Lab -6-

Sex-linked inheritance

About 1910, T.H. Morgan and his students at Columbia University began to study inheritance in Drosophila. Among the first mutants found were flies that had developed white eyes instead of normal red eyes.

The researchers noticed that eye color inherited as if the causative gene were located on the X chromosome, and missing from the Y chromosome.Red was dominant to white

1- If **homozygous** red-eyed female was mated to a white eyed male, all the offspring had red eyes; but if a **white eyed female** was mated to a **red-eyed male**, the **males** had white eyes.
2- When a **heterozygous red-eyed female** was crossed to a **red-eyed male**, half the sons (male) were white-eyed.
3- The results were compatible with the hypothesis that the color eyes gene of ***Drosophila melanogaster*** is located on the X chromosome, but not on the Y.
4- Trait that inherited in this way are called sex linked Inheritance.
5- The female, since she has two X chromosomes may be either homozygous or heterozygous for an X-linked gene.
6- A male having one X-chromosome, is said to be hemizygous

Sex-linked inheritance: traits that transmitted from parents to offspring are carried on the sex chromosomes X and Y.
Since females are XX chromosomes and males have XY chromosomes, the Y-linked traits are transmitted via males only.

There are certain diseases come from allele linked to X chromosome but are recessive, the **females act as a carrier if they have only one recessive allele** , such as colour blindness (b) , haemophilia (h) , etc.

Males are more susceptible to get sex-linked diseases because only one copy of allele is enough to cause diseases.

Types of Sex-linked Inheritance females are homogametic with XX chromosomes and males have XY chromosomes, the Y-linked traits are transmitted via males only.

1-X-linked Inheritance : The X chromosome is larger than the Y chromosome. **Any disorder or trait that is transmitted from the X chromosome.** X-linked inheritance can either be recessive or dominant.

Triat (disorders)	Type of allel	symbol of allel	Non infected person	Carrier non infected	Infected person
Color blindness	recessive	b	X^BX^B-X^BY	X^BX^b	X^bX^b-X^bY
Haemophilia	recessive	h	X^HX^H-X^HY	X^HX^b	X^hX^h-X^hY
Vitamin D-resistance Rickets	dominance	D	X^dX^d-X^dY	X^DX^d	X^DX^D-X^DY

2- **Y-linked Inheritance**

The mutated gene is present in the Y chromosome,. so the Y –linked inheritance is present in males only, Y-linked disorders are transfer from fathers to male offspring. **Webbed toiesm,** see Figure (6-1) **,hairy pinna** (presence of long dark hair on the pinna of ear) is an example of Y-linked inheritance.

Figure (6-1)

Soluted Exercises

Q1) In fruit flies, white eye color is a recessive X-linked trait while red eye color is dominant. What would be the eyes color of the male offspring from a cross between a white-eyed female and a red-eyed male?

The dominant alell is R (Red eyes color)

The recessive alell is r (white eyes color)

P1 X^rX^r x X^RY

G1 X^r X^r X^R Y

F1 X^RX^r , X^rY , X^RX^r , X^rY

The eyes color of the male offspring is white color

Q2) man infected haemophilia married with woman free from disease, what is the genotypes and phenotypes of first filial .

The dominant alell is H (free from Haemophilia)

The recessive alell is h (Haemophilia)

P1 X^HX^H x X^hY

G1 X^H X^H X^h Y

F1 X^HX^h , X^HY , X^HX^h , X^HY

All the first filial are free from disease but the females are carriers the disease with out infection