

SPECIAL PHARMACOLOGY

I. NEUROTROPIC DRUGS

1. DRUGS ACTING ON THE PERIPHERAL NERVOUS SYSTEM

1.1. DRUGS ACTING ON ADRENERGIC TRANSMISSION

•ADRENERGIC AND DOPAMINERGIC AGONISTS.

A. Actuality. The sympathetic nervous system is involved in regulating the function of internal organs and metabolic processes. Drugs that act on the sympathetic system exhibit various pharmacodynamic actions and have a broad pharmaco-therapeutic use.

B. The aim of the training is to familiarize students with the pharmacological properties of adrenomimetics and dopaminemimetics.

C. Learning objectives:

1) The student must **know**: the general characteristic of adrenomimetics, dopaminomimetics, classification, mechanisms of action, pharmacological effects, indications, contraindications, adverse reactions and the clinical picture of acute and chronic poisoning with some drugs of these groups and their treatment.

2)The student must **be able to**: prescribe the compulsory drugs from the respective groups in various medicinal forms and indicate them according to the disease and pathological conditions.

D. Knowledge from previous and related disciplines necessary for interdisciplinary integration.

Biochemistry. Neurotransmitters of adrenergic and dopaminergic synapses (noradrenaline, dopamine). Structure, biosynthesis and inactivation of mediators, actions on lipid, carbohydrate and protein metabolism.

Histology. The sympathetic autonomic nervous system, morpho-functional features. The structure of the adrenergic synapse.

Physiology. Adrenergic synapse. Types and subtypes of adrenergic receptors. Their location. The effects of activation of adrenergic receptors of tissues innervated and non-innervated by the autonomic nervous system.

Pathophysiology. Deregulation of the excitability and conductivity of neurons. Disruptions of synaptic conductivity. Pathology of the vegetative nervous system.

E. Self-training questions:

1. Adrenergic transmission. Catecholamine synthesis, action, and degradation.
2. Types, distribution and functions of adrenergic receptors.
3. Classification of adrenergic drugs(sympathomimetics): according to the mechanism of action, the chemical structure, the type of predominant action.
4. Classification of direct-acting adrenoceptor agonists (α -adrenomimetics). Mechanism of action, pharmacological effects, indications and contraindications. Adverse reactions.
5. Classification of indirect-acting sympathomimetic agents. Mechanism of action, pharmacological effects, indications and contraindications. Adverse reactions.
6. Mixed acting sympathomimetic agents. Mechanism of action, pharmacological effects, indications and contraindications. Adverse reactions.
5. Classification of β -adrenomimetics. Mechanism of action, pharmacological effects, indications and contraindications. Adverse reactions.
6. α,β -adrenomimetics. Mechanism of action, pharmacological effects, indications and contraindications. Adverse reactions.
7. Classification of drugs with influence on the dopaminergic system. Mechanism of action, pharmacological effects, indications and contraindications. Adverse reactions.

F. The student's individual work. The student's individual work (points 1, 2, 3, 4 are done in written form during the preparation process)

1) Medical prescription exercises

To prescribe the following drugs in all medicinal forms:

1. Norepinephrine hydrotartrate. 2. Epinephrine hydrochloride. 3. Isoprenaline. 4. Salbutamol. 5. Dopamine. 6. Dobutamine. 7. Phenylephrine. 8. Ephedrine hydrochloride. 9. Naphazoline.

<i>Nr.</i>	<i>Name of drug</i>	<i>Form of delivery, dose</i>
1	Norepinephrine hydrotartrate	Sol. in amp. – 0,2%- 1ml (intravenous)
2	Epinephrine hydrochloride	Sol. in ampoules amp. - 0,1% -1 ml Sol. in phials - 0,1%-10ml; 0,18%-10 ml; Sol. amp. (hidrotartrat)-0,18%- 1 ml (intravenous)
3	Isoprenaline	Tablets 0,005 Sol. in phials 0,5%; 1% -25 ml; 100ml (for inhalation)
4	Salbutamol	Aerosol 10ml Sol in amp. -0,1%- 2,5 ml (for inhalation) Sol in phials -0,1%- 2,5; 5; 10; 50 ml; Tab. 0,002; 0,004; 0,006 ; 0,007; 0,008 Syrup - 0,04%- 50ml Sol. in amp. - 0,1%- 5 ml (intravenous)
5	Dopamine	Sol. in amp – 0,5%; 1%- 2ml (intravenous) Sol. in phials - 2% - 10ml; 4%- 5ml (intravenous)
6	Dobutamine	Sol. in amp – 0,5%- 50ml; 1,25% -20ml; (intravenous) Powder for injection in phials – 0,25; 0,53; (intravenous)
7	Phenylephrine	Sol. in amp. – 1% -1ml; (intravenous)
8	Ephedrine hydrochloride	Tablets 0,002; 0,003; 0,01; 0,025; Sol. in amp - 5% -1 ml; (i/m; i/v; s/c) Nasal drops - 2%; 3%- 10ml; Aerosol – 10ml
9	Naphazoline	Sol. in amp – 0,05%; 0,1%- 1,5 ml; (nasal drops) Sol. in phials -0,05%; 0,1%- 5; 10 ml; (nasal drops)

2) List the groups and drugs used in (for): acute hypotension, anaphylactic shock, bronchial asthma attack, acute heart failure, rhinitis, conjunctivitis, cardiogenic shock, bronchial asthma, hypoglycemic coma, prolongation of action of local anesthetics, imminent abortion.

3) Tables (recapitulation of knowledge)

Table 1 Indicate receptor affinity for epinephrine and norepinephrine

Receptor type	Epinephrine	Norepinephrine
Alpha 1		
Alpha 2		
Beta 1		
Beta 2		

Table 2 Comparative characteristic of ephedrine and epinephrine

Parameters	Ephedrine	Epinephrine
Stability in per os administration (+/-)		
Duration of action (min., hours)		
Location of action (presynaptic / postsynaptic)		
Influence on CNS		
Influence on blood pressure after denervation		
Tachyphylaxis (+/-)		
Drug addiction (+/-)		

Table 3 Indications of adrenomimetic drugs

Indications	Phenylephrine	Nafazoline	Isoprenaline	Dopamine	Fenoterol	Epinephrine	Norepinephrine	Efedrine
Heart attack								
Cardiogenic shock								
Acute heart failure								
AV block								
Anaphylactic shock								
Bronchial asthma								
Conjunctivitis								
Rhinitis								
Hypoglycemic coma								
Prolongation of action of local anesthetics								
Acute hypotension								
Imminent abortion								
Bronchial asthma attack								

Note! The presence of the indication is marked with the "+"

4) Situational problems:

A 45-year-old man has recently been the recipient of a heart transplant. Which one of the following drugs is least likely to cause tachycardia in this patient?

A. Amphetamine; B. Dobutamine; C. Epinephrine; D. Isoproterenol; E. Norepinephrine

Give the characteristics of drug and argue the selection.

5) Tests for self-training: (Guidelines for Laboratory Work in Pharmacology).

G. Interactive activity

1. Experimental and virtual didactic movie (elaboration of protocol, conclusions).
2. Clinical cases. (Guide for laboratory work in pharmacology, Pharmacology book)
3. Virtual situations (Guide for laboratory work in pharmacology)