Gonosomal inheritance in pedigree and experiment, examples of traits in man

Two subtypes:

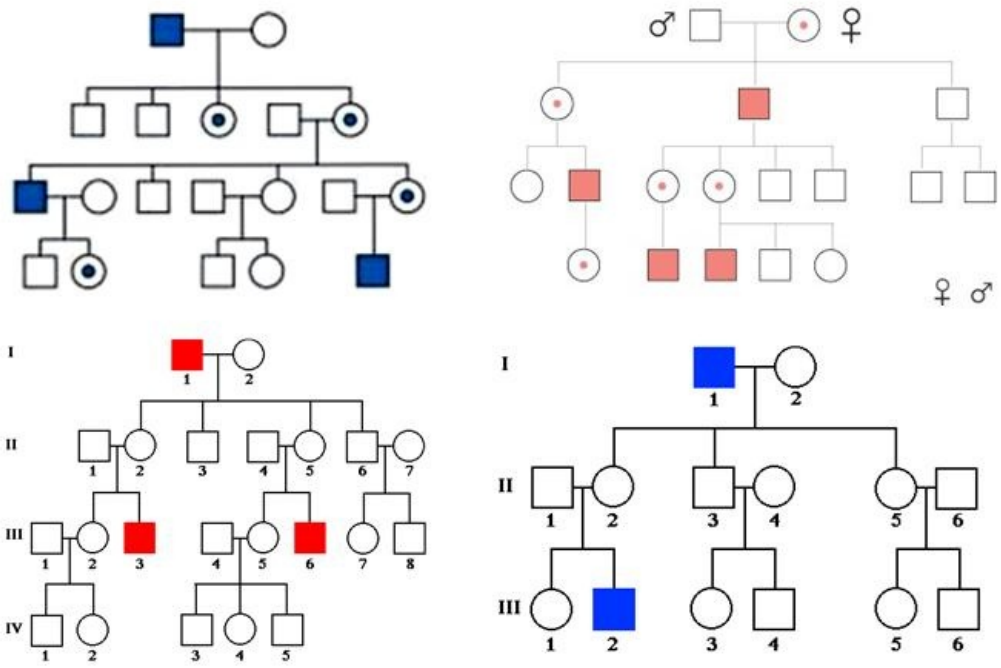
- gonosomal (X-linked) recessive, GR
- gonosomal (X-linked) dominant, GD

Gonosomal recessive - GR

Characteristics of GR pedigrees

- males are much more likely to be affected
- affected males get the disease from their mothers – healthy carriers
- no transmission from father to son
- transmission from an affected grandfather to his grandsons

Examples of GR pedigrees



GR disease/trait examples

- hemophilia A, hemophilia B,
- Duchenne muscular dystrophy,
- color blindness,
- anhidrotic ectodermal dysplasia

Gonosomal dominant - GD

Characteristics of GD (X-linked Dominant) pedigrees

- Only one copy of a disease allele on the X chromosome is required (and sufficient) for an individual to be susceptible to an X-linked dominant disease
- Both males and females can be affected, although males may be more severely affected because they only carry one copy of genes found on the X chromosome
- Some X-linked dominant disorders are (even) lethal in males (in male fetuses).
- When a female is affected, each pregnancy will have a one in two (50%) chance for the offspring to inherit the disease allele.
- When a male is affected, all his daughters will be affected, but none of his sons will be affected.
- Transmission from an affected grandfather to his grandsons

GD disease examples

- vitamin D-resistant (hypophosphatemic) rickets,
- incontinentia pigmenti,
- Alport syndrome,
- amelogenesis imperfekta (X-linked)

X linked inheritance in hybridization experiment

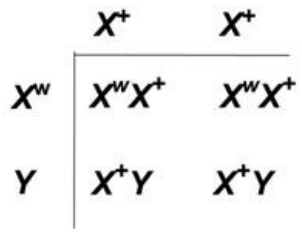
The white (w) locus in Drosophila

A single white-eyed male fly was isolated in the laboratory of T. H. Morgan in 1910, and they studied genetic crosses using this white mutant.

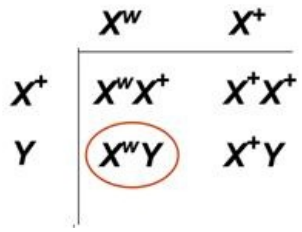
1. When the white male was crossed to wild type (i.e. red-eyed) females, all the progeny were red-eyed. From it they concluded the white mutation was recessive.
2. When the F1 generation members were crossed with one another, 1/4 of the (F2) progeny were white- eyed. But ... The white phenotype was only seen in males.

Schedule is explaining the experimental procedure

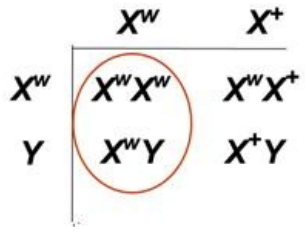
Supposed the white gene is located on the X chromosome, the original male is hemizygous for w allele (genotype XwY). The original cross is represented as XwY x X+X+, and all progeny are wild-type in phenotype.



If F1 siblings are now crossed, X+Y x XwX+, all females are phenotypically normal, and 1/2 of the males are white (1/4 of total progeny) in F2 generation.



In a backcross (Bc), when white males are crossed to heterozygous females, XwY x XwX+, equal numbers of white males and females are observed in the progeny; 1/2 progeny are white-eyed.



In reverse backcross, when white females are crossed to wild-type males, XwXw x X+Y, white female parents give rise to white progeny males.