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SEX-LINKED INHERITANCE

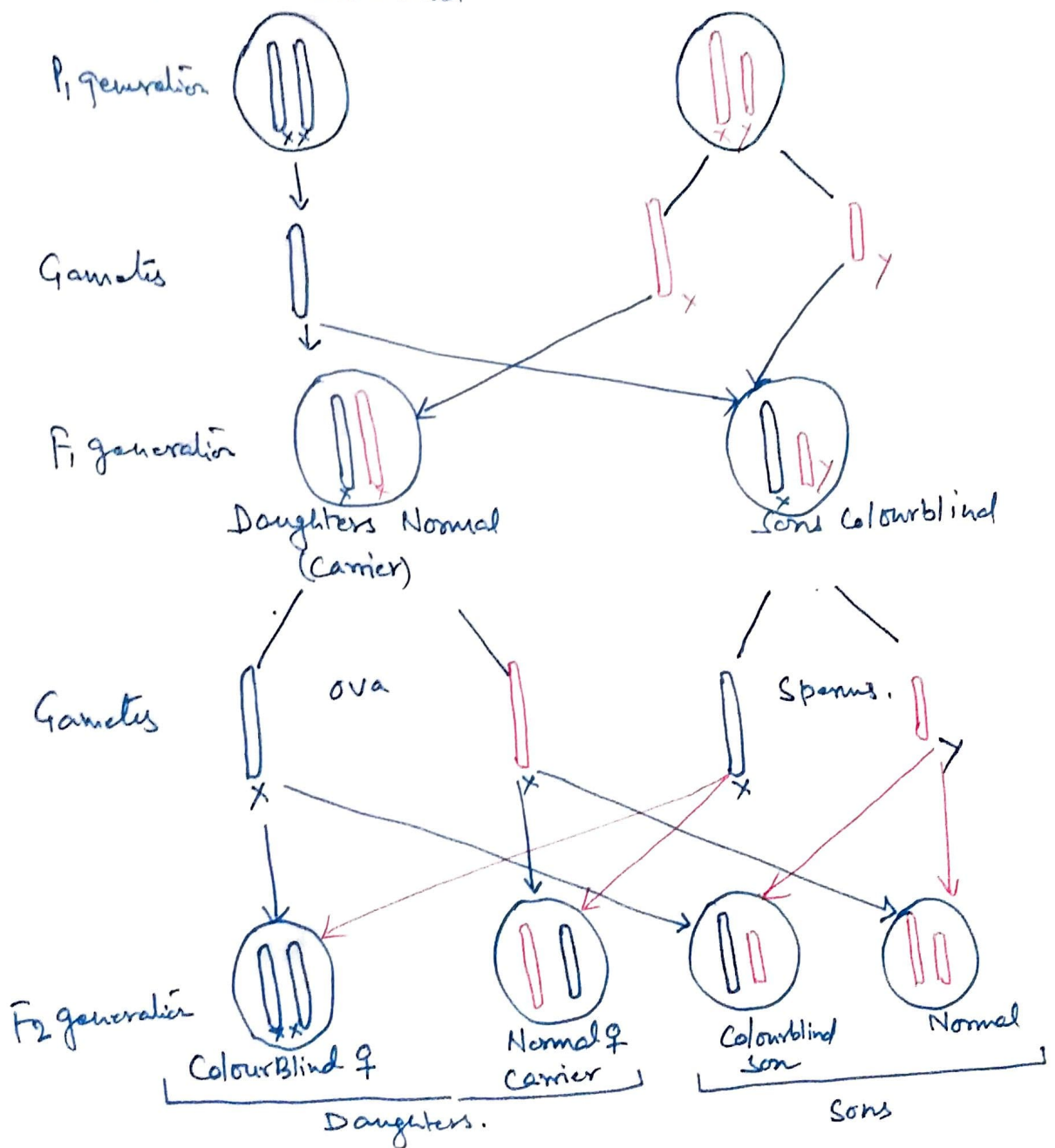
Colour Blindness in Human.

1. Normal Woman married to a Colourblind Man :- When a normal woman is married to a colourblind man all her sons and daughters have normal vision, but when her daughters are married to man with normal colour vision all ~~her~~ ^{some} sons are colourblind. It means that a woman with normal colour vision whose father is colourblind gives birth to children of which about half of the sons are normal and half of the sons are colourblind.
2. Colourblind Woman is married to a Normal Man :- All her sons are colour blind whereas all daughters have normal colour vision. But when these daughters having normal colour vision are married to a colourblind man, the colourblind grandsons and granddaughters are produced with almost equal no. of normal grandsons and granddaughters. It means that a colourblind woman has sons all colourblind and daughters all with normal vision (carrier) and a colourblind woman always has a colourblind father and a carrier mother.

The above results could easily be explained with the assumption that colour vision is sex-linked character and its gene is present on the X-chromosome, Y-chromosome lacks its allele. In man sex-chromosomes are XY while

In woman there are XX. It means that a man possesses only one gene for colour vision, whereas woman possesses two. The normal colour vision is dominant over colour blindness. Therefore, woman will be colour blind only when she has gene for colour blindness in both the X-chromosomes, whereas a man will be colour blind even when this gene is present singly. Woman colour blind

Man Normal



Sex-linked inheritance of colour blindness in Man.

A cross between Colour blind woman with a Normal Man.

From above examples following conclusions may be drawn:

- 1). Colour-blindness is more common in males than in females.
- 2). Two recessive genes are needed for the expression of colour-blindness in females, whereas only one gene expression in males.
- 3). Males are never carrier.
- 4). Colourblind woman has always colourblind father and always produce colourblind sons.
- 5). Colourblind women produce colourblind daughters only when their husbands are colourblind.
- 6). Women with normal colour vision, whose fathers are colourblind, produce normal & colourblind sons in approx. equal proportion.

② Haemophilia: Bleeder's disease, haemophilia, in man is restricted to male members. In haemophilic man the blood fails to clot when exposed to air and even a small skin injury results in continuous bleeding & can lead to death. In normal man blood clots in 2-8 minutes.

It is caused by a sex-linked recessive gene located on x-chromosome. It is inherited in the same manner as colour-blindness i.e. its single gene in man results this disease, whereas a woman needs 2 such genes.

③ Dominant Sex-linked genes: There are some dominant sex-linked genes. One dominant sex-linked gene produce defective enamel of the teeth and is found more frequently in woman than in man because there are two x-chromosomes in woman and only one in man.

- ④ Inheritance through γ -chromosome: In *Drosophila* the sex linked genes are found to be located in X-chromosomes and γ -chromosome has been described empty. But few genes are also found in non-homologous part of γ -chromosome. For Ex. There are two genes for male sterility which are located in the non-homologous part of γ -chromosome. Similarly 17 genes are present on γ -chromosome of man. Hypertichosis (long hair growth on the ear) is a γ -linked character.
- ⑤ Sex limited Genes

Such genes are present in autosomes but their ^{expression is determined by} presence or absence of the sex-hormones. Therefore, these express themselves only in one sex. They are different from sex-linked genes present on sex-chromosomes. For Ex. beard development in human being is a sex limited character. Similarly deep voice in male, ossiculature in male expressed only in presence of sex hormone. Likewise, female voice, development of breast and female ossiculature is sex limited characters.

- ⑥ Sex Influenced genes: — These are also present on autosomes whose dominance is influenced by the sex of bearer. For example baldness is dominant in male and recessive in female. This is because the gene for baldness (B) in heterozygous state (Bb) expresses itself in male, but not in female. It means gene (B) for baldness behaves as a dominant in male and recessive in female.

Genotype	Male	Female
BB	Bald	Bald
Bb	Bald	Not bald.
bb	Not bald	Not bald.