

Variation

Variation refers to the differences between individuals of the same species.

There are three causes of variation in a species:

1. **Genetic causes**
2. **Environmental causes**
3. **A combination of genetic and environmental causes**

1. Variation due to Genetic cause

- **Variation** is the differences between individuals of a **population**, many of these differences are caused by **genes**, inherited from **parents**.
- **Genetics Variation:** When **gametes** from the mother and father fuse together in **fertilisation**, their **genetic information** is combined, creating a unique set of **chromosomes** and causing **genetic variation**.
- **Mutations:** Genetic variants arise due to **mutations** in **DNA**. **Mutations** occur continuously but most of them have no effect on the organism's **phenotype**. Occasionally, **mutations** will cause changes to the **protein** that is expressed and therefore change the **phenotype** of the organism. **Mutations** can cause rapid changes in a species if the new **phenotype** makes the organism more suited to an **environmental change**.
- **Example:** Characteristics in humans determined solely by **genes** include eye colour, blood group, **inherited disorders** and the ability to roll the tongue.

2. Variation due to Environmental causes:

- **Environmental Variation:** **Variation** between organisms can also be caused by **environmental differences**. **Environmental variation** covers everything that could cause organisms to be different that isn't down to **genetics**.
- **For example:**

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- People living in different areas of the world have different **accents** and speak different **languages**.
- **Accidents** can cause scarring, injuries or even loss of limbs.
- **Plants** grow more healthy when they have lots of **light** than in the dark.

3. Variation due to combination of genetic and environmental causes

- Most characteristics are due to interactions between both **genetic** and **environmental** factors.
- How **tall** a human can potentially grow is determined by its **genes**, inherited from its **parents**. However, if they have a poor **diet**, they will struggle to grow to their full capacity so will be **shorter**.
- **For Example : body weight and skin colour.**

GENETIC VARIATION VERSUS ENVIRONMENTAL VARIATION

Genetic variation is the variation of genomes between individuals in the same species

Some examples include coat colors of animals, skin color, hair color, color of eyes, freckles, and dimples

Can be caused by mutations of genes, gene flow, random mating, random fertilization, and crossing over between homologous chromosomes

Pass through generations and through natural selection, and affect evolution

Environmental variation is the alteration of the phenotype of a particular genotype as a response to the environment

Phenotypic differences in identical twins are an example

Can be caused by the external environmental factors such as light, temperature, moisture, climate, exposure, minerals, diet, culture, & lifestyle

Do not cause changes in the genome, and have no effect on evolution

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