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|  | **Mutation** = Change in the DNA code or sequence |
|  | 1. **Reproductive Cells**
* Egg or sperm cell
* Passed onto offspring

- possible effects include: production of a new trait, dysfunctional protein, lethal, or positive effects (evolution)1. **Body Cells**

- Change in body cell (liver, skin, brain, etc.) * No passed to offspring

-possible effects include: damage function of that cell |
|  | 1. **Point mutation =** change in single base pair in DNA

**Example: CTT 🡪 CAT** **Possible effects:** wrong amino acid is made so the function of the protein could be messed up1. **Frameshift mutation** = single base is added or deleted from DNA sequence which causes shift in reading of the codons

**Example:** * **Deletion = GCCATTCGC 🡪 GCATTCGC**
* **Insertion = GCCATTCGC 🡪 GCCATCTCGC**
* **Inversion = GCCATTCGC 🡪 GCCTTACGC**
* **Translocation = GCCATTCGC 🡪 GCCCGCATT**

**Possible effects:** all amino acids after the addition or deletion are wrong. This is SO much worse. |
|  | 1. **Chromosomal mutation** = change in chromosome

**Examples:*** 1. Deletion: nucleotide sequence is deleted
	2. Insertion: new nucleotide added
	3. Inversion: nucleotide rotates 180o
	4. Translocation: moved to new location

**Possible Effects:** offspring dies, or sterile  |

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|  | **Causes of Mutations:** * Spontaneous- mistakes during transcription
* Mutagen= any agent that can cause change in DNA

Ex: **R**adiation (X-rays, UV Light)  **C**hemicals (asbestos, cyanide, formaldehyde)  **H**igh Temperatures  |