PIPADOR REVISION

MRCOG Part 1 Revision Notes

Adrenal Medulla

ENDOCRINOLOGY • LECTURE 177

VISUAL EXAMINATION REVISION NOTES

2026 Edition

177

MRCOG PART 1 REVISION NOTES | ENDOCRINOLOGY

Adrenal Medulla

Adrenaline, noradrenaline and dopamine — synthesis, receptors, stress response and phaeochromocytoma

≈ 80%	PNMT	Metanephrines	α then β
Medullary output as adrenaline	Cortisol-dependent (NA → adrenaline)	Test for phaeochromocytoma	Block order in phaeochromocytoma

■ KEY FACTS: Learning objectives

- Describe the medulla as a modified sympathetic ganglion and catecholamine synthesis and metabolism.
- Describe adrenergic and dopaminergic receptors and their actions, including in the uterus and pregnancy.
- Describe the stress (fight-or-flight) response.
- Describe phaeochromocytoma in pregnancy and relevant obstetric pharmacology.

177.1 The adrenal medulla

Neural-crest derived **chromaffin cells** = modified **postganglionic sympathetic neurons**, innervated by **preganglionic cholinergic** fibres (splanchnic nerves, nicotinic receptors). Catecholamines are released directly into the blood. Cortisol from the surrounding cortex (portal blood flow) induces **PNMT**, so the medulla makes mainly **adrenaline**; sympathetic nerves release **noradrenaline**.

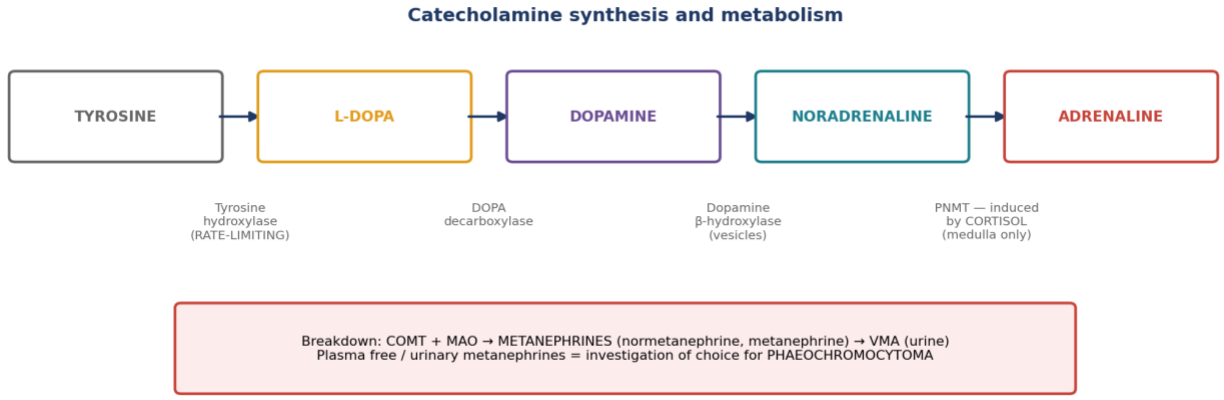
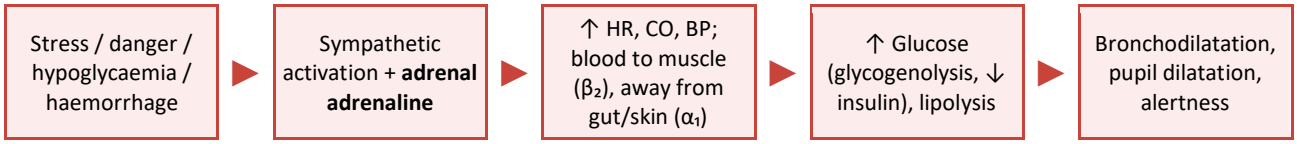


Figure 177.1 — Catecholamine synthesis and metabolism

177.2 Receptors and actions

Receptor	G protein	Main locations / actions	Obstetric relevance
α_1	Gq	Vascular smooth muscle constriction; sphincters; pupil dilatation	Phenylephrine for spinal hypotension; ergometrine partly α
α_2	Gi	Presynaptic ↓ NA release; central ↓ sympathetic outflow; platelets	Methyldopa, clonidine (antihypertensives)
β_1	Gs	Heart ↑ rate, contractility, conduction; renin release	β-blockers (labetalol — α + β) for hypertension; fetal bradycardia/FGR with atenolol
β_2	Gs	Bronchodilatation; vasodilatation (muscle); myometrial relaxation; glycogenolysis; K^+ into cells	Terbutaline/salbutamol tocolysis (tachycardia, hypokalaemia, hyperglycaemia, pulmonary oedema); asthma
β_3	Gs	Lipolysis; detrusor relaxation	Mirabegron (OAB)

Receptor	G protein	Main locations / actions	Obstetric relevance
D_1 / D_2	Gs / Gi	Renal vasodilatation; D_2 inhibits prolactin, emesis (chemoreceptor trigger zone)	Metoclopramide/domperidone (↑ prolactin); cabergoline (↓ prolactin)



■ CLINICAL CORRELATION

- **Labour**: pain/anxiety → catecholamines → may ↓ uterine blood flow (α-vasoconstriction) and slow labour (β_2 relaxation); **epidural analgesia** reduces maternal catecholamines.
- **Fetal catecholamine surge** at birth (hypoxia, cord compression): lung fluid clearance (Na^+ absorption), surfactant release, glucose mobilisation, thermogenesis (brown fat) — elective CS babies have lower levels (↑ TTN).
- **Adrenaline** in anaphylaxis: 0.5 mg IM (1:1000). Local anaesthetic with adrenaline prolongs block and reduces toxicity (vasoconstriction).

177.3 Phaeochromocytoma in pregnancy

Feature	Key points
Presentation	Paroxysmal hypertension, headache, palpitations, sweating, anxiety; may mimic pre-eclampsia (but no proteinuria early; hypertension before 20 weeks, postural hypotension); crises triggered by supine position, uterine contractions, labour, anaesthesia, drugs (metoclopramide, glucocorticoids)
Diagnosis	Plasma free or 24-h urinary metanephrines; MRI (avoid MIBG in pregnancy); associated syndromes: MEN2, VHL, NF1, SDH
Management	α-blockade first (phenoxybenzamine or doxazosin) → then β-blockade (unopposed α-stimulation if β first → hypertensive crisis); fluid/salt loading; surgery (laparoscopic adrenalectomy) in 2nd trimester or at/after CS
Outcome	High maternal and fetal mortality if undiagnosed; caesarean usually preferred over labour

177.4 Must-know summary

■ EXAM TIP

- Medulla = modified sympathetic ganglion (preganglionic ACh); **cortisol induces PNMT** → adrenaline.
- Tyrosine hydroxylase is rate-limiting; metabolism by **COMT/MAO → metanephrines, VMA**.
- β_2 relaxes myometrium (tocolysis); α_1 constricts vessels (phenylephrine); D_2 inhibits prolactin.
- Phaeochromocytoma: metanephrines; **α-blocker before β-blocker**; MRI not MIBG in pregnancy.

■ MNEMONIC / MEMORY AID

Catecholamine synthesis — 'Try Doing Dancing Nicely Always': Tyrosine → DOPA → Dopamine → Noradrenaline → Adrenaline. **Phaeo — 'α before β, A before B'**.