PIPADOR REVISION

MRCOG Part 1 Revision Notes

Parturition

PHYSIOLOGY • LECTURE 147

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG PART 1 REVISION NOTES | PHYSIOLOGY

147 Parturition

Uterine quiescence, initiation of labour, myometrial contraction, cervical ripening, stages and mechanism of labour

37+0 – 41+6	4 cm	3–4 / 10 min	> 5 / 10 min
Term (weeks)	Start of established first stage (NICE)	Contractions in established labour	Tachysystole

■ KEY FACTS: Learning objectives

- Describe the endocrine and paracrine mechanisms that initiate human labour.
- Describe myometrial excitation–contraction coupling, the pharmacology of uterotonics and tocolytics, and cervical ripening.
- Describe the stages and mechanism of labour.
- Relate parturition physiology to preterm, post-term and induced labour.

147.1 Uterine quiescence (pregnancy)

Throughout pregnancy the myometrium is kept quiet by **progesterone** (↓ oxytocin and PG receptors, ↓ connexin-43, anti-inflammatory), **relaxin, NO, PGI_2, CRH acting via cAMP**, and ↑ β_2-adrenergic tone. The cervix stays firm and closed (dense cross-linked collagen).

147.2 Initiation of labour

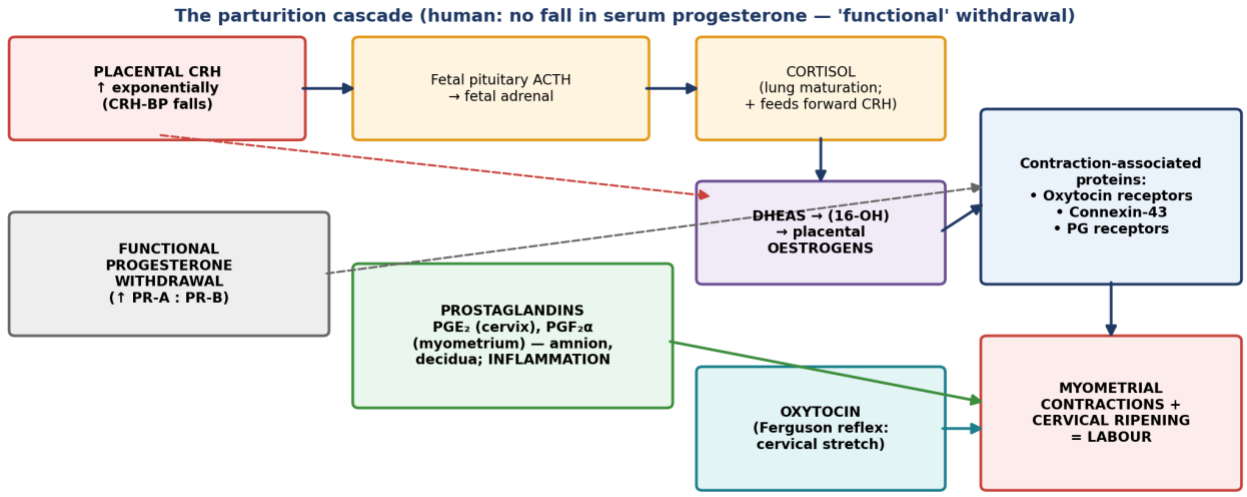


Figure 147.1 — The parturition cascade

Mechanism	Detail
Placental CRH 'clock'	CRH rises exponentially; CRH-binding protein falls near term → free CRH ↑. Stimulates fetal ACTH and cortisol (which positively feeds back on placental CRH — unlike the hypothalamus)
Fetal HPA axis	Fetal cortisol: lung maturation (surfactant), ↑ PG synthesis; fetal adrenal DHEAS → placental oestrogens (oestriol via 16-OH-DHEAS) — placenta lacks 17α-hydroxylase so depends on fetal precursors
Functional progesterone withdrawal	No fall in serum progesterone in humans (unlike sheep/rodents). Mechanisms: ↑ PR-A : PR-B ratio, ↓ co-activators, ↑ local 20α-HSD metabolism, NF-κB inflammation antagonising PR. Mifepristone induces labour

Mechanism	Detail
Oestrogen activation	↑ Contraction-associated proteins: oxytocin receptors, connexin-43 gap junctions (synchrony), PG receptors, ion channels
Prostaglandins	Amnion (PGE_2) and decidua ($PGF_2\alpha$); PGE_2 ripens cervix, $PGF_2\alpha$ contracts myometrium. PGDH in chorion falls at term
Oxytocin	Serum levels rise only modestly; myometrial oxytocin receptors ↑ ≈ 100-fold by term. Ferguson reflex: cervical/vaginal stretch → pulsatile oxytocin
Inflammation	Leucocyte infiltration of myometrium/cervix/membranes, IL-1β, IL-6, IL-8, TNF-α → PGs, MMPs; fetal surfactant protein A may be a signal

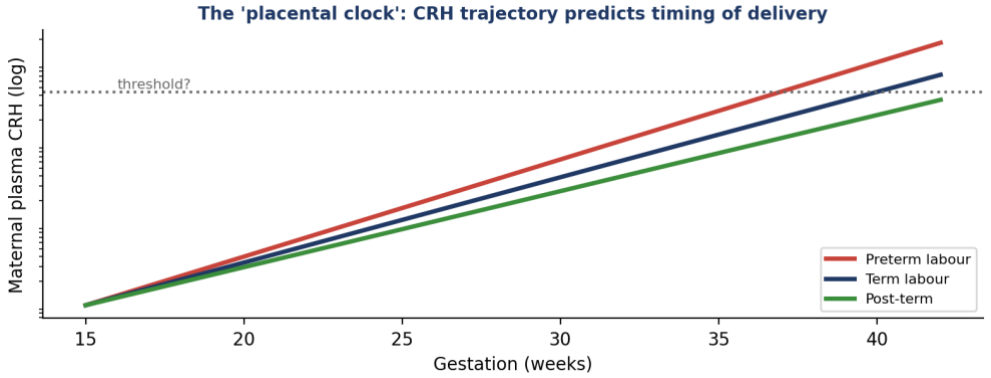


Figure 147.2 — The placental clock (schematic, after McLean et al.)

147.3 Myometrial contraction and pharmacology

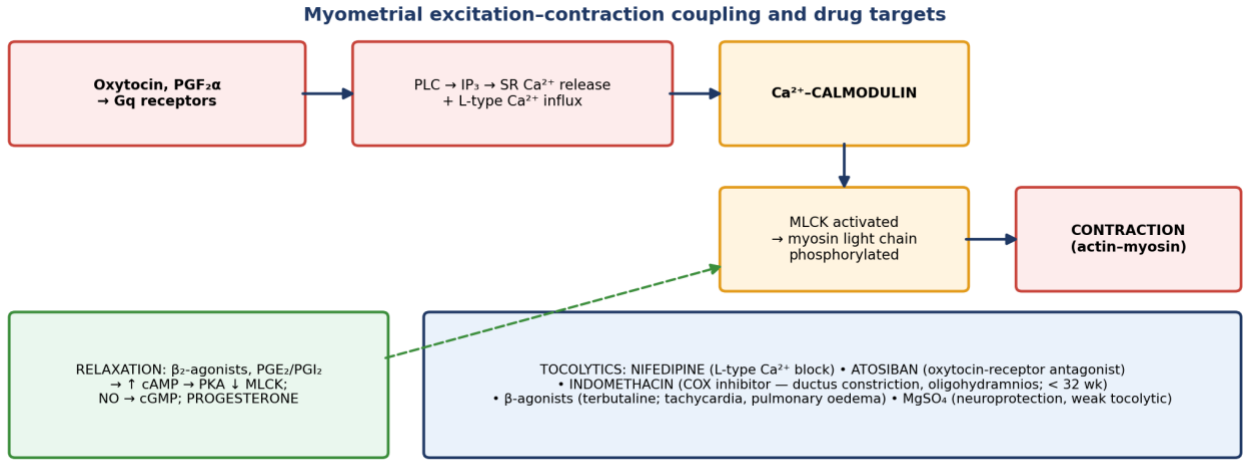


Figure 147.3 — Excitation–contraction coupling and tocolytic targets

Uterotonic	Mechanism	Notes
Oxytocin (Syntocinon)	Oxytocin receptor (Gq)	Half-life ≈ 3–5 min; IOL/augmentation, PPH; water retention/hyponatraemia (ADH-like), hypotension with bolus
Ergometrine	α-adrenergic, 5-HT, dopamine receptors — sustained tetanic contraction	Contraindicated in hypertension/pre-eclampsia, cardiac disease
Carboprost (15-methyl $PGF_2\alpha$)	PGF receptor	Bronchospasm — avoid in asthma
Misoprostol (PGE_1 analogue)	EP receptors	Oral/vaginal/sublingual; IOL, miscarriage management, PPH
Dinoprostone (PGE_2)	Cervical ripening	Vaginal gel/pessary for IOL

147.4 Cervical ripening

Pregnancy: rigid cervix (dense cross-linked **type I/III collagen**) ▶ ↑ **PGE_2**, NO, relaxin, inflammatory cells ▶ ↑ **MMPs**, collagen breakdown; ↓ decorin; ↑ **hyaluronic acid** → water ▶ Softening, effacement, dilatation (**Bishop score**) ▶ Mechanical ripening: balloon catheter (↑ local PGs)

147.5 Stages and mechanism of labour

Stage	Definition (NICE NG235, 2023)	Duration / delay
Latent first stage	Painful contractions, cervical change incl. effacement and dilatation up to 4 cm	Variable
Established first stage	Regular painful contractions, progressive dilatation from 4 cm	Suspect delay if < 2 cm in 4 h (nullip) or slowing (parous); average ≈ 8 h nullip (unlikely > 18 h), ≈ 5 h parous (unlikely > 12 h)
Second stage	Passive (full dilatation, no pushing) → active (pushing/head visible)	Birth expected within 3 h (nullip), 2 h (parous) of active second stage
Third stage	Birth of baby → delivery of placenta and membranes	Prolonged if > 30 min (active) or > 60 min (physiological)

Engagement (in occipito-transverse) ▶ **Descent** + **flexion** (sub-occipitobregmatic 9.5 cm) ▶ **Internal rotation** to OA (pelvic floor) ▶ **Extension** — crowning, birth of head ▶ **Restitution** & external rotation ▶ Shoulders: anterior then posterior; **lateral flexion**

Third stage: placental separation by shearing as the uterus retracts (**Schultze** — fetal surface first; **Duncan** — maternal edge first); haemostasis by **'living ligatures'** (myometrial fibres compress vessels) plus the hypercoagulable state. Signs: lengthening cord, gush of blood, rising firm fundus.

147.6 Clinical correlations

Situation	Physiology
Preterm labour	Premature activation of the same pathways: infection/inflammation (≈ 40%), decidual haemorrhage (abruption — thrombin is uterotonic), uterine overdistension (twins, polyhydramnios), stress (CRH), cervical insufficiency. Fetal fibronectin, cervical length, progesterone and cerclage for prevention
Post-term pregnancy	Low CRH trajectory; placental sulphatase deficiency and anencephaly (no fetal ACTH/DHEAS → ↓ oestriol) delay labour
Induction of labour	Mimics ripening (PGE_2, balloon) then contraction (amniotomy + oxytocin); offered from 41+0 wk (NICE)
Tachysystole / hyperstimulation	> 5 contractions in 10 min — ↓ intervillous perfusion between contractions → fetal hypoxia; stop oxytocin, consider terbutaline

147.7 Must-know summary

■ EXAM TIP

- Human labour: **functional** progesterone withdrawal (↑ PR-A:PR-B), not a fall in serum progesterone.
- Placental **CRH** rises exponentially; fetal cortisol **stimulates** placental CRH (positive feedback).
- Oestrogen ↑ **oxytocin receptors, connexin-43, PG receptors**; PGE_2 ripens the cervix.
- Contraction: **Ca^{2+}–calmodulin → MLCK**; relaxation: cAMP, cGMP. Nifedipine (Ca^{2+}), atosiban (OT receptor).
- Established labour from **4 cm**; prolonged third stage > 30 min (active) / > 60 min (physiological).

■ MNEMONIC / MEMORY AID

Cardinal movements — 'Every Daring Fetus Inevitably Exits Right Ending Ecstatically': Engagement, Descent, Flexion, Internal rotation, Extension, Restitution, External rotation, Expulsion.