

Exercise walk-through

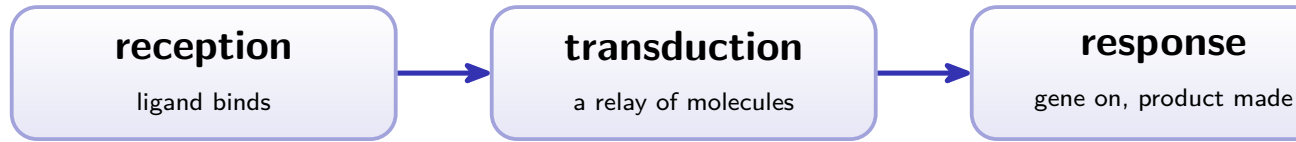
4.2

Introduction to Signal Transduction

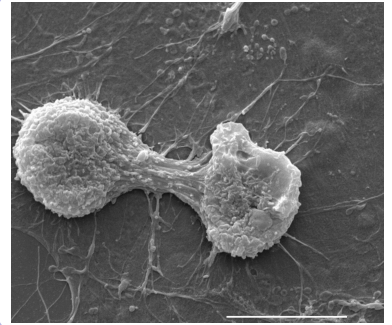
AP Biology

Signal transduction

Turning an outside message into an inside action, in three stages:

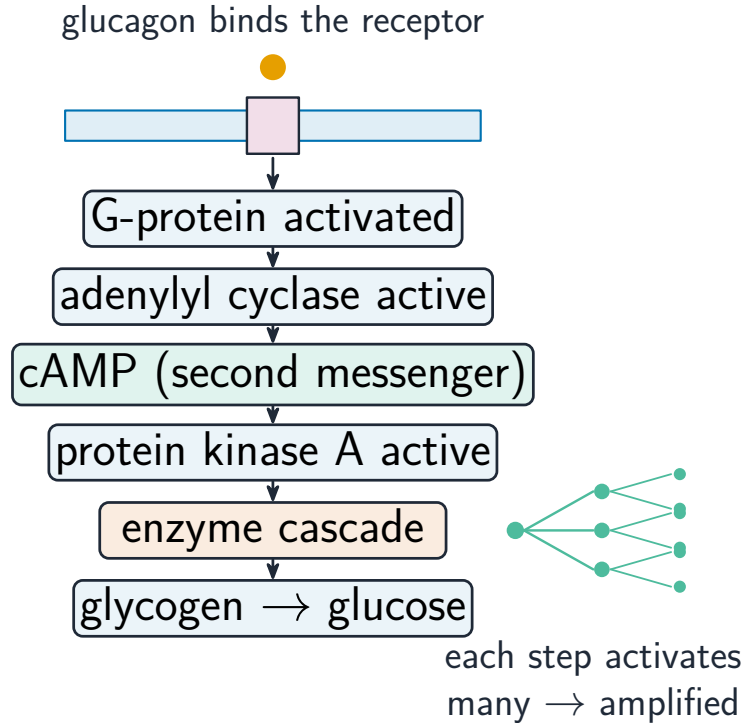


Second messengers (cAMP, Ca^{2+}) and a
phosphorylation cascade give huge
amplification : 1 → 100 → 10,000 → millions.



Cytokinesis fibroblast

Signal Transduction Pathways



A signalling cascade amplifies the message inside the cell

Transduction, and the checkpoints

reception	a signal molecule – often a hormone – binds a specific receptor
transduction	the signal passes through a pathway : often a cascade of proteins that activate one another
why a cascade	each step amplifies , so a few signal molecules can change thousands of targets
response	a change in gene expression, or in the activity of an existing protein
checkpoints	the cell cycle is controlled at points that verify conditions before proceeding
what they check	<i>Is the DNA intact? Are the chromosomes attached?</i> – and a failed check halts the cycle

Cancer is largely a failure of these controls: a checkpoint that no longer stops the cycle, or a pathway stuck in the on position.

Exercises 2.1-2.3

2.1 Name the three stages of signal transduction.

[3]

2.2 What happens during reception?

[1]

2.3 What is the final stage called?

[1]

Exercises 2.1-2.3

2.1 Name the three stages of signal transduction. [3]

2.1

- Reception, transduction, response
-

2.2 What happens during reception? [1]

2.2

- The signal molecule binds its receptor
-

2.3 What is the final stage called? [1]

2.3

- Response

Exercise 3.1

3.1 The first stage of signal transduction is

[1]

☐

A response

B transduction

C reception

D replication

Exercise 3.1

3.1 The first stage of signal transduction is

[1]

☐

A response

B transduction

C reception

D replication

3.1 C

- reception

Exercise 3.2 (a)

3.2 Adrenaline binds a receptor and the cell breaks down glycogen.

(a) Identify the reception and response steps.

[2]

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(a) Identify the reception and response steps.

[2]

(a)

- Reception: adrenaline binds the receptor; response: glycogen is broken down

Exercise 3.2 (b)

3.2 Adrenaline binds a receptor and the cell breaks down glycogen.

(b) State what happens during transduction.

[2]

Exercise 3.2 (b)

3.2 Adrenaline binds a receptor and the cell breaks down glycogen.

(b) State what happens during transduction.

[2]

(b)

- The signal is relayed and amplified through a chain of internal molecules that carry the message to the response

Exercise 3.3

3.3 Explain why binding of the signal changes the receptor, and why this matters. [2]

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3.3

- Binding changes the receptor's shape, which activates it to start the internal pathway; without this change the signal could not be passed on