From one cell to another

Cell signalling coordinates cell activities. This lesson follows a secreted chemical signal to a receptor on the surface of a target cell.

1. FOLLOW THE MESSAGE

A. SECRETION

A signalling cell releases a specific chemical: the ligand.

B. TRANSPORT

The ligand reaches other cells through an extracellular route.

C. RECEPTOR BINDING

A matching receptor on a target cell binds the ligand.

D. SPECIFIC RESPONSE

Receptor activation initiates a particular change inside the cell.

2. TWO WAYS A RELEASED SIGNAL CAN TRAVEL

Local signals can diffuse through tissue fluid to nearby cells. Hormones can be carried by blood to distant tissues, then reach cells through tissue fluid. Transport brings the message within reach; receptor binding determines which cells can detect it.

3. KEEP THE ROLES DISTINCT

The signalling cell releases the ligand. The target cell receives it. The ligand is the message; the receptor is a protein that detects that message. A hormone is one type of signalling ligand, not the name for every ligand.

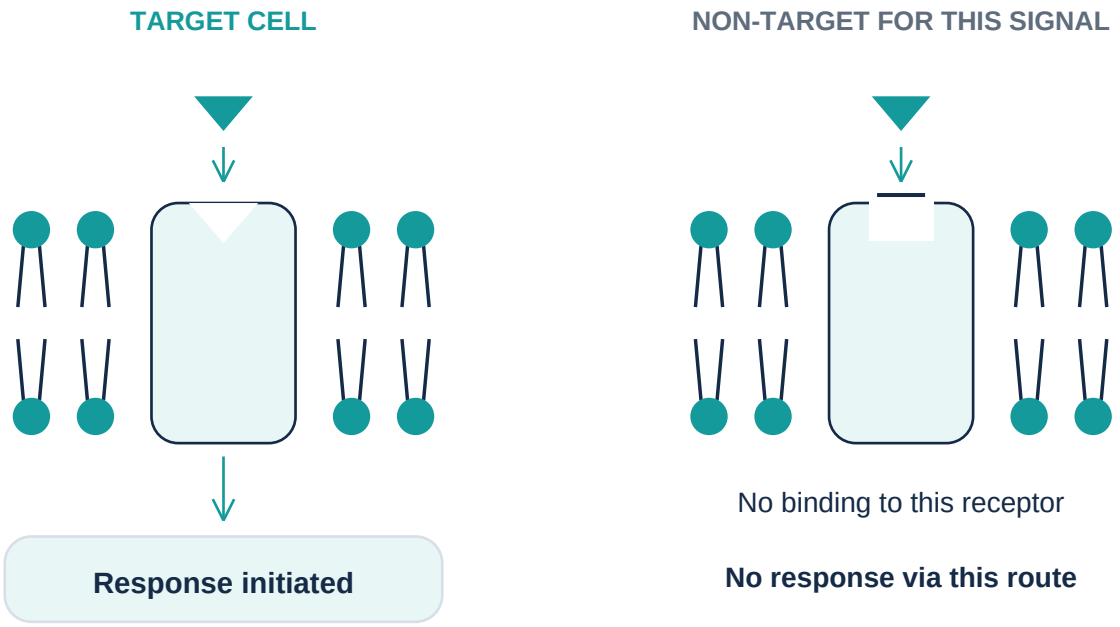
Ligands and transport routes: OpenStax Biology 2e, section 9.1.
Cell communication principles: Alberts et al., Molecular Biology of the Cell.

Scope: Cambridge Biology 9700 syllabus, section 4.1, outcome 4, p. 21.

The receptor selects the target

Two cells may encounter the same ligand. Its presence alone does not make both cells targets: successful reception requires a compatible receptor.

1. SAME LIGAND, DIFFERENT RECEPTORS



Schematic shapes show matching, not actual molecular geometry.

2. COMPLEMENTARY BINDING

The binding site has a suitable three-dimensional shape and chemical properties for the ligand. Binding is specific, not random attachment to any membrane protein. A cell without the appropriate receptor cannot detect this signal through that receptor pathway.

3. BINDING OUTSIDE CAN CHANGE ACTIVITY INSIDE

A cell-surface receptor transmits information across the membrane. The ligand does not need to pass through the lipid bilayer. A receptor is not simply a carrier transporting the ligand into the cell. Internal receptors also exist, but are outside this lesson's main pathway.

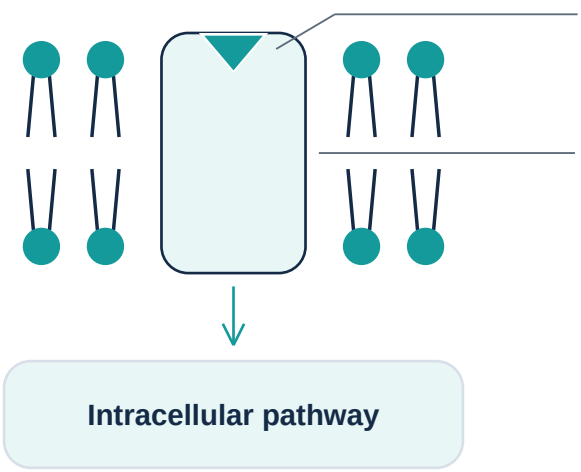
Receptor specificity and signal reception: Alberts et al., Cell Communication.
Cell-surface versus internal receptors: OpenStax Biology 2e, section 9.1.

Scope: Cambridge Biology 9700 syllabus, section 4.1, outcome 4, p. 21.

Turn reception into a response

A response is the change in cell activity after reception. Binding starts the process; it is not the final cellular response.

1. INFORMATION CROSSES THE MEMBRANE



Ligand bound outside

Receptor spans the membrane

The signal is relayed inside the target cell.

2. POSSIBLE OUTCOMES - SUPPORTING EXAMPLES

Enzyme activity	A metabolic pathway speeds up or slows down.
Gene expression	Production of particular proteins changes.
Cell division	Growth signals can promote entry into division.

3. EXAMPLE: ADRENALINE AND MUSCLE

Adrenaline binding to receptors on skeletal muscle cells can activate an internal pathway that promotes glycogen breakdown. Enzyme regulation is the response; adrenaline is the ligand. Detailed pathway chemistry is beyond this outline.

Core sequence: release the ligand, transport it, bind a specific cell-surface receptor, then trigger a specific response.

Cellular outcomes and adrenaline example: OpenStax Biology 2e, section 9.3.
Receptor activation and intracellular signalling: Alberts et al., Cell Communication.

Scope: Cambridge Biology 9700 syllabus, section 4.1, outcome 4, p. 21.