

Modern Genetics: Patterns of Inheritance Beyond Mendel

1-Incomplete Dominance

not all traits show dominance/recessiveness
in incomplete dominance, the heterozygote
shows a phenotype that is intermediate
between the homozygous dominant
and homozygous recessive condition

ex. flower color in snapdragons

P1: red X white

F1: all pink

even though this seems like old blending
theory, it still follows basic rules of
inheritance

when we cross the F1's together, we get a 1
red: 2 pink: 1 white ratio

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2-Co-Dominance

in this type of inheritance, both alleles express themselves completely

3-Multiple Alleles

this occurs when there are more than 2 forms of a gene in a population

ex. Human Blood Groups show dominance, co-dominance & multiple alleles

Phenotype	Genotype	Antigen	Antibody
A	AA, AO	A	antiB
B	BB, BO	B	antiA
AB	AB	A&B	none
O	OO	none	antiA,antiB

dominance: A is domin to O, B is domin to O

co-dominance: A & B are both expressed

multiple alleles: A, B, O

an antigen: is a protein on surface of RBC

an antibody: is a protein that recognizes & fights foreign substances in the body

if blood type A is given type B blood: antiB antibodies detect this foreign antigen B, they attack and RBC's clump together this can clog arteries

the universal donor: type O, has no antigens

universal recipient: type AB, has no antibodies

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4-Polygenic Traits

these are traits that are controlled by more than 1 pair of genes

ex. hair color, skin color, height

eye color: 6 pairs genes giving tone, amount of pigment, and distribution of pigment

5-Sex determination

how sex is determined in different organisms, there are differences in different species

in humans: 23 pairs chromosomes

22 pairs are autosomes, 1 pair is the sex chromosomes

XX: female, 23 pairs true homologous chrom

XY: male, 22 pairs of homologous chromo.
and 1 pair of nonhomologous chromo.

who determines sex of baby?

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5-Linked genes

chromosomes carry more than one gene
some chromosomes are very gene dense,
carrying 100s of genes, some
chromosomes carry very few genes
genes that are carried on the same
chromosome are linked together,
meaning they are inherited together
Law of Independent Assortment applies to
genes on different chromosomes
but linked genes can be separated by
crossing over in meiosis

6-Sex-linked traits

these are traits carried on the sex
chromosomes
ex. color-blindness & hemophilia
these 2 traits are carried on the X chromo
so females get 2 genes for the trait, males
get only one

7-epistasis

when one gene pair influences the expression of another gene pair

ex. coat color in labrador retrievers

B_: gives black coat color

bb: gives brown color

but there is 2nd gene pair E/e that allows coat color to be deposited in hair (that allows expression of coat color)

E_: allows color to be deposited

ee: does not allow color to be deposited

so: BBEE, BB Ee, BbEE, Bb Ee: black

bbEE, bb Ee: brown

BBee, Bbee, bbee: blonde

Chromosomal Abnormalities

a karyotype is a display of an organisms' chromosomes sorted by # & homologous chromosomes

to get chromosomes: stop cell division during metaphase when chromosomes line up in center of cell, then cells are treated with chemicals which stops cell division the cells are placed on slides, treated w/ H₂O which causes swelling the chromosomes then spread out, then we stain them

homologous chromosomes are distinguished from each other by position of centromere, chromosome size, & banding pattern (staining)

we can then determine the sex and any chromosomal abnormalities

Nondisjunction: failure of homologous chrom to separate during meiosis

ex. Down Syndrome: nondisjunction of #21
3 # 21 chromosomes in every cell in body
this causes mental and physical abnormalities

ex. Klinefelter's Syndrome: XXY
this results in a sterile male

ex. Turner's Syndrome: XO
this results in a sterile female

Deletion: part of chromosome is missing
Crie du Chat: deletion of chromosome #5