

# Mutations

- change in DNA that affects genetic code  
Mutations can be:

- |                 |                     |                |
|-----------------|---------------------|----------------|
| <b>Harmful</b>  | <b>Beneficial</b>   | <b>Neutral</b> |
| - sickle cell   | - Immunity to HIV   | - eye color    |
| - Down syndrome | - Lactose tolerance | - birthmarks   |

Mutations can be caused by:

- |                           |                                       |
|---------------------------|---------------------------------------|
| <b>Acquired</b>           | <b>Inherited</b>                      |
| - environmental damage    | - parent → child <sup>egg/sperm</sup> |
| - mistakes in DNA copying | - must occur in <u>gamete</u>         |

## Types of Mutations

### - Point mutation

- only changes 1 amino acid
- changes 1 base or 1 codon
- Substitution mutation
  - one nucleotide is replaced by another ATC → ATG
  - many substitutions are silent - cause no change in AA

more serious

### - Frame shift mutation

- one or more nucleotides inserted or deleted
- shifts reading frame for rest of protein
- protein after mutation will be changed
- Insertion - add nucleotide
- Deletion - removing nucleotide