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A single-base difference between individuals, resulting from a base substitution mutation.

A structural change to a gene at the molecular level: a substitution, insertion or deletion of bases.

Insertion or deletion of bases (not a multiple of three) shifts the reading frame, changing every following codon.

The genetic code is degenerate, so the new codon may code for the same amino acid.

Chemical: benzo[a]pyrene, nitrosamines (tobacco smoke), mustard gas. Radiation: UV, X-rays, gamma rays.

Mutagens (chemicals and radiation) and errors in DNA replication or repair.

Germ cell: can be inherited by offspring.
Somatic cell: not inherited, but can cause cancer.

Mutations can occur anywhere in the genome (some bases more often); no natural mechanism deliberately changes a base to change a trait.

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Why is mutation essential for evolution?

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Risk of commercial genetic tests

Without expert interpretation, information on future disease risk could be misunderstood.

It is the original source of all genetic variation (new alleles) on which natural selection acts.