9.5 Autonomic nervous system

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS sympathetic nervous system
• parasympathetic nervous system

Objective

Predict organ responses from outflow anatomy and the receptor code.

1 Key knowledge and worked examples

■ The two limbs

Sympathetic: T1–L2, paravertebral chain, adrenal medulla ~80 % adrenaline / 20 % noradrenaline ✓. Parasympathetic: craniosacral (CN III, VII, IX, X + S2–S4), wall ganglia ✓.

■ Worked example: the code

Preganglionic ACh/nicotinic ALWAYS. $\alpha 1$ constricts vessels; $\beta 1$ drives heart; $\beta 2$ dilates bronchi; M3 secretes and slows ✓. Horner triad = sympathetic lesion; fixed dilated pupil = III nerve.

2 Practice

2.1 Name the outflow levels of each limb. [3]

2.2 Which receptor mediates bronchodilation? [3]

2.3 Give the Horner triad and the system it implicates. [3]

3 Exam-style questions

3.1 A fictional pure $\beta 2$ agonist is given as a teaching example.

Predict four organ responses (bronchi dilate; skeletal-muscle vessels dilate; heart unchanged, $\beta 1$ untouched; gut motility falls), each read off the receptor table. State one exception where sympathetic postganglionic fibres are cholinergic (sweat glands). [8]

3.2 A fictional patient has a right Horner syndrome.

Interpret the triad (ptosis, miosis, anhidrosis) as a sympathetic PATHWAY lesion anywhere from hypothalamus to eye. Contrast the opposite pupil sign (fixed dilation = parasympathetic III). State the adrenal medulla's secretory ratio and why it is a modified ganglion. [7]

Solutions

2.1

- Sympathetic T1–L2 (thoracolumbar); parasympathetic craniosacral III, VII, IX, X + S2–S4 ✓.

2.2

- $\beta 2$ ✓.

2.3

- Ptosis, miosis, anhidrosis – sympathetic ✓.

3.1

- Bronchi dilate ($\beta 2$ on airway smooth muscle) ✓.
- Skeletal-muscle vessels dilate; heart unchanged ($\beta 1$ not engaged) ✓.
- Gut motility falls ($\beta 2$ and sympathetic dominance) ✓.
- Exception: sweat glands are sympathetic but cholinergic ✓.

3.2

- Triad = sympathetic pathway lesion, side right ✓.
- Fixed dilated pupil instead = parasympathetic III (or its compression) ✓.
- Adrenal medulla: ~80 % adrenaline / 20 % noradrenaline – a ganglion modified to secrete into blood ✓.

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