PIPADOR REVISION

MRCOG Part 1 Revision Notes

Peptide Hormones

BIOCHEMISTRY • LECTURE 231

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG PART 1 REVISION NOTES | BIOCHEMISTRY

231 Peptide Hormones

Synthesis and processing, vasopressin and oxytocin, insulin, POMC and other peptide hormones

9 aa	Prohormones	C-peptide	Minutes
ADH & oxytocin (differ at 2 positions)	Cleaved by convertases	Marker of endogenous insulin	Typical half-life

■ KEY FACTS: Learning objectives

- Describe the synthesis, processing, storage and secretion of peptide hormones.
- Describe the structure and actions of vasopressin and oxytocin and other key peptide hormones (insulin, POMC products, PTH, GnRH).
- Describe the properties (transport, half-life, receptors) of peptide hormones and their clinical applications.

231.1 Synthesis and secretion

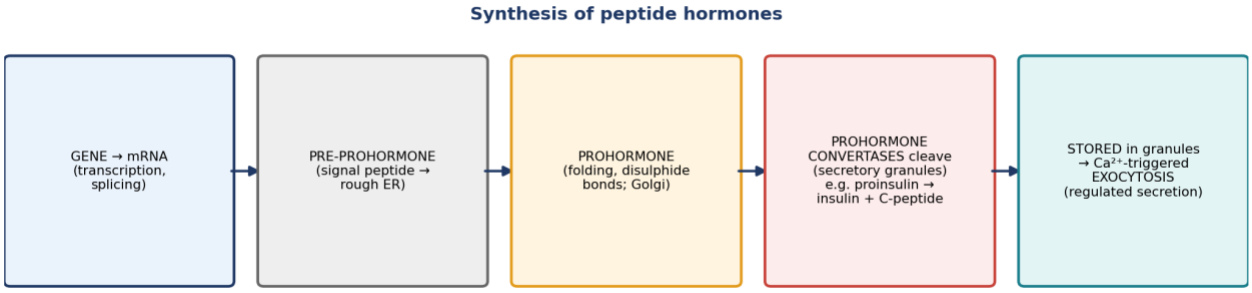


Figure 231.1 — From gene to secreted peptide hormone

- Peptide hormones are **water-soluble**, circulate **unbound**, have **short half-lives** (minutes) and act on **membrane receptors** (GPCRs, receptor tyrosine kinases, JAK–STAT).
- Stored in **secretory granules** for rapid **regulated release** (Ca^{2+}-dependent exocytosis); degraded by peptidases (kidney, liver, target tissue; placental **oxytocinase/vasopressinase**).
- **Orally ineffective** (digested) → injected, nasal or modified (desmopressin, octreotide, GnRH analogues).

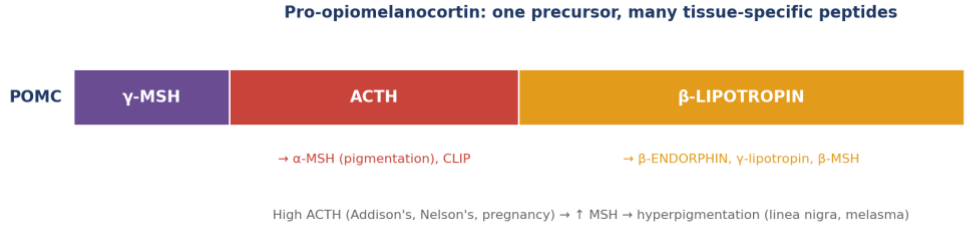


Figure 231.2 — POMC processing

231.2 Vasopressin and oxytocin

	Vasopressin (ADH)	Oxytocin
Structure	Nonapeptide with a 6-aa ring (Cys1–Cys6 disulphide); Arg^8 (arginine vasopressin)	Nonapeptide; differs at positions 3 (Ile) and 8 (Leu) — explains cross-reactivity

	Vasopressin (ADH)	Oxytocin
Synthesis	Supraoptic (mainly) and paraventricular nuclei, as prohormone with neurophysin II + copeptin	Paraventricular (mainly) nuclei with neurophysin I
Release	Posterior pituitary — ↑ plasma osmolality, ↓ volume/BP, nausea, pain	Posterior pituitary — suckling, cervical stretch (Ferguson), orgasm
Receptors	V_1 (Gq) vasoconstriction; V_2 (Gs) aquaporin-2; V_3 ACTH	OT receptor (Gq) — myometrium (↑ ≈ 100-fold at term), myoepithelium
Clinical	DI (desmopressin — V_2 selective, resistant to vasopressinase); SIADH; copeptin as stable surrogate	Syntocinon (IOL, PPH; water intoxication via V_2 cross-reactivity), carbetocin (long-acting), atosiban (antagonist)

231.3 Other important peptide hormones

Hormone	Structure / processing	Notes
Insulin	Preproinsulin → proinsulin → insulin (A 21 aa + B 30 aa, 2 disulphides) + C-peptide	C-peptide ↑ in insulinoma, ↓ in factitious insulin/type 1; analogues (lispro, glargine)
GnRH	Decapeptide (pyroGlu…Gly-NH_2)	Pulsatile; analogues substituted at position 6/10 → agonists (goserelin) or antagonists (cetrorelix)
TRH	Tripeptide (pyroGlu-His-Pro-NH_2)	↑ TSH and prolactin
PTH / PTHrP	84 aa / ≈ 141 aa (shared N-terminus → same receptor)	PTHrP in placenta, lactating breast, malignancy
Relaxin	Insulin-like A + B chains	CL hormone of pregnancy (Lecture 174)
Somatostatin	14/28 aa cyclic	Octreotide analogue
Glucagon, GLP-1	Both from proglucagon (tissue-specific processing)	GLP-1 agonists — stop before pregnancy
Calcitonin, ANP/BNP	32 aa / 28 aa	NT-proBNP — heart failure, peripartum cardiomyopathy

231.4 Must-know summary

■ EXAM TIP

- Pre-prohormone → prohormone → hormone (prohormone convertases); granule storage; Ca^{2+}-triggered exocytosis.
- Water-soluble, unbound, short half-life, membrane receptors; not orally active.
- **ADH vs oxytocin**: 9 aa, differ at positions 3 and 8 → cross-reactivity (oxytocin → hyponatraemia).
- POMC → ACTH, MSH, β-endorphin; proinsulin → insulin + C-peptide; proglucagon → glucagon, GLP-1.

■ MNEMONIC / MEMORY AID

'Oxytocin and ADH are nonapeptide twins — Supraoptic Saves water (ADH), Paraventricular Pushes (oxytocin)'.