

Exercise walk-through

10.1

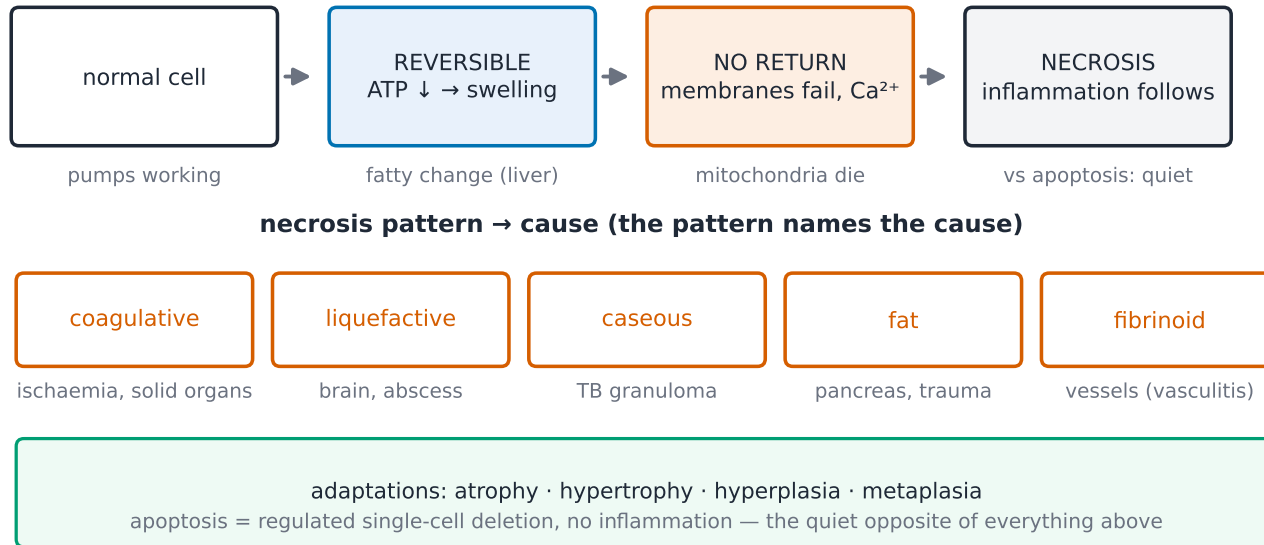
Cell injury, adaptation and death

University Medicine

Cell injury: reversible to irreversible

- 1 **Reversible** Hypoxia $\rightarrow$ ATP $\downarrow$ $\rightarrow$ Na⁺/K⁺ pump fails $\rightarrow$ swelling, fatty change; membranes intact.
- 2 **No return** Membrane damage + Ca²⁺ influx + mitochondrial death — enzymes leak (LDH/ALT rise).
- 3 **Patterns** Coagulative (ischaemia) · liquefactive (brain) · caseous (TB) · fat (pancreas) · fibrinoid (vessels); **apoptosis** is quiet deletion.

Injury progression from swelling to death patterns



ATP depletion swells the cell; membrane damage kills it — the pattern names the cause.

Exercises 2.1-2.3

2.1 Name the ion whose influx marks irreversibility. [3]

2.2 Which necrosis pattern belongs to TB granulomas? [3]

2.3 Bronchial lining turning squamous under smoke – name the adaptation. [3]

Exercises 2.1·2.3

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2.1

- Ca^{2+} – its influx with membrane damage is the point of no return ✓.
-

2.2 Which necrosis pattern belongs to TB granulomas? [3]

2.2

- Caseous necrosis ✓.
-

2.3 Bronchial lining turning squamous under smoke – name the adaptation. [3]

2.3

- Metaplasia – one mature lining type swapped for a hardier one ✓.

Exercise 3.1

3.1 A fictional ischaemic tubule experiment: 20 minutes of hypoxia then reperfused, versus 4 hours then reperfused.

Explain the first outcome (ATP-low swelling, pumps resume, recovery) and the second (membrane damage, Ca^{2+} entry, enzyme leak – LDH/ALT rise readable from blood). State which necrosis pattern a solid-organ infarct shows and why (slow proteolysis keeps outlines – coagulative) ✓.

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3.1

- At 20 min: pump failure only – swelling resolves on reperfusion ✓.
- At 4 h: membranes leak, Ca^{2+} enters, mitochondria die → necrosis ✓.
- Cytosolic enzymes (LDH/ALT) leak into blood – the cell's biography readable ✓.
- Solid-organ infarct = coagulative: proteolysis is slow, outlines persist ✓.

Exercise 3.2

3.2 Four fictional scenarios: bed rest (disuse), hypertension (cardiac), pregnancy (uterine), smoking (bronchus).

Assign atrophy, hypertrophy, hyperplasia or metaplasia with the defining distinction for each (smaller cells / bigger cells / more cells / new lining type) ✓. [7]

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3.2

- Bed rest → atrophy (smaller cells); cardiac hypertension → hypertrophy (bigger cells) ✓.
- Pregnancy uterus → hyperplasia (more cells, plus hypertrophy) ✓.
- Smoking bronchus → metaplasia (squamous replaces columnar) ✓.
- Distinguish by what changes: size, number, or type ✓.