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Sex Determination in Various Animals Including Humans-Male and

Female Heterogamety

Sex Determination

- Henking discovered the genetic/chromosomal basis of sex determination by working on insects. He observed specific nuclear structures during spermatogenesis in insects. He named these structures as X bodies.
- He observed that after spermatogenesis, 50% of the sperm obtained these structures, while 50% did not.
- Later on, it was found that the X body observed by Henking was actually a chromosome and thus, this chromosome was named X chromosome.
- Chromosomes involved in sex determination are called sex chromosomes, while the other chromosomes are called autosomes.
- XO type of sex determination
    - Other than autosomes, at least one X chromosome is present in all insects.
    - Some sperms contain X chromosomes, while some do not.
    - Eggs fertilised by sperms having X chromosomes become females. So, females have two X chromosomes.
    - Eggs fertilised by sperms not having X chromosomes become males. So, males have only one X chromosome.
    - Example of organisms with XO type of sex determination − Insects
- XY type of sex determination
    - Males have X chromosome and its counterpart Y chromosome, which is distinctly smaller. Hence, males are XY.
    - Females have a pair of X chromosomes. Hence, females are XX.
    - Example of organisms with XY type of sex determination − Humans and *Drosophila*

- Male heterogamety − XO and XY types of sex determination are examples of male heterogamety.
    - In XO type, some gametes have X chromosomes, while some gametes are without X chromosomes.
    - In XY type, some gametes have X chromosomes, while some gametes have Y chromosomes.
- Female heterogamety − ZW type of sex determination is an example of female heterogamety.
    - In ZW type, the female has one Z and one W chromosome, while the male has a pair of Z chromosomes.

Mutation, Pedigree Analysis, & Genetic Disorders

Mutation

- Alteration of DNA sequence resulting in changes in genotype and phenotype of organisms
- DNA helix runs in a chromatid, hence any change (insertion or deletion) in the DNA sequence affects the chromosome.
- Point Mutation − Mutation arising due to change in single base pair of DNA as in sickle cell anaemia
- Frameshift Mutation − Mutations arising due to deletion or insertion in DNA sequence
- Mutagens − Chemical or physical agents that lead to mutations Example − UV radiations