Quadrant II- Transcript and Related Material

Programme	: Bachelor of Science (First Year)
Subject	: Zoology
Semester	: II
Course Code	: ZOC 102
Course Title	: Diversity of chordates and Genetics
Unit Number	: 8
Module Name	: Sex linked Inheritance -I
Name of the Presenter	: Dr. Kulkarni Rajender Rao.

Notes

CHROMOSOMES are of two types Autosomes (Somatic chromosomes) and Allosomes (Sex chromosomes)

Autosomes (Somatic chromosomes) are 22 Pairs in Human. In reciprocal cross of characters whose genes are present on the autosomes, no change occurs in phenotypic ratio.

Allosomes (Sex chromosomes) are one pair. XX Female homogametic XY Male heterogametic. Phenotypic ratio changes due to sex linkage in reciprocal cross of characters whose genes are present on the allosomes.

Sex linked inheritance is transmission of characters /traits by the genes present on the sex chromosomes / Allosomes. Genes present on sex chromosomes are called Sex linked genes and characters expressed by them are called Sex linked Characters.

If Locus is only on X Chromosomes the genes are known as **X** - linked genes. I and characters regulated by them are **X** linked characters. The pattern of inheritance of these genes or characters is **X** linked inheritance. e.g. Haemophilia, Colour Blindness

Dominant Sex linked Inheritance occurs only in homogametic sex. Female in human XX, Males in birds ZZ, Carry two alleles - Homo or heterozygous

In heterogametic sex i.e. Male (XY) in Humans, Females in Birds (ZW), Hemizygous

Carry only one allele. It is expressed more in Females. e.g. Barred pattern in poultry.

Recessive Sex linked Inheritance. To express it female requires 2 genes, male -1 gene. Hence expressed more in heterogametic males.

e.g.Eye colour in drosophila, Haemophilia, Colour blindness in Man.

Pseudo Dominance – Single recessive gene expression in absence of dominant gene.

If Locus is only on both X and Y Chromosomes the genes are known as **XY** - linked genes and characters regulated by them are **XY** linked characters. The pattern of inheritance of these genes or characters is **XY** linked inheritance. e.g.Xeroderma pigmentosum.Nephritis, Retinosa pigmentosa.

If Locus is only on Y Chromosomes the genes are known as **Y** - linked genes (Holandric genes) and characters regulated by them are **Y** linked characters. The pattern of inheritance of these genes or characters is **Y** linked inheritance.

Y chromosome in Man is small in size; do not have all alleles / loci of X Chromosomes. Thus only few genes are Y linked and confined to only males- i.e. always passes from affected father to son. E.g. hypertrichosis, Ichthyosis (Holandric sex linkage).

Morgan (1910) found mutant white eyed male and Crossed with wild Variety i.e. red eyed Female Drosophila. All F_1 progeny were Red eyed i.e., red is dominant over white.(w+)

On Inbreeding obtained 3 red eyed female and 1 white eyed (all male) in F2.

On reciprocal cross F2 progeny was 1Red eyed female: 1Red Eyed male: 1 White eyed male: 1 Red eyed female

Hypothesis. Eye Color gene is located on X chromosome. Male is hemizygous, white. Mutant male genotype is w/Y. female may be homologous or heterologous. Wild red female genotype w+w+ (Homozygous Red Eye).The F1 flies were w+w females w+Y males. F2 data Show criss cross pattern of inheritance.

Transmission of Mutant eye colour from father to daughter to Grandson.-**Diagynic** .from Mother to Son to granddaughter- **Diandric**

Red eyed female XX(w+w+) White eyed male XY (wy) produced all red eyed progeny. XX (w+w) Red Eyed female and XY(w+Y)Red Eyed male.

In reciprocal cross Red eyed male XY(w+Y) White eyed female XX (ww) produced XX (w+w) Red eyed female and XY(wY) white eyed male.

When Red eyed female XX (w+w) is crossed with Red eyed male XY(w+Y) the progeny were with Red Eyed female XX (w+w+) XY Red Eyed male(w+Y) XY and White Eyed (XY) wY, significance only male are white eyed.

Red Eyed female XX (w+w) crossed with White Eyed male XY(wY) the progeny were XX Red Eyed female w+w, XX White Eyed female ww, XY Red Eyed male w+Y and XY White Eyed male wY. Both male and female Red and White eyed in equal number.

Nasse's Law - transmission of sex linked Characters /diseases from affected father to grand children through their daughters in Criss Cross Pattern of inheritance.e.g. haemophilia affects only boys but is transmitted through mothers and sisters.

Male receive X chromosome always from Mother and Y chromosome only from father. Female gets X Chromosomes from Both parents. X linked Dominance traits appear more in Homogametic female, If Mother is Carrier for mutant Gene 50% of Sons and Daughters are affected.50% are normal. If father is carrier – 100% daughters and 0% sons gets the disorder.

X Linked recessive inheritance frequency is more in males/heterogametic as they have only one X chromosome .50%, In female/homogametic (33%) If both parents have the mutant gene (female- Carrier) 100% daughters will have and only 50% sons. **Complete sex Linkage.** X and Y Chromosomes are not similar. X is large Y is short. Upper parts of both chromosomes are not same. Non homologous (Heterologous). No genes on Y. Genes present only on X chromosomes and are Linked and inherit together, No crossing over – Completely sex linked inheritance. e.g. Haemophilia ,Colour blindness.

Incomplete sex linkage – Lower parts of both the chromosomes same. Homologous having same genes. Genes present on Homologous regions of X and Y. No linkage. Crossing over occurs. E.g. Retinitis Pigmentosa, Nephritis.