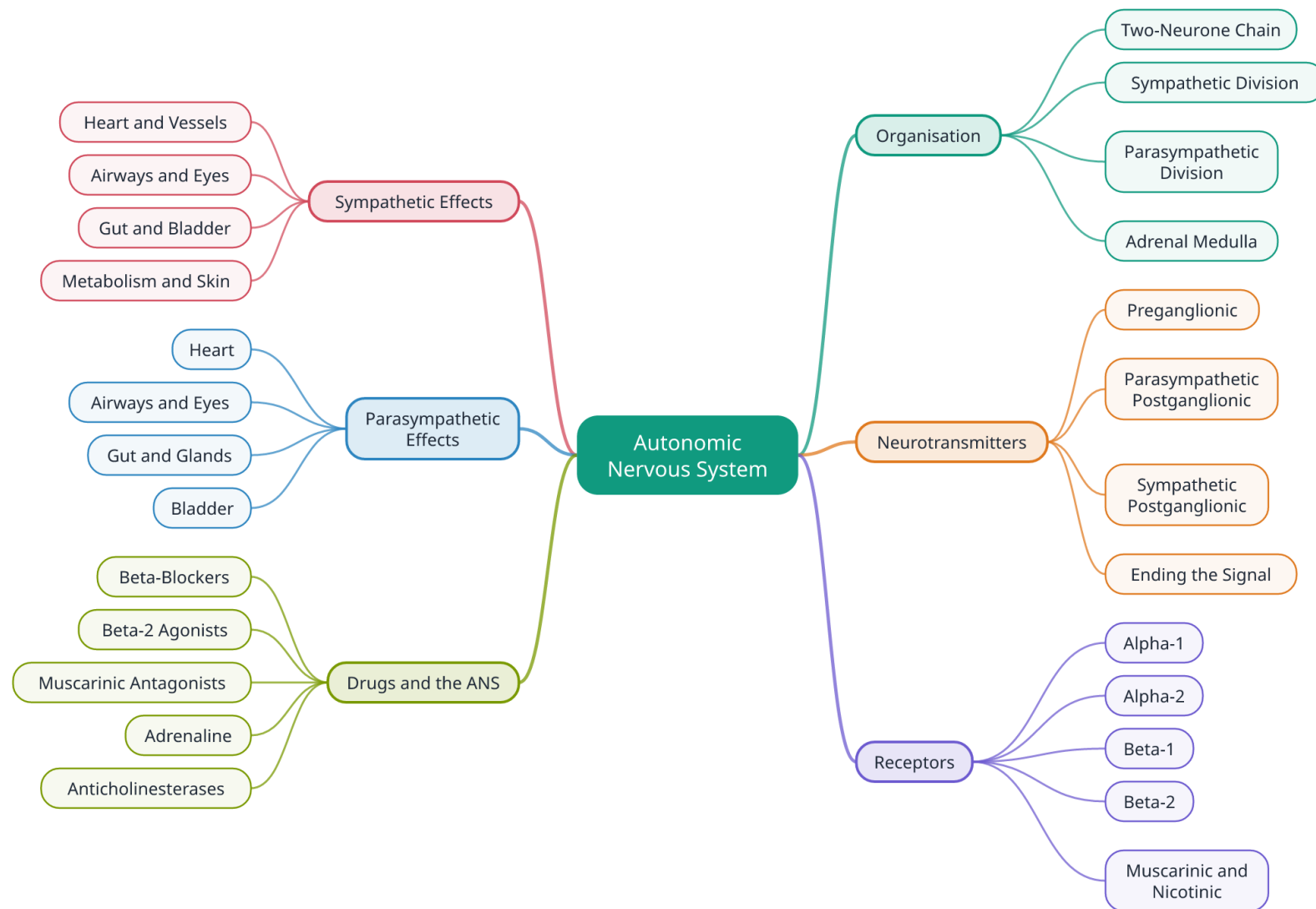


Autonomic Nervous System Mind Map

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Autonomic Nervous System mind map explained

Organisation

The involuntary part of the peripheral nervous system. It controls smooth muscle, cardiac muscle and glands.

Two-Neurone Chain

A preganglionic neurone runs from the central nervous system to a ganglion, where it synapses with a postganglionic neurone that runs to the target organ.

Sympathetic Division

Thoracolumbar outflow (spinal segments T1 to L2). Short preganglionic fibres to the sympathetic chain near the spine, then long postganglionic fibres.

Parasympathetic Division

Craniosacral outflow: cranial nerves III, VII, IX and X (the vagus) and sacral segments S2 to S4. Long preganglionic fibres to ganglia in or near the target organ, then short postganglionic fibres.

Adrenal Medulla

Works like a sympathetic ganglion: preganglionic fibres stimulate it to release adrenaline, and some noradrenaline, straight into the blood.

Neurotransmitters

Which chemical is released depends on the division and the neurone.

Preganglionic

All preganglionic neurones, in both divisions, release acetylcholine onto nicotinic receptors.

Parasympathetic Postganglionic

Release acetylcholine onto muscarinic receptors on the target organ.

Sympathetic Postganglionic

Mostly release noradrenaline onto adrenergic receptors. The main exception is sweat glands, where they release acetylcholine onto muscarinic receptors.

Ending the Signal

Acetylcholinesterase breaks down acetylcholine. Noradrenaline is mainly taken back up into the nerve ending.

Receptors

Knowing the receptor tells you the effect, and which drugs will act there.

Alpha-1

Smooth muscle contraction: constricts blood vessels and dilates the pupil.

Alpha-2

On nerve endings, where it reduces further noradrenaline release (negative feedback).

Beta-1

Mainly in the heart: increases heart rate and force of contraction. Also triggers renin release from the kidney.

Beta-2

Relaxes smooth muscle: dilates the airways and blood vessels in skeletal muscle.

Muscarinic and Nicotinic

Cholinergic receptors. Nicotinic receptors are at the ganglia; muscarinic receptors are on target organs, for example M2 in the heart (slows it) and M3 in smooth muscle and glands.

Sympathetic Effects

Fight or flight: preparing the body for action.

Heart and Vessels

Heart rate and force of contraction rise. Vessels to the skin and gut constrict, while those to skeletal muscle dilate.

Airways and Eyes

The airways dilate (bronchodilation) and the pupils dilate (mydriasis).

Gut and Bladder

Gut movement and secretions slow. The bladder wall relaxes and its sphincter contracts, holding urine in.

Metabolism and Skin

The liver releases glucose and fat is broken down for energy. Sweating increases.

Parasympathetic Effects

Rest and digest: conserving energy and supporting digestion.

Heart

The vagus nerve slows the heart rate.

Airways and Eyes

The airways narrow (bronchoconstriction) and the pupils constrict (miosis).

Gut and Glands

Gut movement and digestive secretions increase, and salivation increases.

Bladder

The bladder wall contracts and the sphincter relaxes, emptying the bladder.

Drugs and the ANS

Examples for learning receptor pharmacology, not clinical guidance.

Beta-Blockers

Block beta-1 receptors in the heart, slowing it and lowering blood pressure, for example atenolol.

Beta-2 Agonists

Stimulate beta-2 receptors in the airways, causing bronchodilation, for example salbutamol in asthma.

Muscarinic Antagonists

Block muscarinic receptors, for example atropine, which speeds up a slow heart and dilates the pupils.

Adrenaline

Acts on alpha and beta receptors. Used in anaphylaxis to constrict blood vessels and open the airways.

Anticholinesterases

Stop acetylcholinesterase breaking down acetylcholine, so more acts at the receptors, for example neostigmine.

How to revise with this mind map

1. Learn the wiring first. Draw both divisions side by side: where the outflow leaves the spinal cord, where the ganglia sit, and how long the preganglionic and postganglionic fibres are.
2. Then learn the chemistry: which neurotransmitter each neurone releases and which receptor it acts on. Most exam questions build on this.
3. Make an organ-by-organ table with a sympathetic column and a parasympathetic column: heart, airways, pupils, gut, bladder and glands.
4. Link drugs to receptors. For each drug, say which receptor it acts on, whether it activates or blocks it, and so

what effect it has. Predicting a drug's effects from its receptor is a classic exam question.

5. Make it yours. Build your own autonomic nervous system map in Mindmapi from your lecture notes, and ask the AI about any branch you are unsure of. The answer is saved into that branch's notes for next time.