

7.2 Natural Selection

SBI3U

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Remembering key terms

Adaptation

Physiological
Adaptation

Phenotype

Variation

Camouflage

Genetic mutation

Structural
adaptation

Selective Advantage

Behavioural
adaptation

Mimicry

Which rabbit has the selective advantage?



Which rabbit has the selective advantage?



Natural Selection

A process that occurs when characteristics of a population of organisms change over time.

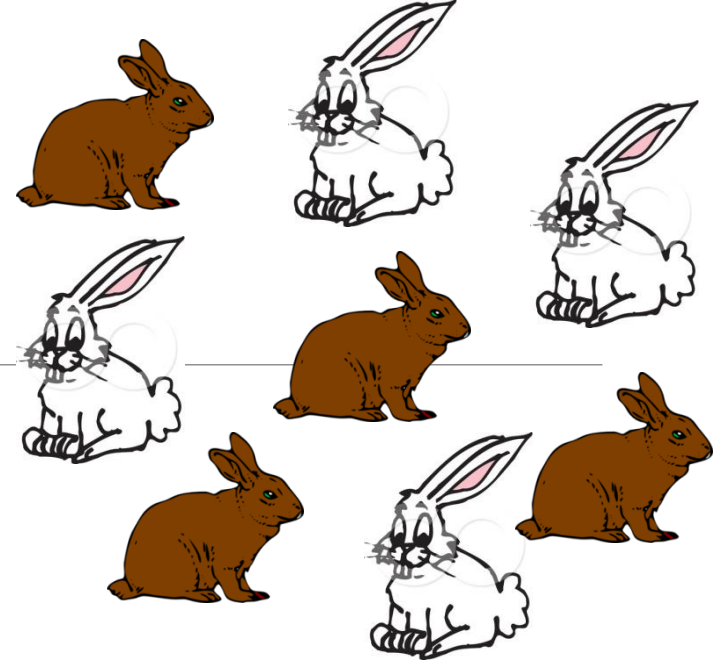
Different variations (resulting from mutations) in the population may be a selective advantage for organisms.

Their ability to mate and pass on their alleles to the offspring causes the growth of a new population of organisms with the same genetic trait.

Selective Pressure

Selective Pressure:

When the environment changes it exerts pressure on a population of species. Due to this environmental pressure, traits with a selective advantage will be favoured through the process of natural selection



Winter



Types of Selective Pressures

Selective pressure can come in the form of :

- 1) Biotic Factors (Living things)
- 2) Abiotic Factors (Environmental pressures)

1) Biotic Pressures

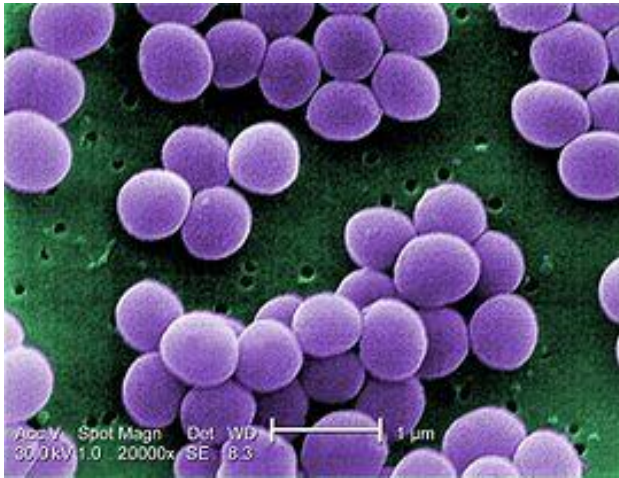
A living component that affects another organism. Ex.: predators, parasites, competition between two organisms for resources



Different environmental conditions (i.e. snow, grass, forest) enabled different variations of rabbits to camouflage with their surroundings. Rabbits that were better able to camouflage were able to escape their predators and survive.

2) Abiotic Pressures

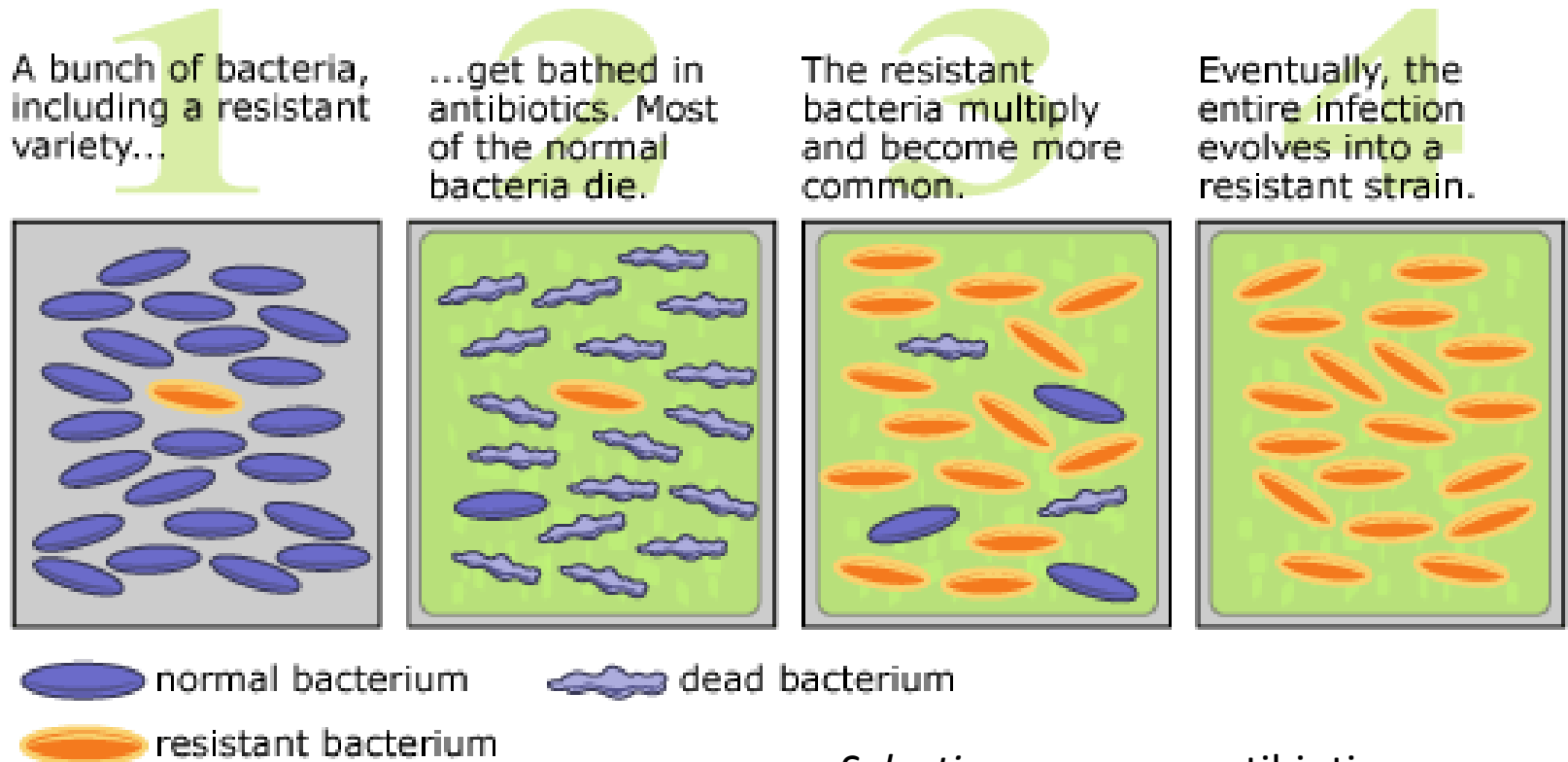
Changes in the environment that can alter the behaviour in a population. Ex.: Weather, Urban vs. Rural, Pesticides, Antibiotics



Genetic mutations in the bacteria may allow them to survive in the presence of an antibiotic. The bacteria with the selective advantage undergoes mitosis and produces identical offspring with the same genetic sequence.

Bacterial resistance

2) Abiotic Pressures – Antibiotic Resistance



Selective pressure: antibiotics

Selective advantage: mutation/resistance

Natural Selection is Situational

Natural selection is *situational* because it depends on its environment and the traits that are available

It does not anticipate the change in the environment and thus has *no direction or purpose*.

There are times when one trait may have no relevance for survival until a selective pressure turns that trait into a selective advantage.

Natural Selection & Fitness



“Since Darwin said it's survival of the fittest, I thought I'd better take up an aerobic sport.”

Fitness: the contribution that an individual makes to the next generation by producing offspring that will survive long enough to reproduce.

Natural Selection & Fitness

When an organism has a *high degree of fitness* it is referring to its trait having a selective advantage in a particular environment.

Fitness is the ability of an organism to reproduce and create *viable offspring*

The higher the reproductive rate of an organism the greater the degree of fitness.

Artificial Selection

Selective pressure exerted by humans on populations as a means to improve or modify particular desirable traits.

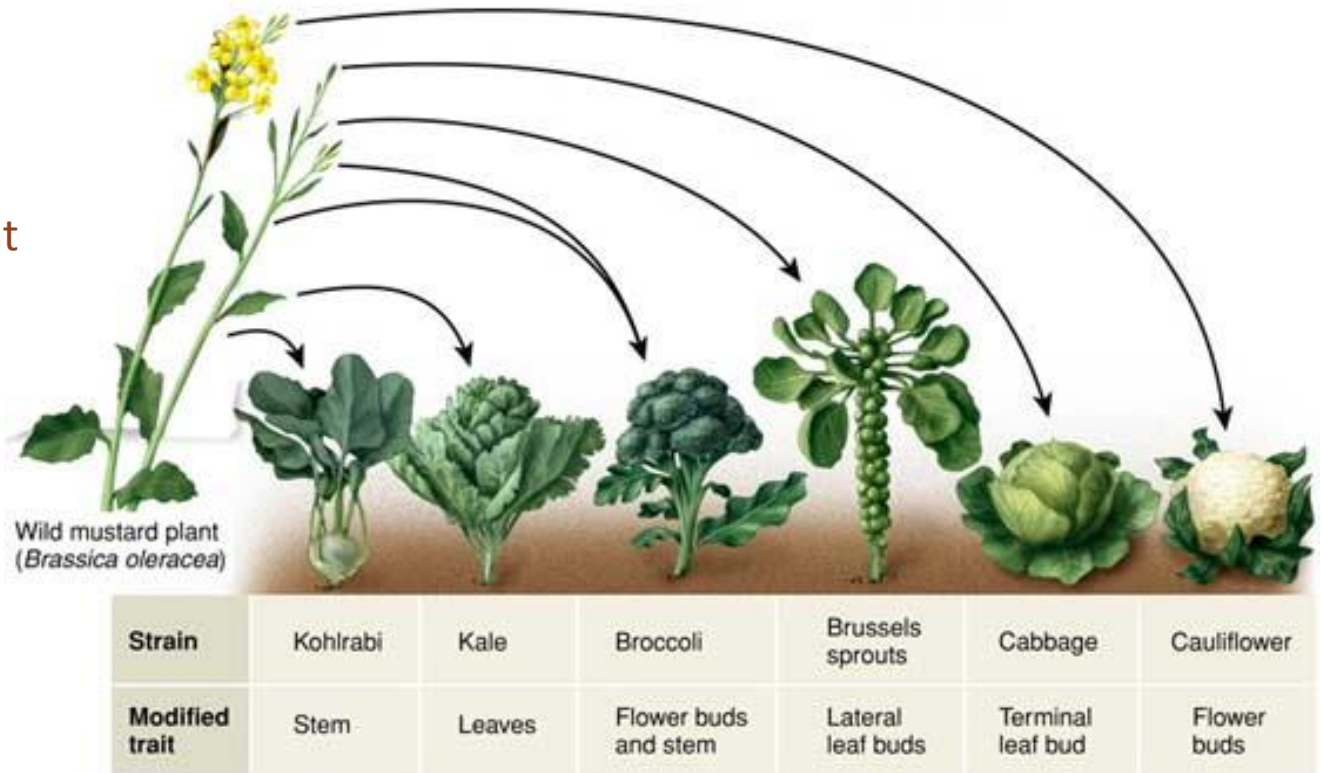


Natural selection vs. artificial selection: natural selection, the environment plays the role that humans play in artificial selection

Ex. Of Artificial Selection

The wild mustard plant has been selectively bred.

Different parts of the flower had been modified to create a variety of food crops.



Artificial Selection & Food Crops

Why would farmers selectively breed crops?

- 1) To increase nutritional value
- 2) To increase the production at harvest, thus increasing the economy for countries dependent on crops.
- 3) To be drought-resistant or pest-resistant (allowing seasonal harvest)

Consequences of Artificial Selection

- 1) Certain inherited traits may cause severe side effects within organisms.

Breeders breed bulldogs so that they can inherit the flat face. The flat face trait can cause severe respiratory problems.



Consequences of Artificial Selection

2) Monoculture: Selective breeding in plants, has the tendency to produce genetically identical plants.



This reduces the genetic diversity so that farmers are able to produce the quantity and type of plants they need.

Consequences of Artificial Selection

3) Gene Banks: Seeds of plants are preserved so that their genetic combinations are available to farmers.



The genes that are collected are those of plants that were able to survive certain environmental conditions and reproduce.

This helps protect against natural disasters.

Checking for Understanding

Which best describes a selective pressure?

- A) a characteristic that reduces an organism's chance of survival
- B) The process by which populations change biologically over time as organisms pass their traits to offspring.
- C) The process by which individuals change biologically over time as organisms pass their traits to offspring.
- D) a characteristic that improves an organism's chance of survival.
- E) Environmental conditions that select for certain characteristics of individuals and select against other characteristics that are not adaptive.

Checking for Understanding

Which of the following is an example of natural selection?

- A) the speed of a racing greyhound dog
- B) the long fur of a Persian cat
- C) the high oil content of some types of corn crops
- D) antibiotic-resistant bacteria
- E) crops modified to be pest-resistant

Checking for Understanding

What is the end product of natural selection?

- A) mutation
- B) adaptation
- C) monoculture
- D) environmental change
- E) artificial selection

Checking for Understanding

What is the source of new alleles in a population?

- A) selective pressure
- B) natural selection
- C) mutation
- D) adaptation
- E) selective advantage

Homework

Which best describes a selective pressure?

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- B) The process by which populations change biologically over time as organisms pass their traits to offspring.
- C) The process by which individuals change biologically over time as organisms pass their traits to offspring.
- D) a characteristic that improves an organism's chance of survival.
- E) Environmental conditions that select for certain characteristics of individuals and select against other characteristics that are not adaptive.