

ADRENERGIC DRUGS

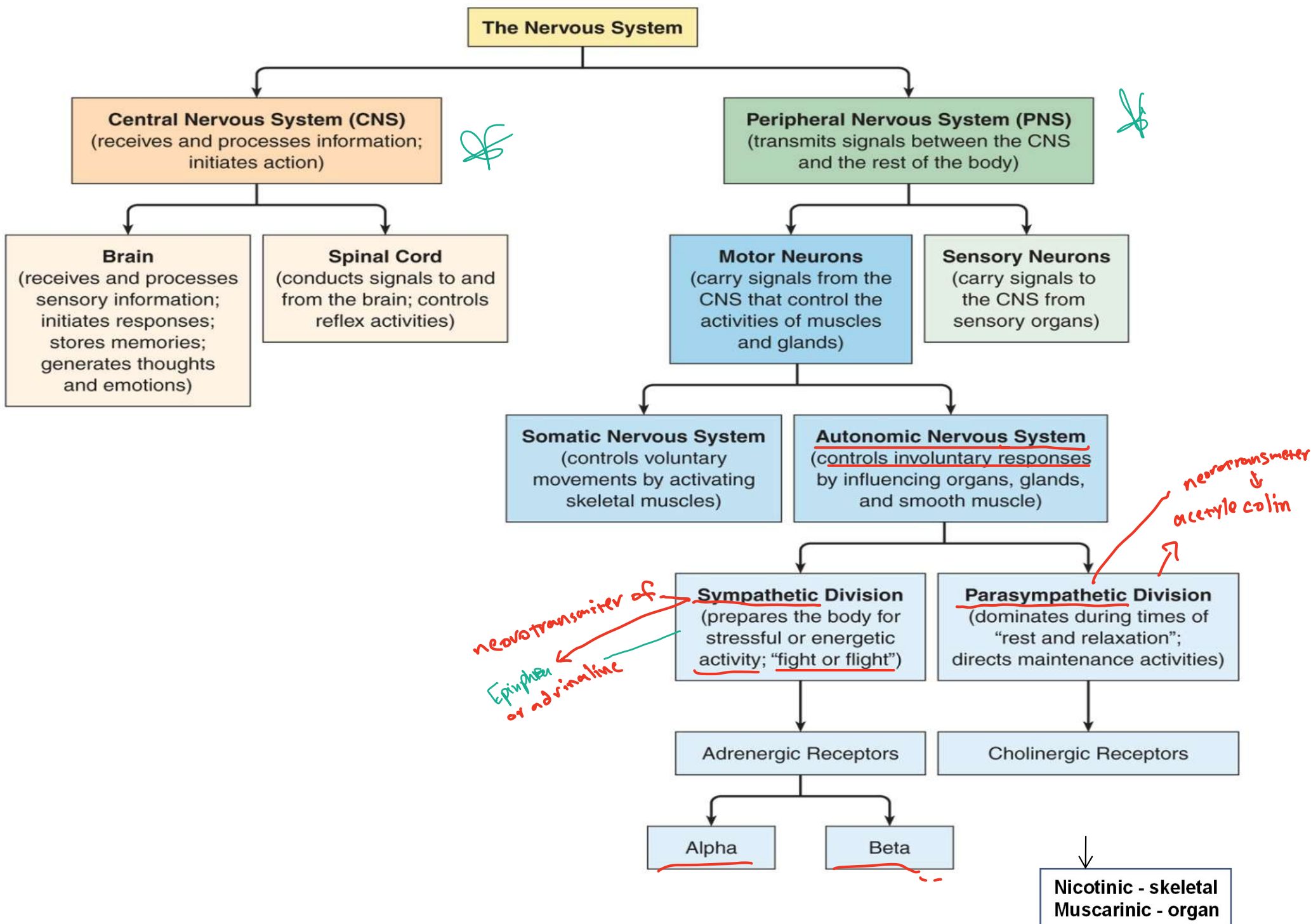
Learning outcomes

By the end of this lecture, students should be able to:

List types of adrenergic agonists

Describe pharmacologic effects of adrenergic agonists

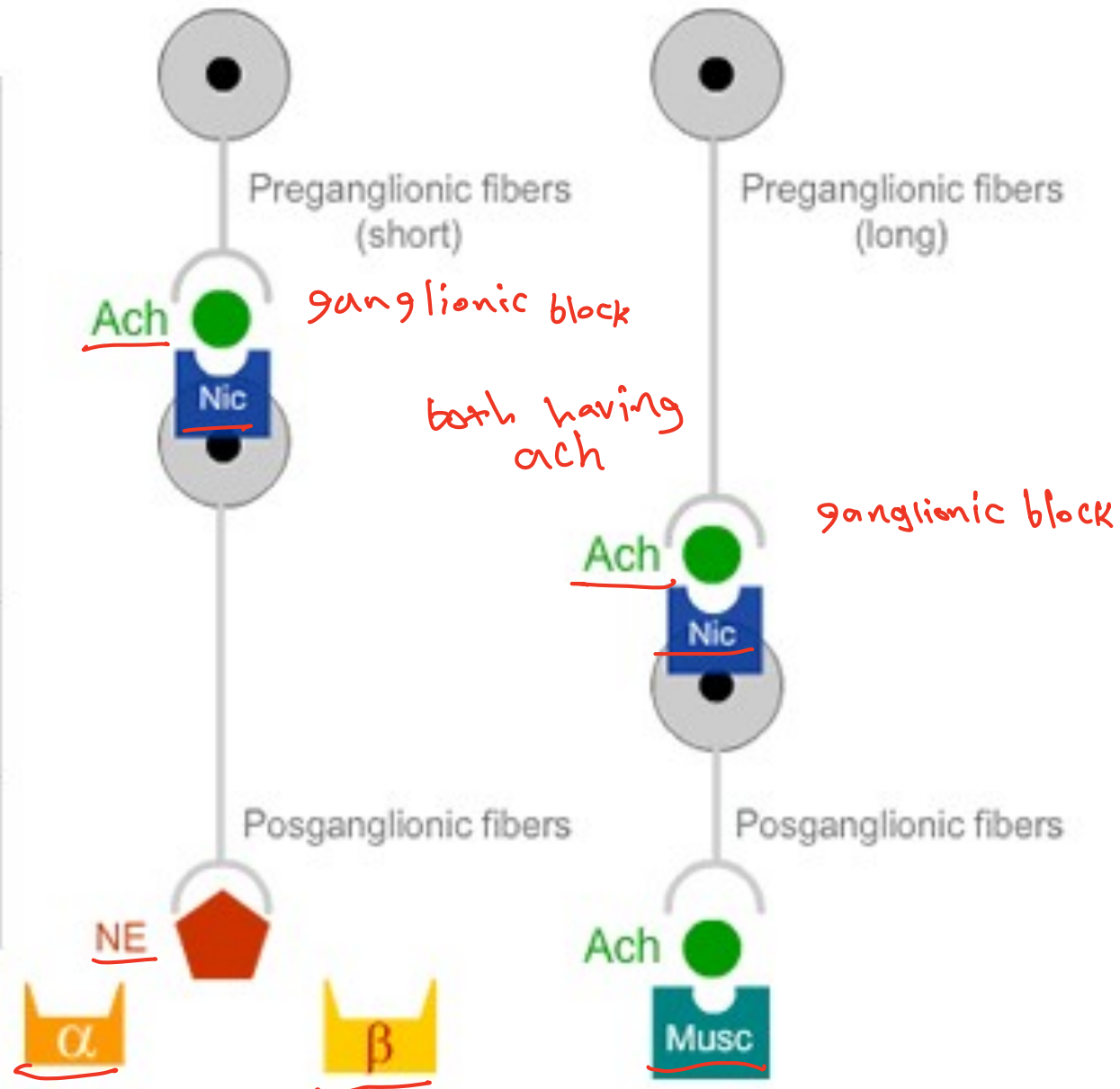
Recall therapeutic uses of adrenergic agonists.



Sympathetic


Parasympathetic

Ach ● <u>Acetylcholine</u>
Nic Nicotinic receptor
Musc Muscarinic receptor
NE ● Norepinephrine
α β Adrenergic receptors



Autonomic Nervous System

- Autonomic or visceral division – not
controlled by conscious

 ~~Ex~~ – Controls :

- Blood pressure
- Heart rate
- Gastrointestinal activity
- Glandular secretions

SUBDIVISIONS OF THE AUTONOMIC NERVOUS SYSTEM

- **Sympathetic nervous system**
 - Fight or Flight
 - Useful in highly stressful or emergency situations
- **Parasympathetic nervous system**
 - Maintains homeostasis
 - Works in “opposition” of the Sympathetic nervous system
 - “Rest and Digest”

similar “SYNONYMOUS” TERMS

- SYMPATHETIC
 - *other name* ADRENERGIC
 - SYMPATHOMIMETIC
 - MIMICS THE SYMPATHETIC SYSTEM
- PARASYMPATHETIC
 - CHOLINERGIC
 - PARASYMPATHOMIMETIC
 - MIMICS THE PARASYMPATHETIC NERVOUS SYSTEM

Adrenergic/Sympathetic

NEUROTRANSMITTERS (neurohormones)

CATECHOLAMINES

- 1 – Epinephrine (**prototype**) – secreted by Adrenal gland, direct response at nerve ending *use to patient*
- 2 – Norepinephrine – secreted by Adrenal gland. Stored in the axon, direct response at the nerve ending *not use for patient*

RECEPTORS

ALPHA 1

ALPHA 2

BETA 1

BETA 2

3- DOPAMINE RECEPTORS

- The endogenous catecholamine dopamine produces a variety of biologic effects that are mediated by interactions with specific dopamine receptors.
- These are particularly important in the brain.
- Pharmacologically distinct dopamine receptor subtypes, termed D₁ and D₂,

Control Parkinson

less dopamine Parkinson
more dopamine schizophrenia

Uptake and Enzymatic degradation

- Feed back control via alpha 2 receptors.
- ^{help to go out of the body by} Enzymatic degradation: ¹⁻ Monoamine oxidase (MAO) and ²⁻ catechol-o-methyl transferase.

Summary of Drugs

<i>stimulate</i> <u>Alpha 1 agonist</u>	<i>stimulate</i> <u>Alpha 2 agonist</u>	<i>stimulate</i> <u>Beta 1 agonist</u>	<i>stimulate</i> <u>Beta 2 Agonists</u>
<i>drug</i> <u>Phenylephrine</u> <u>Increases BP</u>	<u>Clonidine</u> <u>Reduces BP</u>	<u>Dobutamine</u> <i>heart</i> <u>Increases BP and HR</u>	<u>Salbutamol</u> <u>Bronchial Relaxation</u> <i>lung</i>

alpha 2 is for feedback

<i>block</i> <u>Alpha 1 Blocker</u>	<i>block</i> <u>Alpha 2 Blocker</u>	<i>block</i> <u>Beta Blockers (1 and 2)</u>	
		Selective to B1	Block both B1 and B2
<i>drug</i> <u>Prazosin</u> <u>Reduces BP</u>	<u>Yohimbine</u> <u>Increases BP</u>	<u>Atenolol</u> <u>Reduces BP</u>	<u>Propranolol</u> <u>Reduces BP</u>

Adrenergic Drugs

- Pharmacology
 - Central Nervous System (CNS)
 - These drugs produce CNS excitation or alertness.
 - Higher doses produce anxiety, apprehension, restlessness, and tremors.
 - Cardiovascular System
 - These drugs increase the force and rate of contraction of the heart.
 - Blood pressure is also increased.
 - Total peripheral resistance is also increased.

Adrenergic Drugs

- Pharmacology

- Eye

- These drugs lower intraocular pressure and can cause mydriasis.

- Respiratory System

- These drugs cause a relaxation of bronchiole smooth muscles.

- Metabolic Effects

- Increased Glycogenolysis from β -receptor stimulation causes hyperglycemia. *in diabetic*

- Salivary Glands

- These drugs produce vasoconstriction of the salivary glands which leads to decreased salivary flow. *dryness*

Adrenergic Drugs

- Uses

- ↳ Vasoconstriction

- These drugs are used in dentistry because of their vasoconstrictive actions on blood vessels. They are ^①added to local anesthetics because they prolong the action of the local anesthetic, ^②reduce the risk for systemic toxicity, and ^③help to create a dry field.

- ↳ Cardiac Effects

- These drugs are used to raise blood pressure and to treat cardiac arrest.

- Epinephrine is often used in combination ^{with} local anesthetic agents to prolong the duration of anesthetic action.
- This would include articaine, lidocaine. This combination is used because epinephrine can induce vasoconstriction thus limiting the diffusion of the local anesthetic from the site of injection.
local anesthetics drugs end with caine
- This not only prolongs the actions of the local anesthetic but also ^{also} to reduce the toxicity of the local anesthetic by limiting its systemic absorption. Lidocaine in toxic doses can produce cardiac arrhythmias and convulsions.

Adrenergic Drugs

- Uses
 - Bronchodilation: These drugs are used to treat asthma and allergic reaction.
- Adverse Reactions
 - The adverse reactions associated with these drugs are an extension of the drugs' pharmacologic effects.
 - They include: *increase*
 - Anxiety, Tremors, Tachycardia, Increased blood pressure, Arrhythmias.

Few examples of adrenergic agents

I. Pressor agents *↑ increase BP*

- **Noradrenaline**
(Norepinephrine) 2-4 µg/min IV infusion

II. Cardiac stimulants

- **Adrenaline** (Epinephrine)

III. Bronchodilators

- **Adrenaline**
- **Salbutamol**

IV. Nasal decongestants

- **Ephedrine** nasal drops

V. CNS stimulants

- **Ephedrine**
- **Dexamphetamine**

VI. Uterine relaxants and vasodilators

- **Orciprenaline**
- **Terbutaline**

VII. Anorectics *Stop desire of food*

- **Sibutramine**

Antiadrenergic Drugs

Pharmacology

- These drugs reduce sympathetic tone in the blood vessels and decrease total peripheral resistance.
- This results in a reduction in blood pressure.

Uses

- These drugs are used to treat hypertension, peripheral vascular disease and benign prostatic hypertrophy.

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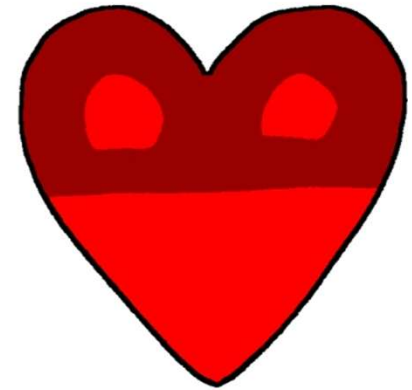
ALPHA 2 Adrenergic Drugs

- CLONIDINE
 - Decrease blood pressure
 - Management of Opioid withdrawal
- METHYLDOPA
 - Decrease blood pressure

BETA BLOCKER ACTIONS

β_1

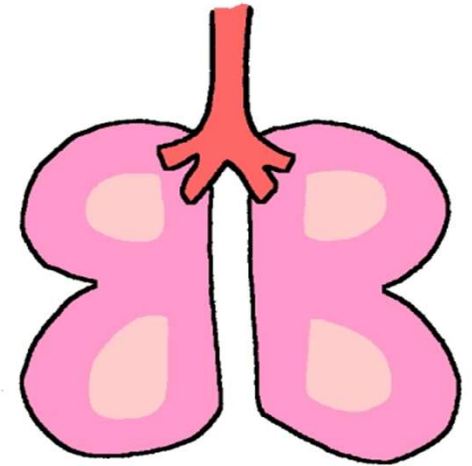
Blockers Affect
(**1** = Heart)



The Heart

β_2

Blockers Affect
(**2** = Lungs)



The Lungs

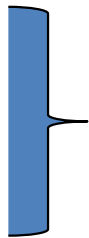
CIMILLER

Adrenergic (beta-1 and 2) blocking drugs

- Beta-adrenergic blocking drugs

- Propranolol

- Nadolol



NON- SELECTIVE
WORKS ON BOTH
B1 AND B2

- Atenolol

- Metoprolol

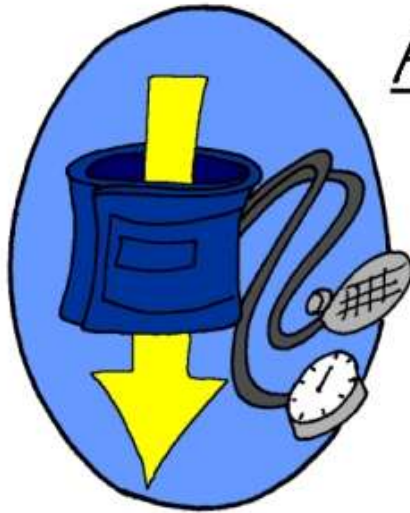


SELECTIVE BLOCKERS

ADRENERGIC BLOCKING DRUGS

- Adverse reactions
 - Drowsiness, fatigue
 - Bradycardia
 - Hypotension
 - Orthostatic hypotension
 - Diarrhea

SIDE EFFECTS OF ADRENERGIC ANTAGONISTS β - BETA BLOCKERS



Hypotension



Symptoms of
CHF

Examples:

Propanolol
(Inderal)

Atenolol
(Tenormin)

Metoprolol
(Lopressor)



Bradycardia
(AV-Block)



Drowsiness,
Depression

References

- Bart –Jhonson, Frank J. Dowd. ***Pharmacology and Therapeutic for Dentistry***, 6th edition, 2011. Elsevier Publishers,USA
- Karen Whalen, Richard Finkel, Thomas A Panavelil. Lippincott Illustrated Reviews Pharmacology. 6th ed. 2015. Philadelphia Wolter Kluwer Puplisher.