

Exercise walk-through

6.5

Regulation of Gene Expression

AP Biology

Regulation of gene expression

Every cell shares one genome – **differential gene expression**

makes them differ:

Promoter + factors
transcription factors
switch a gene on/off

Operon
bacteria control re-
lated genes as a group

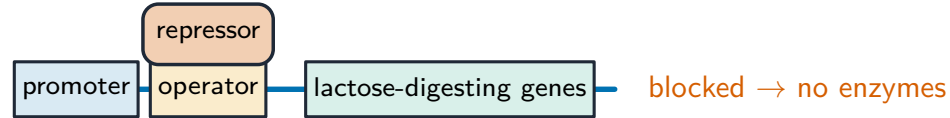
Epigenetics – DNA methylation
DNA silences a gene
without changing the sequence

Hox genes

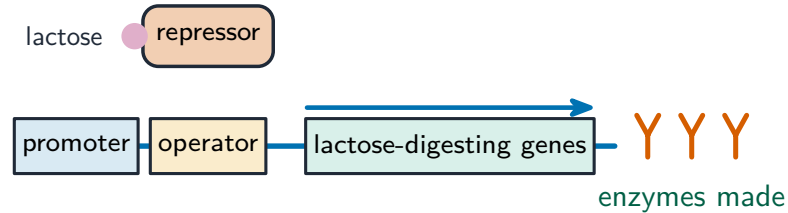
are master switches that lay out the body plan.

Regulation of gene expression, in detail

no lactose

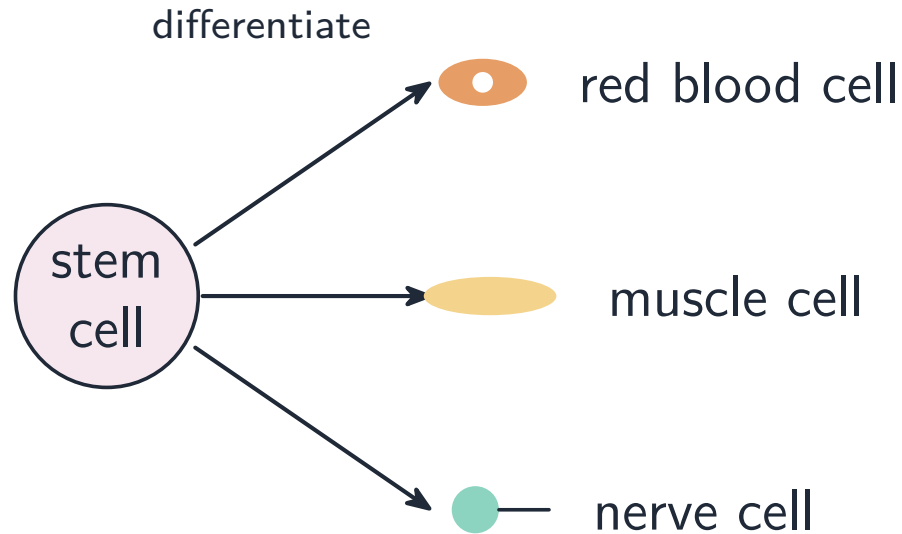


lactose present



The lac operon switches genes on only when lactose is present

Gene Expression and Cell Specialization



A stem cell differentiates into specialised cell types

Exercises 2.1-2.3

2.1 Does a cell express all its genes at once? [1]

2.2 Where does RNA polymerase bind to begin transcription? [1]

2.3 What does a repressor protein do? [1]

Exercises 2.1-2.3

2.1 Does a cell express all its genes at once? [1]

2.1

- No
-

2.2 Where does RNA polymerase bind to begin transcription? [1]

2.2

- At the gene's promoter
-

2.3 What does a repressor protein do? [1]

2.3

- Blocks transcription of a gene

Exercise 3.1

3.1 A protein that blocks transcription of a gene is a(n)

[1]

☐

A activator

B repressor

C ribosome

D polymerase

Exercise 3.1

3.1 A protein that blocks transcription of a gene is a(n)

[1]

☐

A activator

B repressor

C ribosome

D polymerase

3.1 B

- a repressor

Exercise 3.2 (a)

3.2 A bacterium expresses lactose-digesting genes only when lactose is present.

(a) Explain the advantage of this control.

[2]

Exercise 3.2 (a)

3.2 A bacterium expresses lactose-digesting genes only when lactose is present.

(a) Explain the advantage of this control.

[2]

(a)

- The cell makes the digesting enzymes only when they are useful, saving energy and resources when lactose is absent

Exercise 3.2 (b)

3.2 A bacterium expresses lactose-digesting genes only when lactose is present.

(b) State the general role of regulatory proteins in this.

[1]

Exercise 3.2 (b)

3.2 A bacterium expresses lactose-digesting genes only when lactose is present.

(b) State the general role of regulatory proteins in this.

[1]

(b)

- Regulatory proteins switch the genes on or off in response to the lactose signal

Exercise 3.3

3.3 Explain why gene regulation is essential for a multicellular organism to have different cell types. [2]

Exercise 3.3

3.3 Explain why gene regulation is essential for a multicellular organism to have different cell types. [2]

3.3

- Different cell types express different sets of genes; regulation turns the right genes on in each cell, so the same genome can produce specialized cells