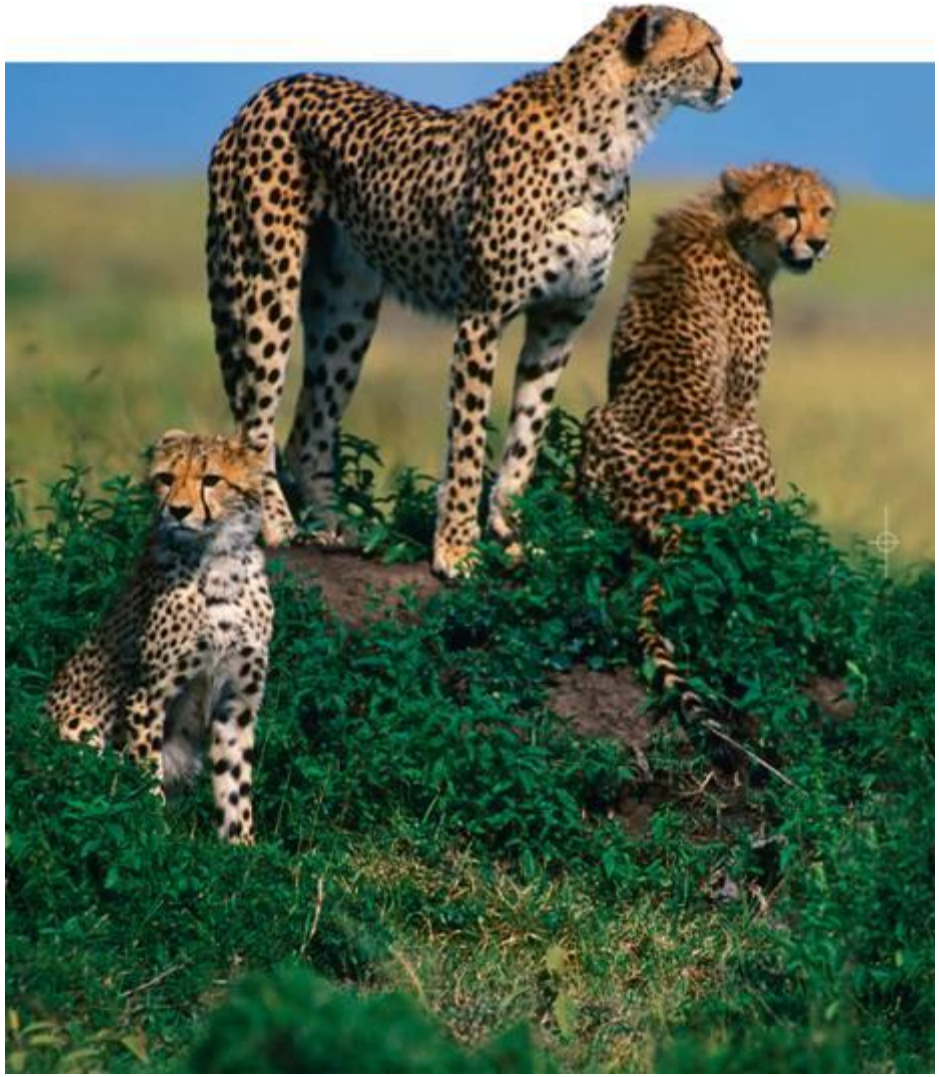
13–4 Applications of Genetic Engineering



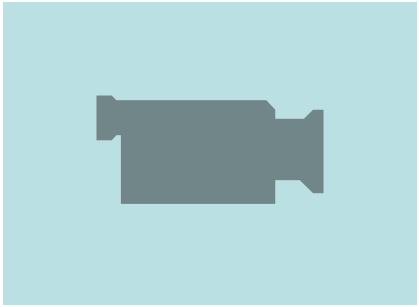
Transgenic Organisms

An organism described as transgenic, contains genes from other species.

Transgenic Microorganisms

Transgenic bacteria produce important substances useful for health and industry. Transgenic bacteria have been used to produce:

- insulin
- growth hormone
- clotting factor



Transgenic Animals

Transgenic animals have been used to study genes and to improve the food supply.

Mice have been produced with human genes that make their immune systems act similarly to those of humans. This allows scientists to study the effects of diseases on the human immune system.

Genetic engineering has spurred the growth of biotechnology.

Researchers are trying to produce transgenic chickens that will be resistant to the bacterial infections that can cause food poisoning.

Transgenic Plants

- Transgenic plants are now an important part of our food supply.
- Many of these plants contain a gene that produces a natural insecticide, so plants don't have to be sprayed with pesticides.

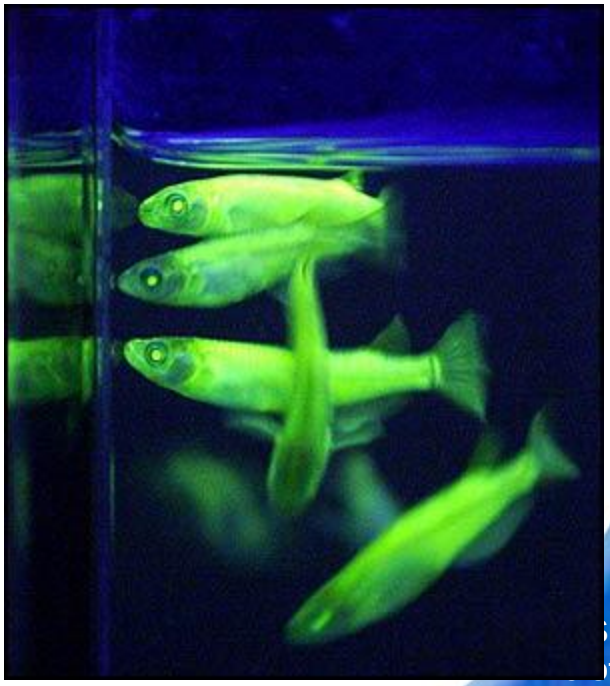
Transgenic Plant w/insect resistance.

Not healthy

Healthy transgenic

Glow Danios = gene from sea anemone

Glow Medaka = jelly fish gene (green)



Uses of transgenic organisms:

in toxicology: as responsive test animals (detection of toxicants);

to introduce human genes into other organisms for the study of disease processes;

the analysis of the regulation of gene expression;

the production of human pharmaceuticals in farm animals (**"pharming"**); targeted production of pharmaceutical proteins, drug production and product efficacy testing;

in biotechnology: as producers of specific proteins;

genetically engineered hormones to increase milk yield, meat production

13–4 Applications of Genetic Engineering

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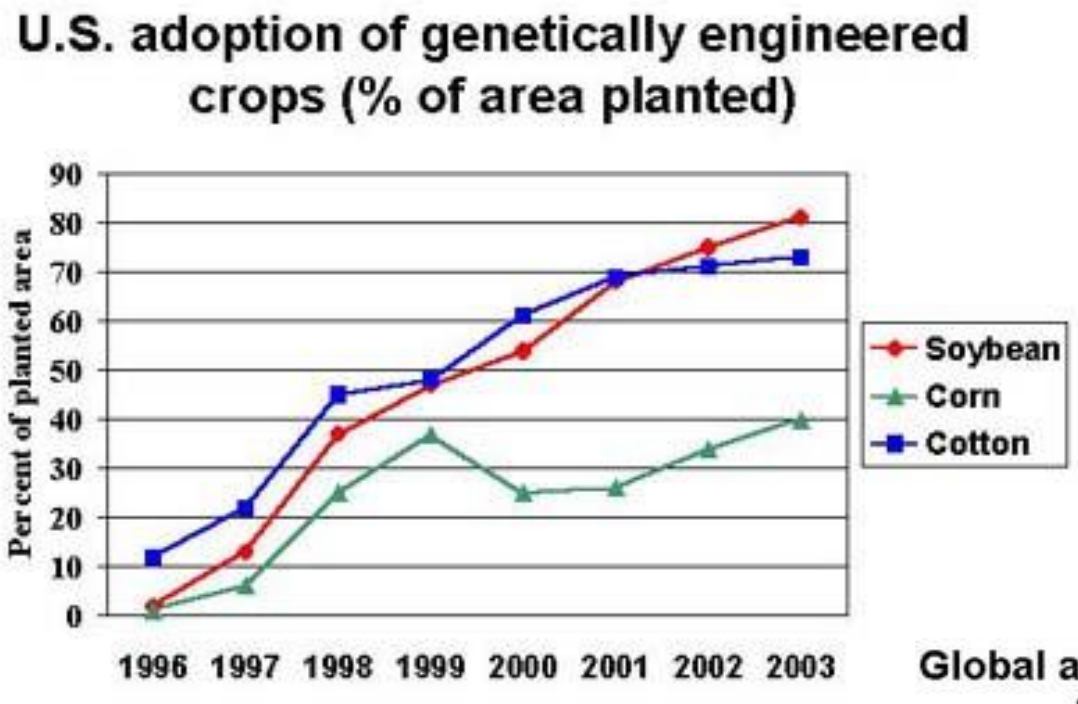
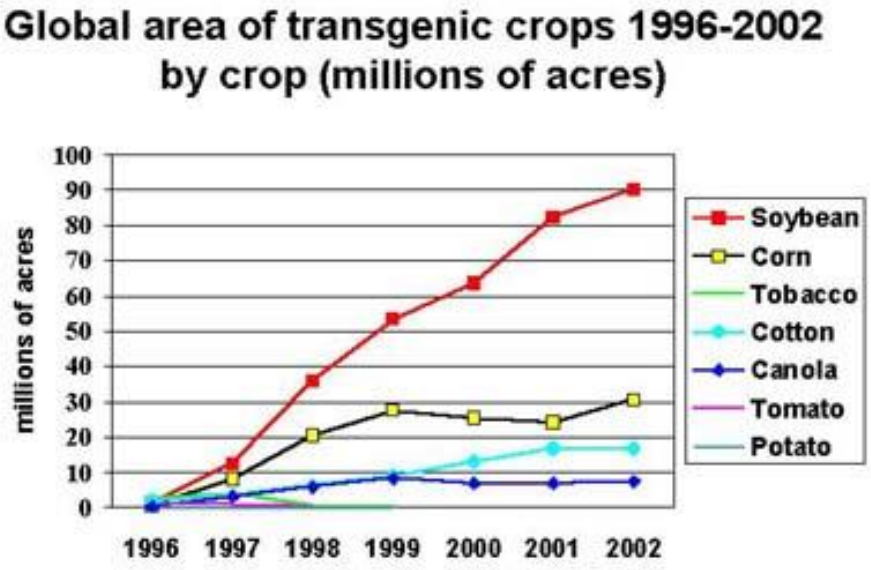


Source: http://www.cls.casa.colostate.edu/TransgenicCrops/current.html#crops



13–4 Applications of Genetic Engineering

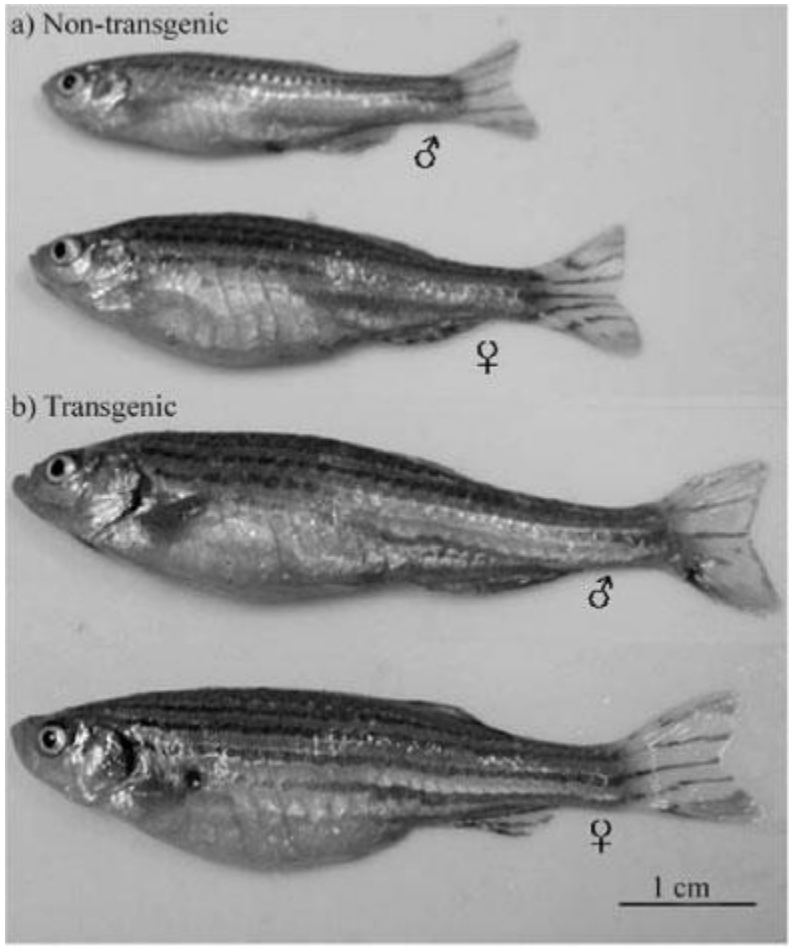


Figure 1 - Zebrafish (*Danio rerio*): (a) one-year old non-transgenic fish (average weight = 0.68 ± 0.13) and (b) one-year old G_0 transgenic fish (average weight = 1.79 g ± 0.37).

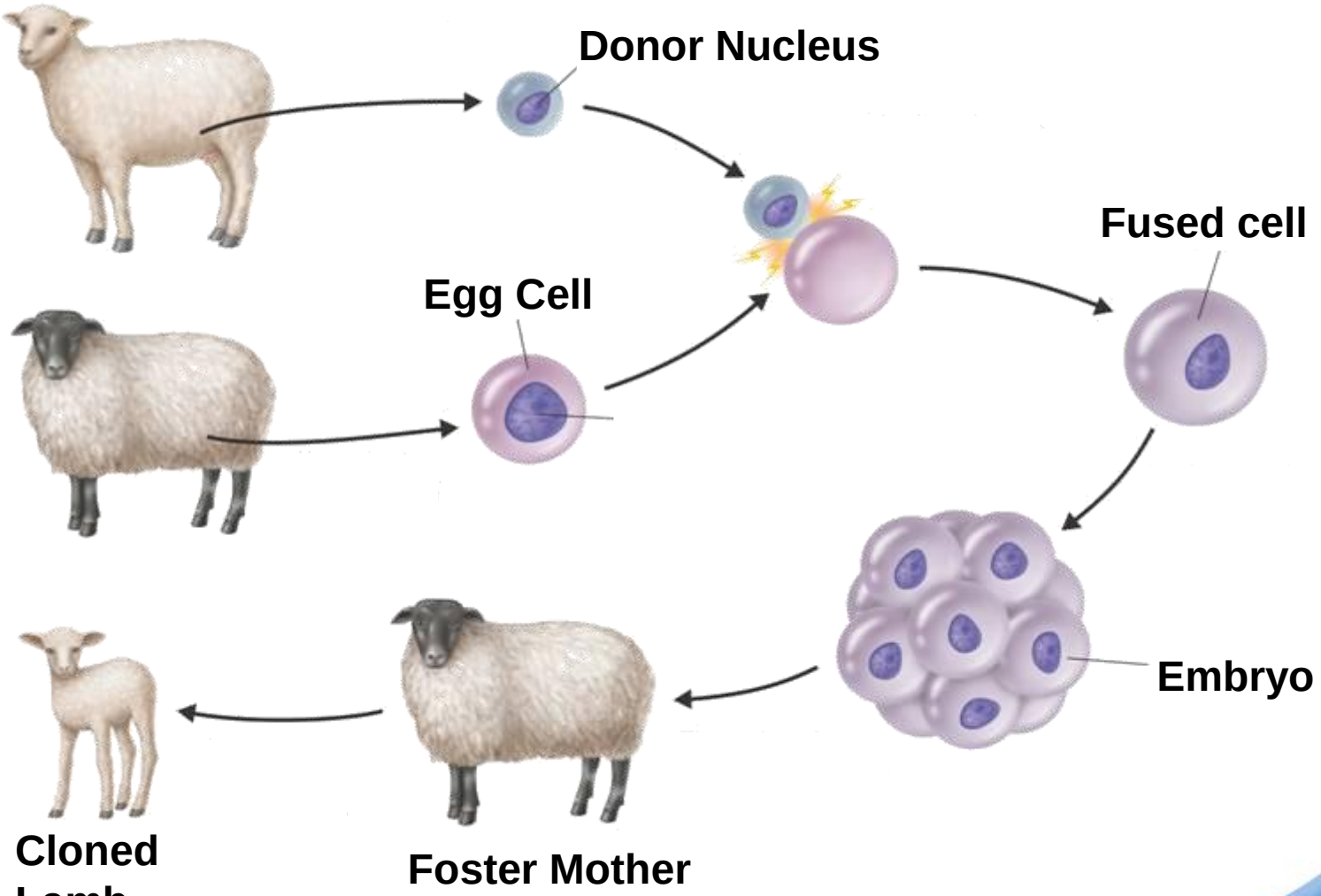
Cloning

A **clone** is a member of a population of genetically identical cells produced from a single cell.

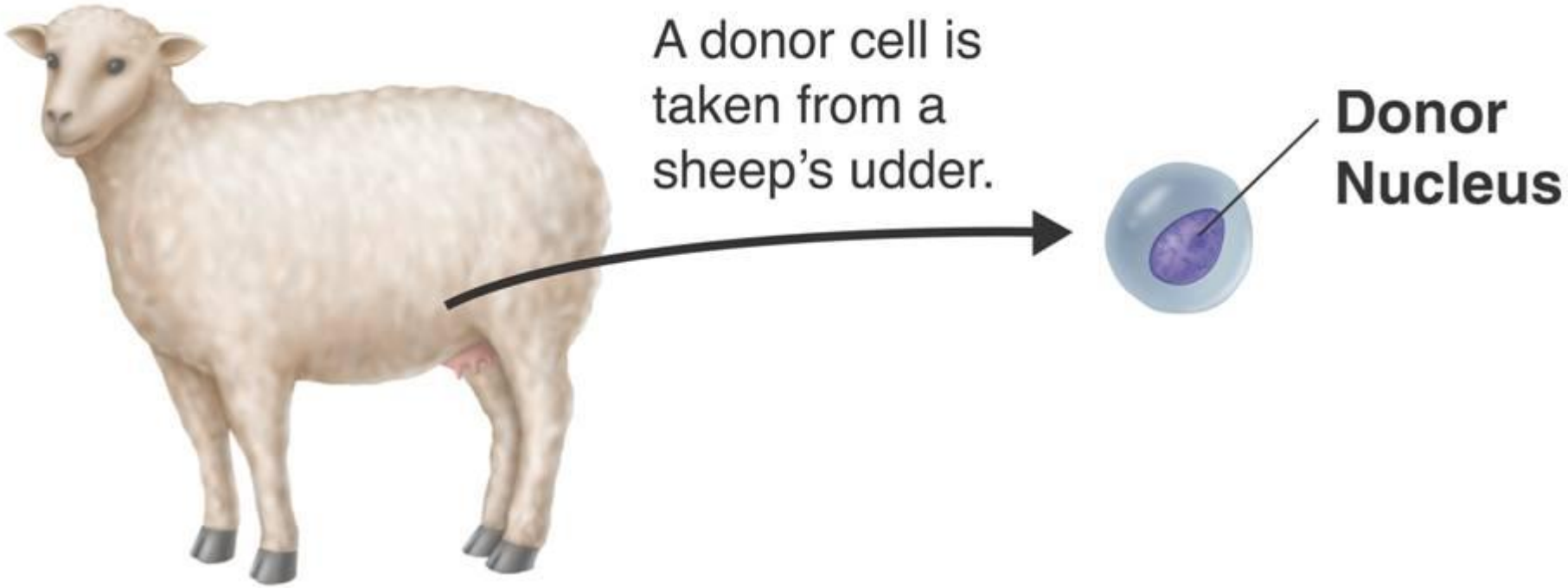
In 1997, Ian Wilmut cloned a sheep called Dolly.

Dolly and Bonnie

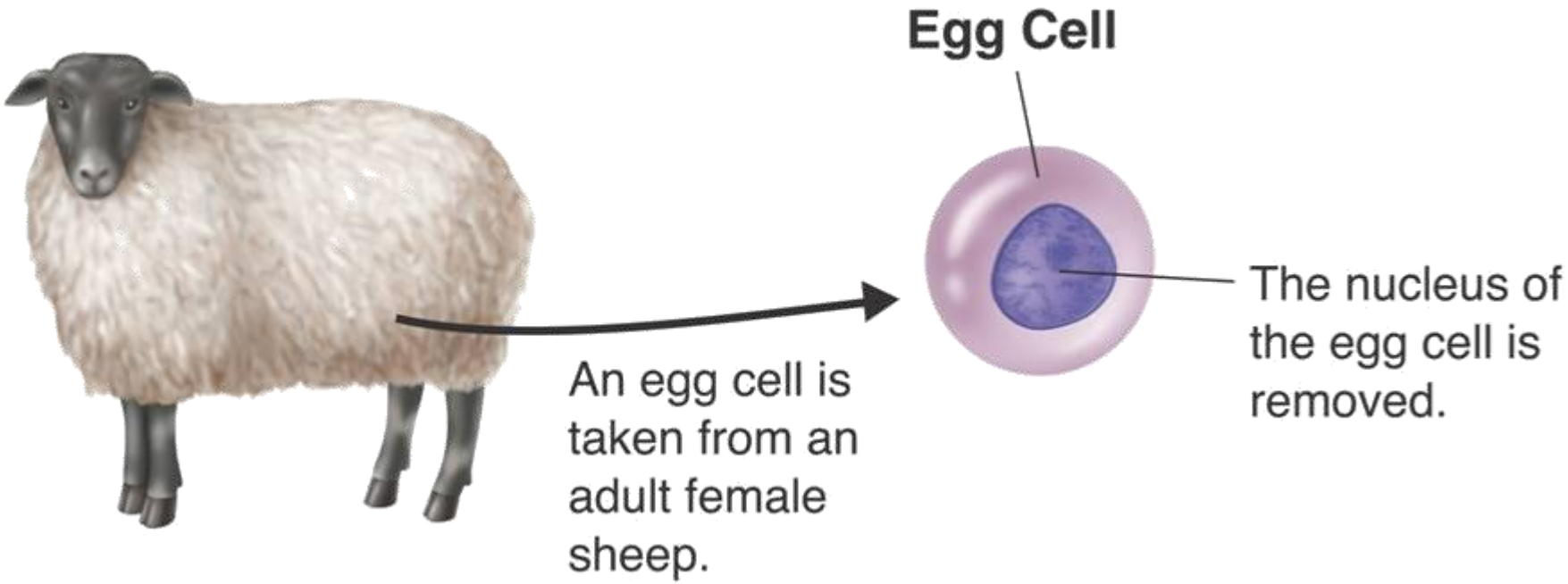
Cloning Dolly



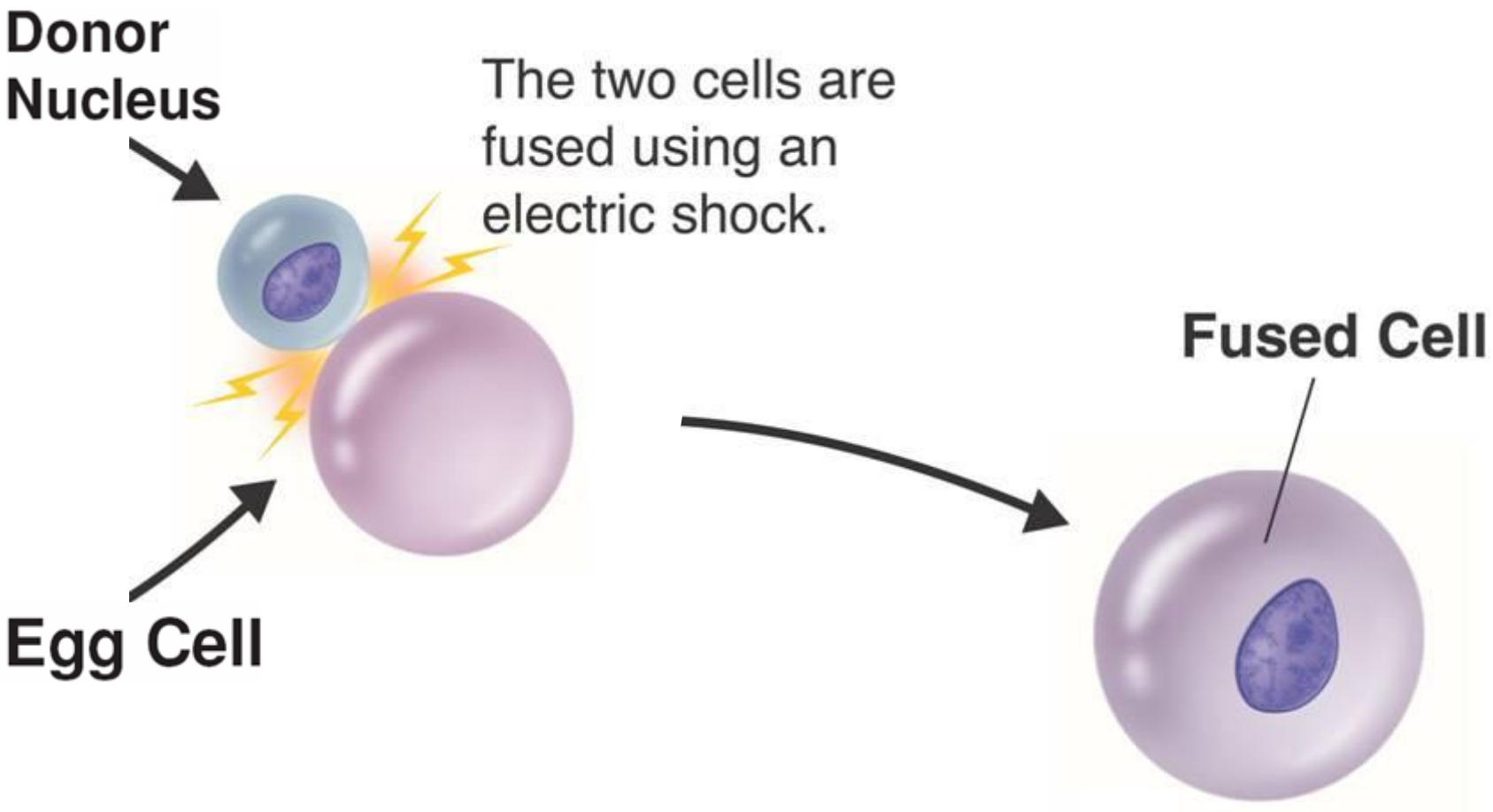
Cloning Dolly



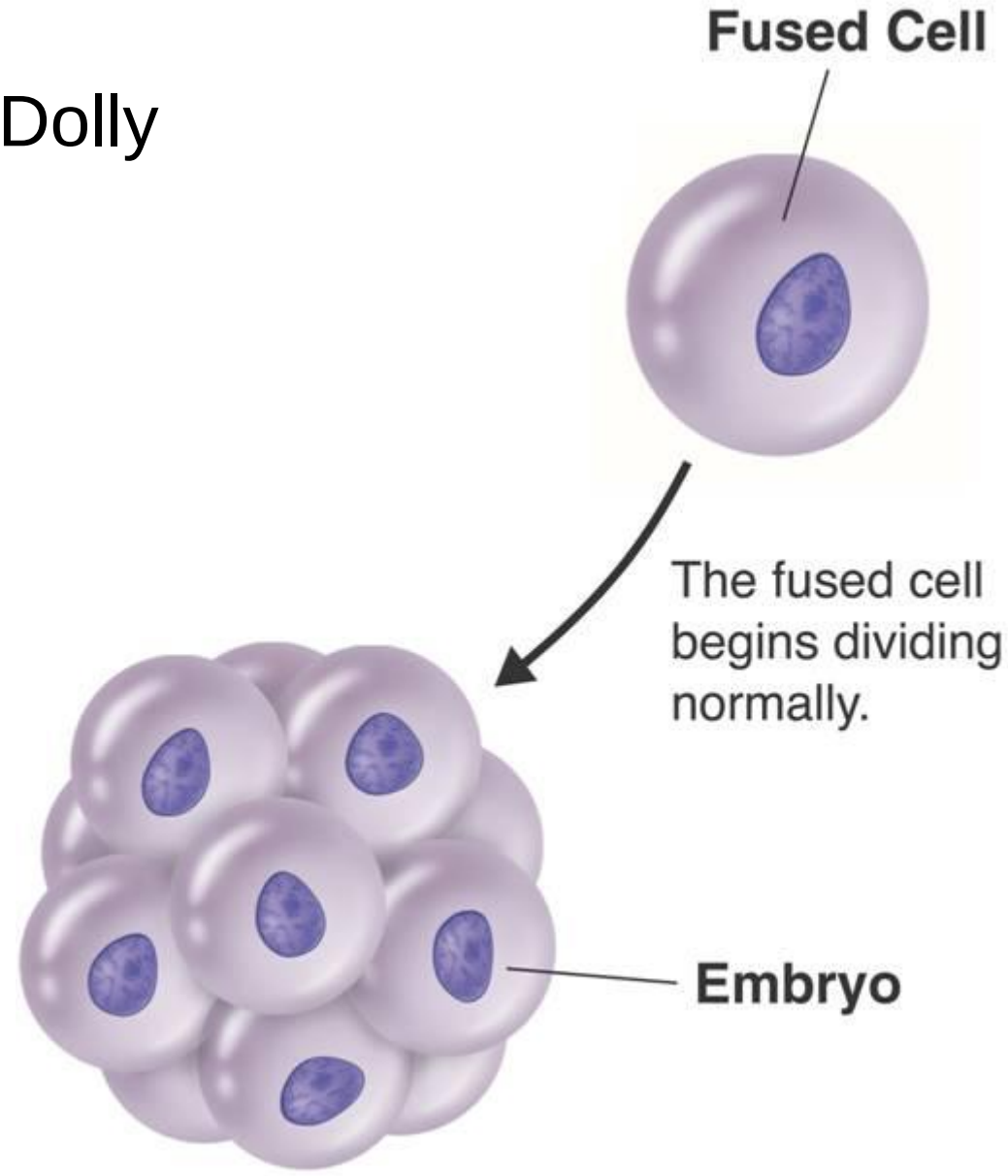
Cloning Dolly



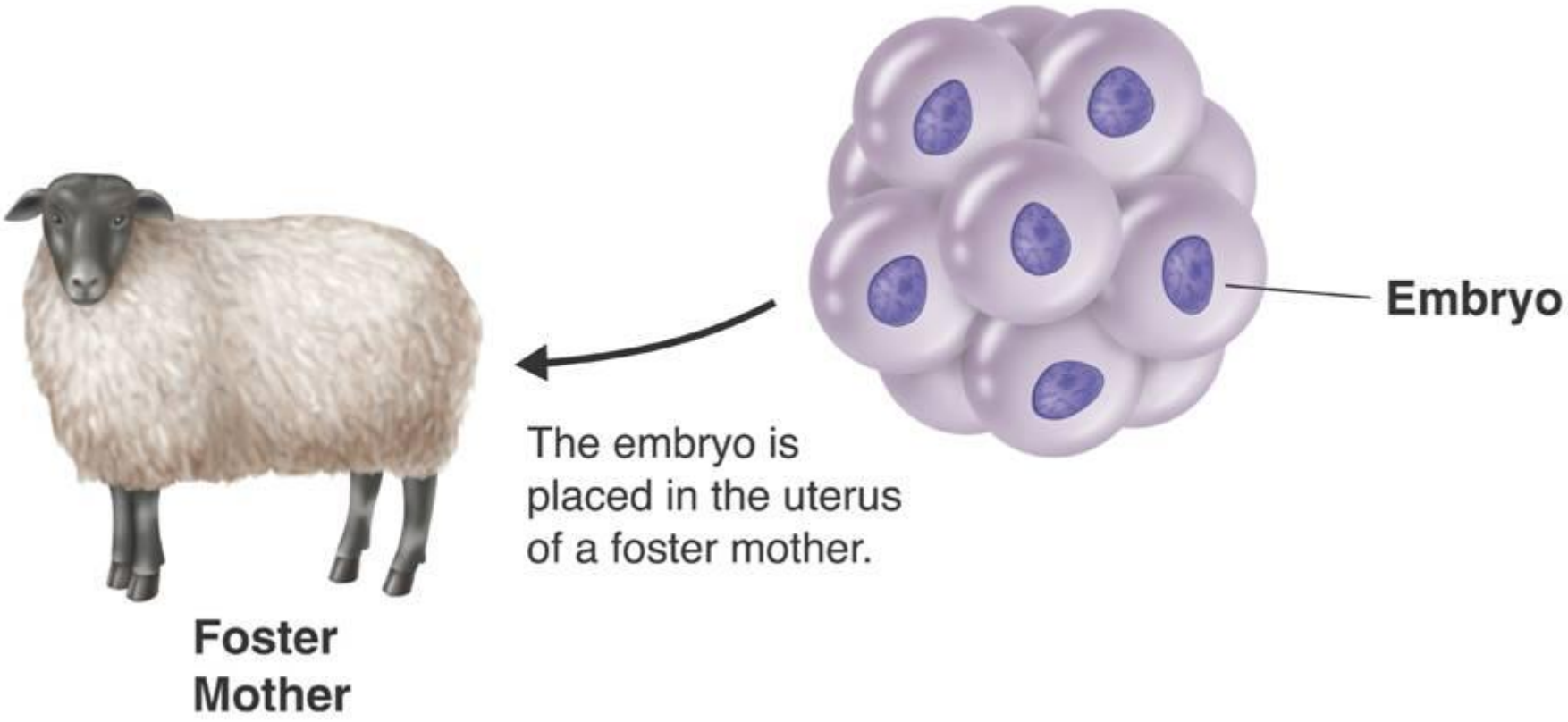
Cloning Dolly



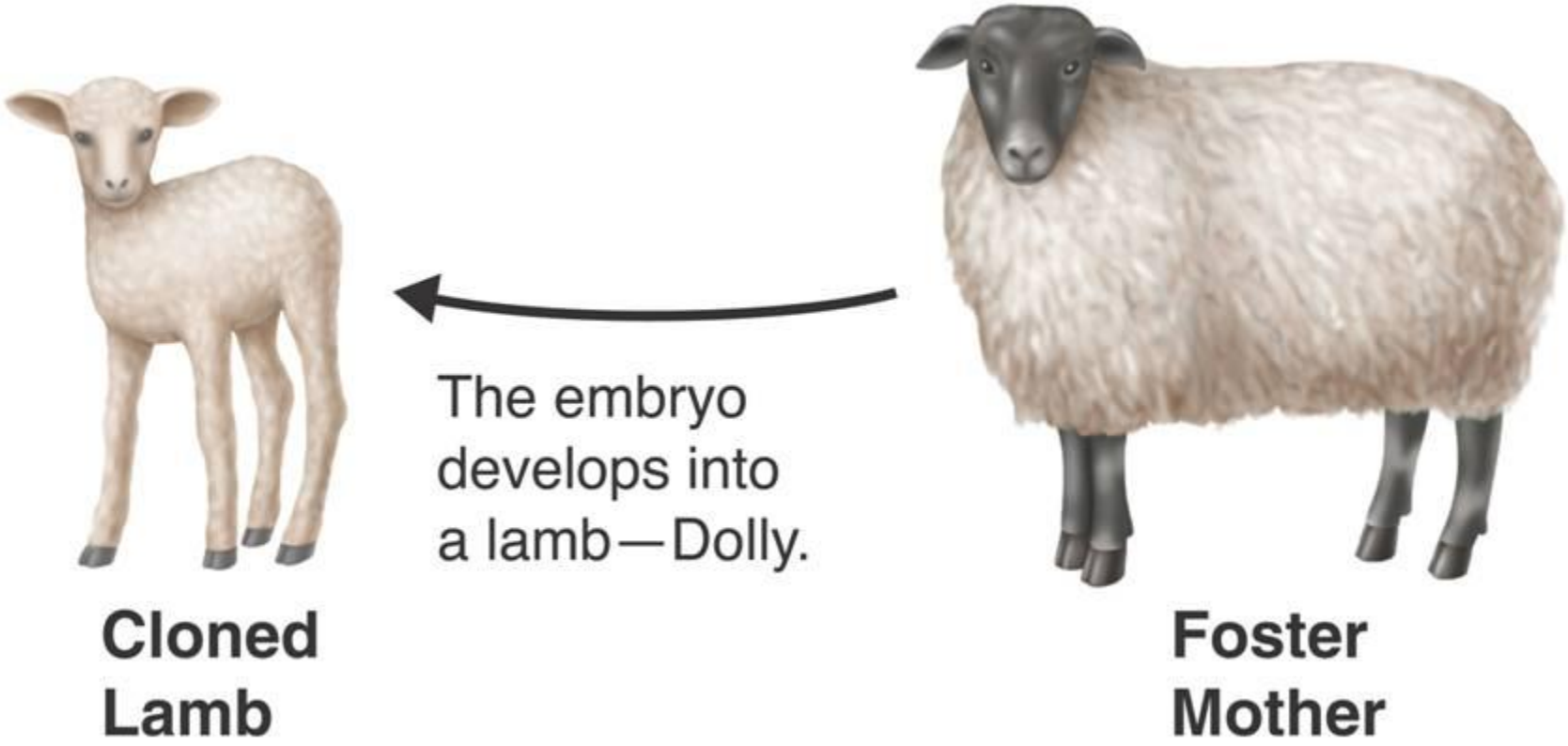
Cloning Dolly



Cloning Dolly



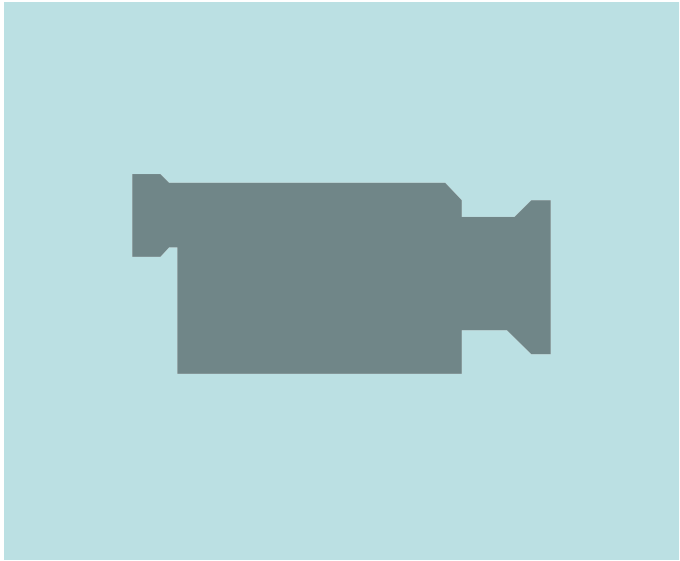
Cloning Dolly



Researchers hope cloning will enable them to make copies of transgenic animals and help save endangered species.

Studies suggest that cloned animals may suffer from a number of genetic defects and health problems.

13–4 Applications of Genetic Engineering



13–4 Section QUIZ

Continue to:

Section QUIZ

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13–4 Section QUIZ

1 Insulin-dependent diabetes can now be treated with insulin produced through the use of

a. transgenic plants.

b. transgenic animals.

c. transgenic microorganisms.

d. transgenic fungi.

2 Transgenic tobacco plants that glow in the dark were produced by transferring the gene for luciferase from a

a. clone.

b. bacterium.

c. firefly.

d. jellyfish.

3 The first mammal to be cloned was a

a. sheep.

b. horse.

c. dog.

d. cat.

4 In producing a cloned animal, an egg cell is taken from a female and its nucleus is removed. A body cell is taken from a male. The clone from this experiment will

a. look just like the female.

b. be genetically identical to the male.

c. have a mixture of characteristics from both animals.

d. resemble neither the male nor the female.

5 Animals produced by cloning have been shown to

a. all be perfectly healthy.

b. suffer from a number of health problems.

c. live longer than uncloned animals.

d. be less intelligent than uncloned animals.