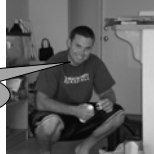


Chapter 4 Modern Genetics



What are you looking at?
We're the Dorchaks!

Don't you see the family resemblances?



Section 1 Human Inheritance

-Humans have some traits controlled by a single gene

-Ex. Dimples, widow's peak, etc



-Some human traits show a large number of phenotypes because the traits are controlled by many genes. The genes act together as a group to produce a single trait

-Ex. Height, skin color

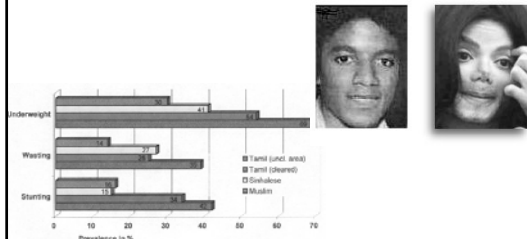
-The various combinations of alleles at each gene will determine the outcome



The Effects of Environment

-effects of genes are often altered/effected by the environment

-Ex. Diet and height/skin color and sun exposure



Male or Female

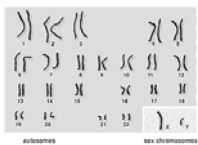
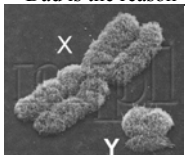
-determined by sex chromosomes

-Female = XX

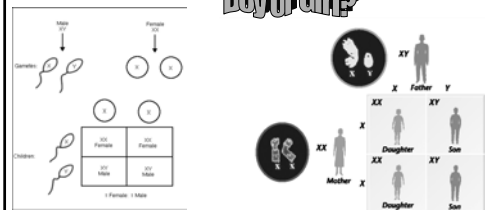
-Male = XY

-Y chromosome is much smaller than the X

-Mother always supplies an X and father will give a X or a Y = Dad is the reason you are a boy or a girl



Boy or Girl?



Autosomes = nonsex chromosomes

-human has 22 pairs of autosomes and one pair of sex chromosomes

-Probability says you have 1/2 for boy and 1/2 for girl

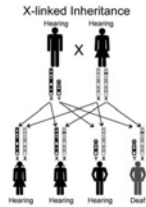
Sex Linked Genes

Sex-Linked Inheritance = only show up in males

-Few genes are Y so few passed on this way from father to son

-However the X chromosome a recessive trait can show up

- 25% chance of a healthy boy
- 25% chance of a boy with the disease
- 25% chance of a carrier female
- 25% chance of a healthy girl



-Trait does not show up in daughter because the other dominant X will mask it

-This is why more boy's show up with problems then girls

-ex. Red-green color blindness

Carrier = person who has one recessive allele for a trait and one dominant – carrier can pass it on



Hey Dorchak, play the video about colorblindness!

Section 2 Human Genetic Disorders

Genetic Disorder = an abnormal condition that a person inherits through genes or chromosomes

-caused by mutations or changes in a persons DNA

-Can happen during meiosis

-Can be a mutation passed from parents

Now is the time to play the 3 min Mpeg of nondisjunction!



Okay! Just please do not hurt me oven mitt!

Cystic Fibrosis

-Genetic disorder where body produces abnormally thick mucus in the lungs

-Hard to breathe

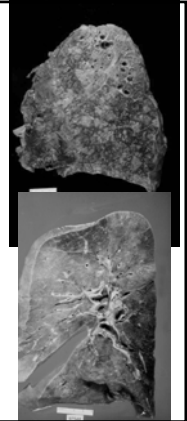
-Bacteria can grow

-Difficult for digestion because of mucus in the intestine

-Carried on a recessive allele

-More common for people with ancestors from N. Europe

-No Cure



Sickle-Cell Disease

-Genetic disorder that affects the blood - affects hemoglobin shape – shape is called “sickle shape”- can not carry as much oxygen – cells can become stuck in narrow blood vessels and block them – suffer from lack of oxygen in the blood and experience pain and weakness

-Most common in african american ancestry –

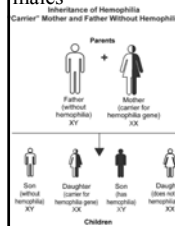
-Person with two sickle-cell alleles will have sickle cell disease but person with one will have sickle-cell trait = resistant to malaria



Hemophilia

-a genetic disorder where a person's blood does not clot – person does not produce a specific protein and person can bleed to death from a simple cut or bruise

-Recessive disorder on X chromosome – more frequent in males



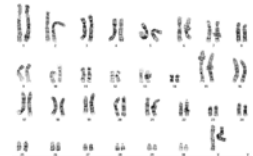
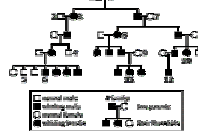
Down Syndrome

- genetic disorder too many chromosomes- extra copy of chromosome 21 from an error during meiosis
- Have some degree of mental retardation – heart defects common



Diagnosing Genetic Disorders

- use pedigrees, amniocentesis and karyotypes to help detect genetic disorders
- Amniocentesis = long needle used to remove a small amount of fluid that surrounds the developing baby
- Karyotypes = picture of all the chromosomes in a cell – used to see if they have the proper number and can tell if boy or a girl



Genetic Counseling

- couples can go to see if they are carrying genetic traits
- Can find their chances of having healthy children



Ike says, "Show the Mpeg Dorchak".

Section 3 Advances In Genetics

Selective Breeding

- the process of selecting a few organisms with selected traits to serve as parents of the next generation
- Used in animals and plants

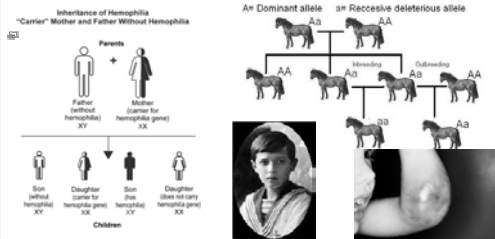
-Ex. Cows



Competitors at a livestock judging, probably the Nebraska State Fair. NSHS.

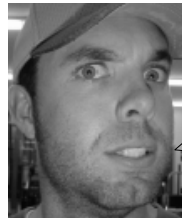
resistance

Inbreeding = crossing two individuals that have identical or similar sets of alleles - offspring will have alleles that are very similar – also increase probability that organism will inherit alleles that lead to a genetic disorder because no new allele combinations

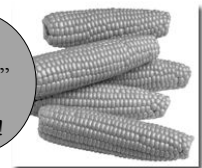


Hybridization

- breeders cross two genetically different individuals to give best of both traits to offspring
- Ex) crossing corn with many kernels with a disease resistant corn to get both traits



No "corny" jokes Hicks!



Cloning

-problem with hybridization is cannot control if desired allele is passed on because of probability

Clone = genetically identical to the organism from which it was produced = exact same genes

- can be done with plants, animals and other organisms



No Member, not these kinds of clones! By the way, Mr. Dorchak has the force! The force of making you take notes!

Cloning Plants

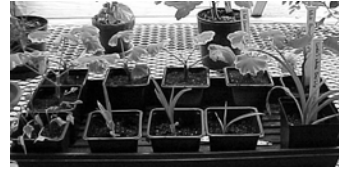
-through "cuttings"

-Cut a small part of the plant

-Place in a proper solution

-Cutting will grow into a new plant

-Genetically identical



Cloning Animals

Dolly was the first cloned animal = a sheep

-removed an egg from a sheep

-Replaced the nucleus with 6 year old sheep

-Egg implanted into the uterus of a third sheep

-Dolly genetically identical to 6 year old sheep

What?



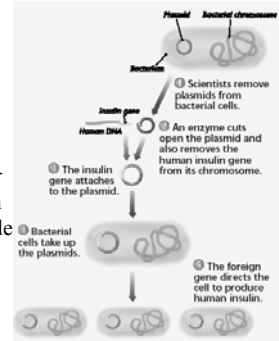
Dolly says play the MPEG!

I did?



Genetic Engineering in Bacteria

-insert DNA from other organisms into bacteria
-the bacteria will produce the protein that the human gene codes for (ex. Insulin) – insulin can be collected to treat people who can not make this protein



Genetic Engineering in Other Organisms

-today can put a gene from bacteria into food – helps fight diseases, pests, temperature, etc.

-Have inserted genes into animals to produce medicine

-Ex) Cows milk and hemophilia



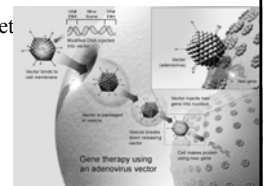
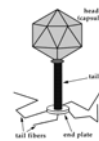
Gene Therapy

-inserting working copies of a gene directly into the cells of a person with a genetic disorder

-Insert into harmless viruses

-Patient has virus infect the genes and the person now produces the protein

-Promising but not functional yet



DNA Fingerprinting

- DNA is cut by enzymes
- Electrical current passed through the DNA
- Current separates the pieces by bands to form a pattern
- each persons bands are different because each person has different DNA sequence
- Used for crime scene investigation

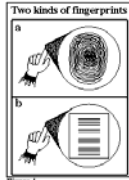
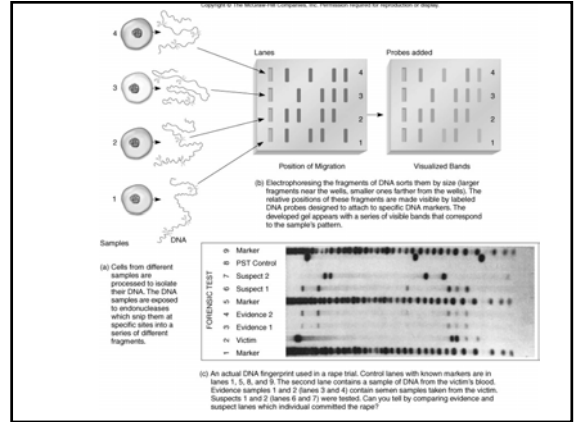


Figure 1
a) Conventional fingerprint
b) DNA fingerprint



Human Genome Project

- 3 billion characters long – people all across the world working together
- Genome = all the DNA in on cell of an organism
- Human genome = 60,000 to 80,000 genes
- Project = identify every DNA sequence of every gene in the human genome
- Will mean we know the amino acid sequence of every protein
- Will lead to treatments, understanding, and strategies for things like cancer and genetic disorders

Nice

