

MORE CHROMOSOMAL OR MENDELIAN GENETICS

How is biological information transmitted
from one generation to the next?

MENDEL'S SECOND LAW:

The Law of Independent Assortment

Chromosomes sort into gametes without regard to their origin.

Oh, no! Almost right, but too simplistic.

Do alleles on the same chromosome always travel together?

Usually: they are "linked if on same chromosome

Why not? Relationship may be altered

-> CROSSING OVER & RECOMBINATION

must be
homologous
(matching)
chromosome
pair

A good thing?

Ensures variability of the species.

Sometimes there is a mistake in MEIOSIS:

Can be fatal

Many embryos spontaneously aborted, perhaps 1/3 or more!

Or can result in problems like Down's Syndrome:

extra 21st chromosome -> mental retardation

or

If part of 5th is missing result is "Cri du Chat" syndrome

Sometime a mistake happens in cell division after fertilization,
a mistake in MITOSIS

One pair of chromosomes determine a person's sex and regulate sexual development: X & Y

Normal males have XY

Normal females have XX

Therefore all men got their Y chromosome from their dad

$\frac{1}{2}$ sperm have Y and $\frac{1}{2}$ have X, 50:50 chance

Sex chromosomes not like the others: unequal size

X: big with lots of genetic traits,

Y: small with most traits absent

Implications for genetic disorders

Sex-linked Disorders

Color blindness:

Allele for color vision on X chromosome

If mother donates X with colorblind allele,

Son will be color blind as Y has NO allele for color vision

Red-Green color blindness fairly common

Hemophilia:

Inability to form blood clots, can bleed to death

Rare recessive allele

So rare women highly unlikely to inherit 2

Queen Victoria

Some people do not have the normal complement of sex chromosomes
(mistake in meiosis)

One X -> woman with Turner's Syndrome

Trisomy:

XXX -> Woman, infertile

XXY -> Klinefelter's Syndrome

XYY -> Super aggressive men? NO, flawed study

Can say: any deviation from normal number of sex cells is very bad
(highly deleterious)

Humans are complicated

Most traits are controlled by more than one locus:

Skin color, height, weight

Genetics of these traits are extremely complex

These are called POLYGENIC TRAITS

Some alleles have multiple effects:

These are called PLEIOTROPIC ALLELES

and the phenotype is also affected by the ENVIRONMENT
(nutrition, sun exposure, etc)

The alleles are the potential, but

what is realized depends on the interaction of
biology and the environment

Nature and nurture