PIPADOR REVISION

MRCOG Part 1 Revision Notes

Cell-to-Cell Adhesion

BIOCHEMISTRY • LECTURE 209

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG PART 1 REVISION NOTES | BIOCHEMISTRY

209 Cell-to-Cell Adhesion

Adhesion molecule families, inflammation, implantation and placentation, cancer invasion and metastasis

Cadherins	Integrins	Selectins	Ig superfamily
Ca^{2+}-dependent, homophilic	Cell–matrix; αβ dimers	Leucocyte rolling	ICAM, VCAM, PECAM

■ **KEY FACTS: Learning objectives**

- Describe the families of cell adhesion molecules and their ligands.
- Describe the role of adhesion in tissue integrity, inflammation, implantation and placentation.
- Describe adhesion changes in cancer invasion and metastasis, and relevant clinical disorders.

209.1 Adhesion molecule families

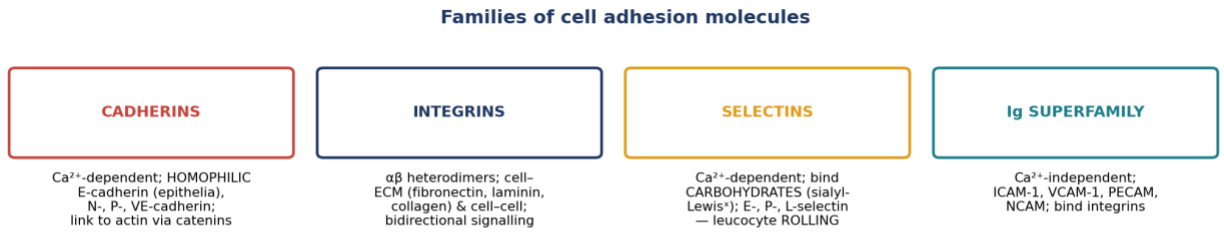


Figure 209.1 — Families of cell adhesion molecules

Family	Ligand	Key roles / examples
Cadherins	Same cadherin on adjacent cell (homophilic), Ca^{2+}-dependent	E-cadherin — epithelial integrity, adherens junctions (via β-catenin → actin); VE-cadherin — endothelium; trophoblast cadherin switching (E → VE) during invasion
Integrins	ECM (fibronectin, laminin, collagen, vitronectin) and Ig-SF (ICAM, VCAM)	Inside-out and outside-in signalling; platelet GPIIb/IIIa (αIIbβ3) binds fibrinogen; leucocyte LFA-1, VLA-4; endometrial αvβ3 marker of receptivity; trophoblast integrin switching (α6β4 → α1β1) during invasion
Selectins	Sialylated carbohydrates (sialyl-Lewisˣ)	E-selectin (endothelium), P-selectin (platelets, endothelium — Weibel–Palade bodies), L-selectin (leucocytes) — rolling; L-selectin on blastocyst trophoblast in early apposition
Ig superfamily	Integrins or homophilic	ICAM-1, VCAM-1 (inflammation, ↑ in pre-eclampsia), PECAM-1 (diapedesis), NCAM (neural)
Others	—	CD44–hyaluronan, mucins (MUC1 — anti-adhesive; ↓ at implantation site)

209.2 Adhesion in inflammation

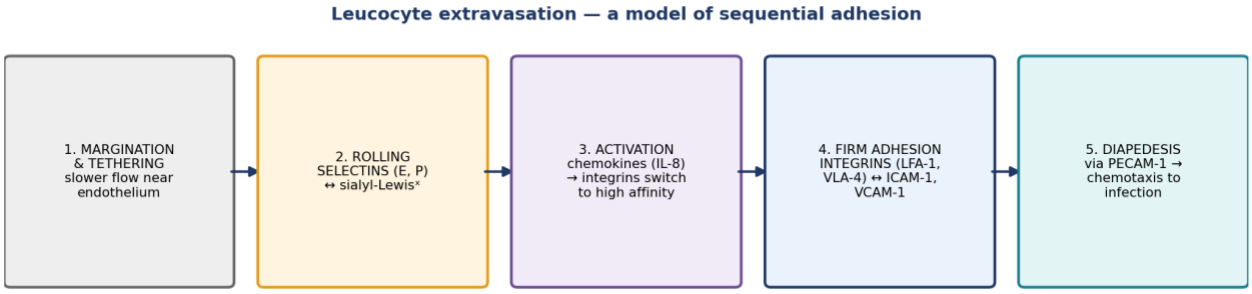


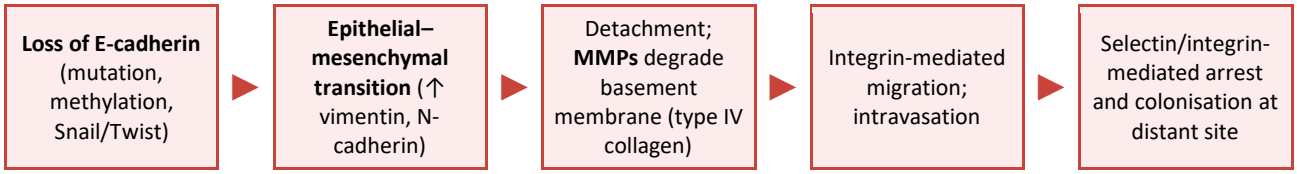
Figure 209.2 — Leucocyte extravasation

Leucocyte adhesion deficiency (type I — CD18/β2-integrin defect): recurrent bacterial infections without pus, **delayed umbilical cord separation** (> 3 weeks), neutrophilia. Glucocorticoids reduce adhesion molecule expression (demargination → neutrophilia).

209.3 Adhesion in reproduction

Process	Adhesion events
Fertilisation	Sperm–zona binding (ZP2/ZP3), IZUMO1–JUNO fusion (Lecture 145)
Implantation	Apposition (L-selectin–carbohydrate; ↓ MUC1), adhesion (integrins αvβ3, α4β1 with osteopontin/fibronectin; trophinin), invasion (MMPs)
Placentation	Extravillous trophoblast pseudo-vasculogenesis — adopts an endothelial adhesion phenotype (VE-cadherin, α1β1, αvβ3) to replace spiral-artery endothelium; failure → pre-eclampsia/FGR
Endometriosis	Adhesion of refluxed endometrial cells to peritoneum (integrins, CD44)
Pre-eclampsia	Endothelial activation — ↑ soluble VCAM-1, ICAM-1, E-selectin

209.4 Adhesion in cancer



- **Hereditary diffuse gastric cancer** (germline **CDH1** — E-cadherin) also ↑ **lobular breast cancer** risk.
- **Lobular breast carcinoma** characteristically loses E-cadherin (single-file 'Indian file' invasion).
- Ovarian cancer spreads transcoelomically — adhesion to mesothelium via CD44 and β1-integrins.

209.5 Must-know summary

■ **EXAM TIP**

- **Cadherins** (Ca^{2+}, homophilic; E-cadherin/catenin/actin); **integrins** (αβ, ECM, bidirectional signalling; GPIIb/IIIa); **selectins** (carbohydrates, rolling); **Ig-SF** (ICAM/VCAM bind integrins).
- Extravasation: margination → **selectin** rolling → chemokine activation → **integrin** adhesion → **PECAM** diapedesis.
- Implantation: L-selectin apposition, αvβ3 adhesion; trophoblast adhesion-molecule switching in spiral artery remodelling.
- Loss of E-cadherin → EMT, invasion (lobular breast, CDH1).

■ MNEMONIC / MEMORY AID

'CISI': Cadherins Connect cells, Integrins Interact with matrix, Selectins Slow (roll) leucocytes, Ig-SF Immobilise.