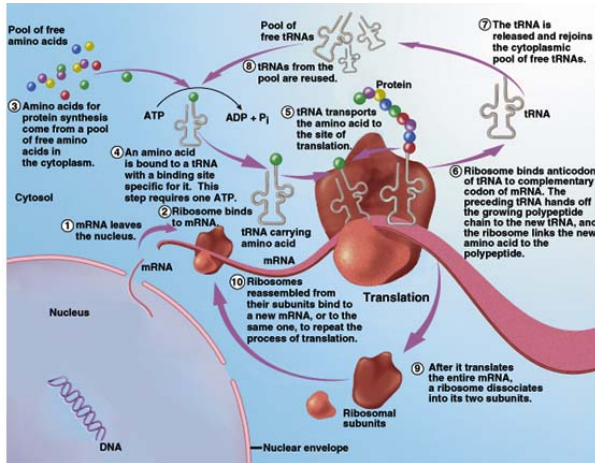
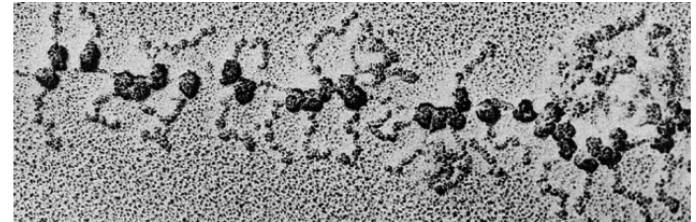


Translation of mRNA Flow Chart



Polyribosome Formation



- Polyribosome
 - cluster of 10-20 ribosomes reading mRNA at once
- Horizontal filament - mRNA
- Large granules - ribosomes
- Beadlike chains projecting out - newly formed proteins

DNA & Peptide Formation

① DNA double helix



② DNA coding strand

TAC CGC CCT TGC GTA CTC ACT

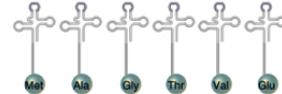
③ Codons of mRNA

AUG GCG GGA ACG CAU GAG UGA
"Start" "Stop"

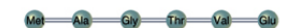
④ Anticodons of tRNA

UAC CGC CCU UGC GUA CUC

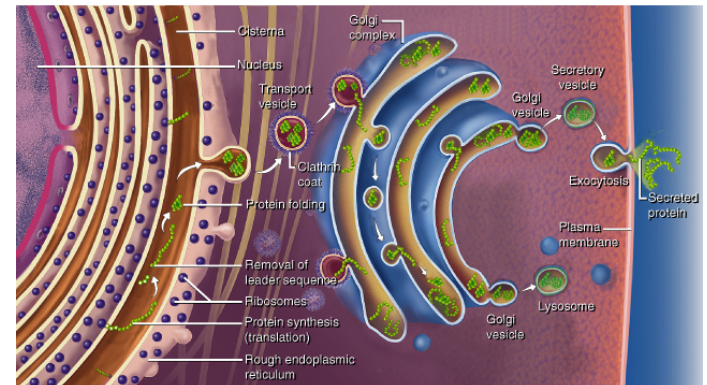
⑤ Amino acids



⑥ Peptide

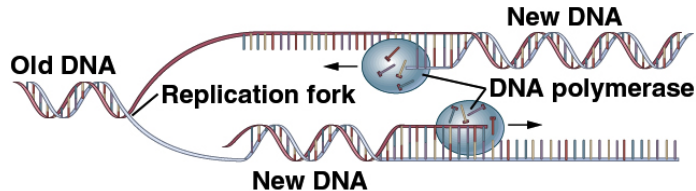


Protein Packaging & Secretion



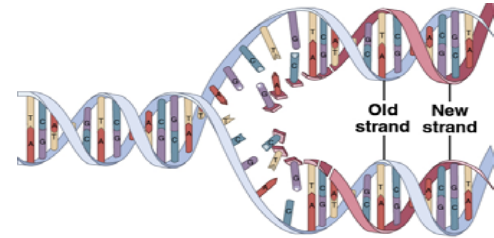
DNA Replication

- DNA unwinds from histones
- DNA helicase opens short segment
 - point of separation called replication fork
- Replication by DNA polymerase
 - one strand replicated from replication fork
 - other strand replicated from opposite direction



DNA Replication

- Semiconservative replication
 - each new DNA has one new helix and the other helix conserved from parent DNA



- Each new DNA helix winds around new histones to form nucleosomes

Mutagens

- Trigger gene mutations
 - cell may die, be destroyed by immune system or produce a tumor

Defenses against mutagens

- Scavenger cells
 - remove them
- Peroxisomes
 - neutralize nitrites, free radicals and oxidizing agents
- Nuclear enzymes
 - repair DNA
- Tumor necrosis factor (TNF) destroys tumors

Chromosomes

- Karyotype
 - chart of chromosomes at metaphase by size, structure
- Homologous chromosomes
 - 2 chromosomes in each pair, 1 from each parent
 - autosomes (22 pairs)
 - sex chromosomes (X and Y)
- Germ cells - sperm and egg cells, haploid
- Somatic cells - all other cells, diploid

Genes and Alleles

- Gene loci
 - location of gene on chromosome
- Alleles
 - two homologous chromosomes have same gene at same locus, may be different forms of gene
- Dominant allele
 - produces normal, functional protein
- Recessive allele
 - when both alleles are recessive produces abnormal protein or no protein

Genetics of Earlobes

- Genotype
 - alleles for a trait (DD)
- Phenotype
 - trait that results
- Dominant allele (D)
 - expressed with DD or Dd
 - Dd parent 'carrier' of recessive gene
- Recessive allele (d)
 - expressed with dd only

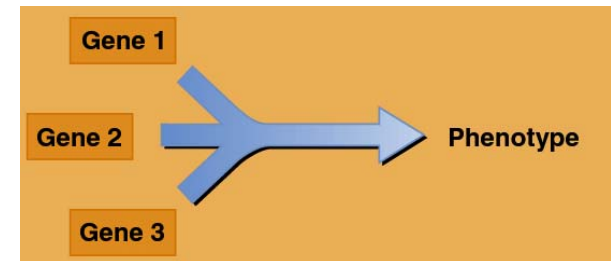
D	d
DD Homozygous, detached earlobe	Dd Heterozygous, detached earlobe
Dd Heterozygous, detached earlobe	dd Homozygous, attached earlobe

Punnett square

Multiple Alleles, Codominance, Incomplete Dominance

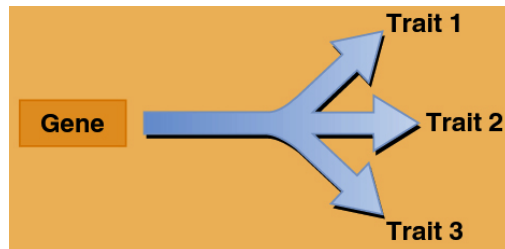
- Gene pool
 - collective genetic makeup of whole population
- Multiple alleles
 - more than 2 alleles for a trait
 - such as I^A , I^B , i alleles for blood type
- Codominant
 - both alleles expressed, $I^A I^B$ = type AB blood
- Incomplete dominance
 - phenotype intermediate between traits for each allele

Polygenic Inheritance



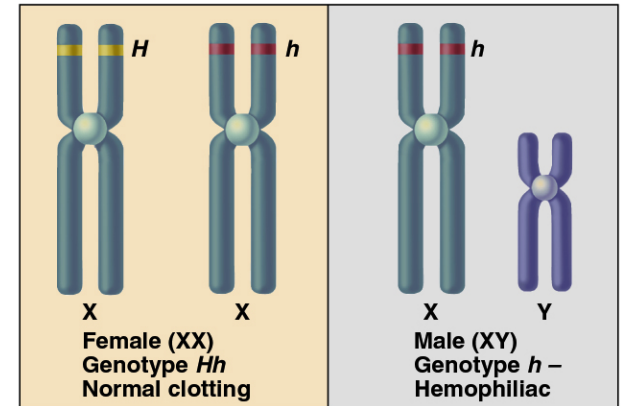
- 2 or more genes combine their effects to produce single phenotypic trait, such as skin color

Pleiotropy



- Single gene causes multiple phenotypic traits, as in sickle-cell disease

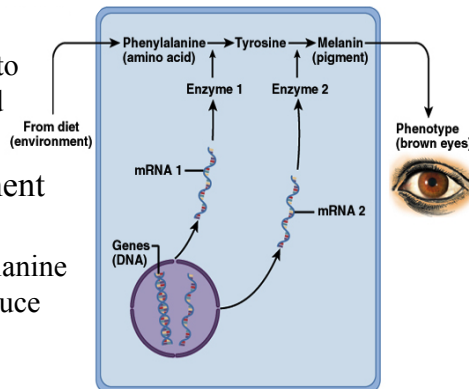
Sex-Linked Inheritance



- Recessive allele on X, no gene locus for trait on Y, so hemophilia more common in men

Penetrance and Environmental Effects

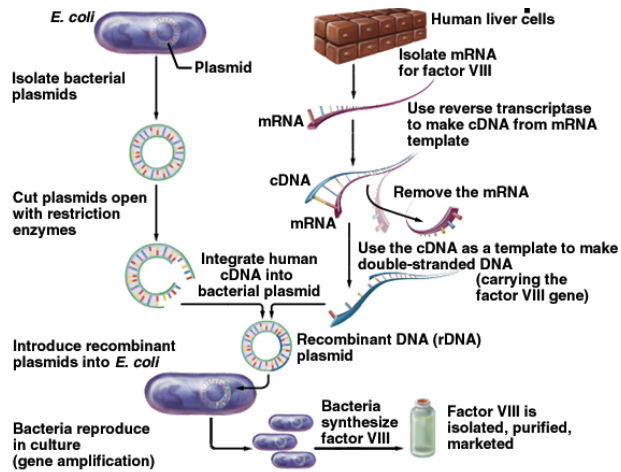
- Penetrance
 - % of population to express predicted phenotype
- Role of environment
 - brown eye color requires phenylalanine from diet to produce melanin, the eye pigment



Alleles at the Population Level

- Dominance and recessiveness of allele do not determine frequency in a population
- Some recessive alleles, blood type O, are the most common
- Some dominant alleles, polydactyly, are rare

Recombinant DNA Technique



The End.