TERMINATION OF ACTION:

IT UNDERGOES HYDROXYLATION TO EPINEPHRINE THEN OXIDATION TO METANEPHRINE AFTER WHICH IT IS ELIMINATED IN THE SAME MANNER AS EPINEPHRINE.

SIDE EFFECTS AND OVERDOSES:

CNS EFFECTS ARE MINIMUM. HEADACHE & VENTRICULAR DYSRHYTHMIAS ARE NOTED.

TACHYPHYLAXIS SEEN IN CHRONIC CASES.

CLINICAL APPLICATIONS:

- AS VASOCONSTRICTORS IN LA.
- FOR MANAGEMENT OF HYPOTENSION.
- AS NASAL DECONGESTANT.
- TO PRODUCE MYDRIASIS.

AVAILABILITY:

IT WAS USED WITH 4% PROCAINE IN 1:2500 DILUTION (BUT NO LONGER AVAILABLE IN DENTAL CARTRIDGES)

MAXIMUM DOSES:

NORMAL PT: 4mG PER APPOINTMENT; 10mL OF 1:2500 SOL.
PT WITH ASA III OR IV: 1.6mL PER APPOINTMENT; 4mL OF 1:2500 SOLUTION.

FELYPRESSIN:

SOURCE:

IT IS A SYNTHETIC ANALOG OF ANTIDIURETIC HORMONE VASOPRESSIN.

IT IS A NON-SYMPATHOMIMETIC AMINE, CATEGORIZED AS VASOCONSTRICTOR.

MODE OF ACTION:

DIRECT STIMULANT OF VASCULAR SMOOTH MUSCLE.

ACTION MORE PRONOUNCED ON VENOUS MICROCIRCULATION THAN ON ARTERIOLAR.

SYSTEMIC ACTIONS:

MYOCARDIUM: NO DIRECT ACTIONS.

PACEMAKER CELLS: NON-DYSRHYTHMOGENIC.

CORONARY ARTERIES: IN OVERDOSES IT MAY IMPAIR BLOOD FLOW THROUGH CORONARY ARTERIES.

VASCULATURE: IN HIGHER DOSES FELYPRESSIN INDUCED CONSTRICTION OF CUTANEOUS BLOOD VESSELS MAY PRODUCE FACIAL PALLOR.

CNS: NO CNS EFFECTS HENCE CAN BE GIVEN TO HYPERTHYROID PATIENTS AND PATIENTS RECEIVING TRICYCLIC ANTI-DEPRESSANTS OR MAO INHIBITORS.

SIDE EFFECTS AND OVERDOSES:

HAS A WIDE MARGIN OF SAFETY.

WELL TOLERATED BY TISSUES.

SYSTEMIC REACTION IS MINIMAL.

AVAILABILITY:

DILUTION OF 0.03 IU/ml WITH 3% PRILOCAINE.

MAXIMUM DOSES:

NOT RECOMMENDED WHEN HEMOSTASIS IS REQUIRED.

PATIENTS WITH ASA III OR IV: 0.27IU; 9mL OF 0.03IU/ml.

REFERENCES

- HANDBOOK OF LOCAL ANAESTHESIA -STANLEY MALAMED.
- LOCAL ANAESTHESIA AND PAIN CONTROL IN DENTAL PRACTICE -C.RICHARD BENNETT.
- LOCAL ANALGESIA IN DENTISTRY -D.ROBERTS & J.SOWRAY.
- A COLOR ATLAS OF DENTAL ANALGESIA AND SEDATION -G.ROBERTS & N.ROSENBAUM.

American Society of Anesthesiologists
Physical Status Classification and Definition

I	Normal, healthy patient
II	Patient with mild to moderate systemic disease
III	Patient with severe systemic disease that limits activity but is not incapacitating
IV	Patient with severe systemic disease that limits activity and is a constant threat to life
V	Moribund patient not expected to survive 24 hours with or without the operation
VI	Clinically dead patient being maintained for harvesting of organs

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