e.g. O refers to carb on cell wall, H is flagellar protein - provide unique strain of ID for bacterial cells
Flagella Arrangement - differ on different bacteria
—if change location, get a different name
usually either bacilli or spirilla on bacterial cells

Axial filaments. - flagella w/in cell, wrapped around body of cell beneath plasma membrane
-Endoflagella
-in spirochetes
-anchored at one end of a cell
-rotation causes cell to move

Fimbriae and Pili.
-outside of bacteria
-Fimb. Allow attachment
-Gliding motility
-Twitching motility
-Pili - used to transfer DNA from one cell to another

2.4 Cell wall. — UNIQUE TO PROKARYOTIC CELLS

-Prevents osmotic lysis
-made of peptidoglycan (in bacteria) - around plasma membrane
-Peptid. Is a polymer of disaccharide (2 sugar rings) of acetylglucosamine (NAG) and N-acetylmuramic acid (NAM)
-Linked by polypeptides

-Gram pos. Cell wall
-thick peptidoglycan layer (located on exterior surface of the cell)
-Teichoic acids

-Gram neg. cell wall —-flagellar protein/H antigen used for distinguishing
-2 plasma membranes
-thin peptidoglycan layer in the periplasmic space (space between membranes)
— this is contained w/in the outer membrane called LPS (Lipopolysaccharide) layer

Gram stain mechanism
-1)crystal violet iodine crystals form in cell. — all cells take up crystal violet stain and become purple
2) add alcohol
-Gram pos. — PURPLE
-Alcohol dehydrates peptidoglycan
-CV-I crystals do not leave (due to thicker layer and look purple)
-Gram Neg. __PINK OR RED
-Alcohol dissolves outer membrane and leaves holes in peptidoglycan
-CV-I, washes out (bc degrades LPS layer and purple color leaves so cells are clear, then colored red or pink by stain saccharin)

Atypical cell walls
-Acid fast cell walls
-Like gram pos cell walls
-Waxy lipid (mycolic acid) bound to peptidoglycan

-conjugative plasmid - carries genes for sex pili and transfer of the plasmid
-Dissimilation plasmids - encode enzymes for catabolism [break down carbs/nutrients] of unusual compounds
-R factors - encode antibiotic resistance
-Flow of genetic info options:
-Vertical gene transfer - how genetic info/dna transferred parent to offspring
-pairs up w/process of replication previously discussed
-horizontal gene transfer - transfer dna to unrelated organisms that exist in the same generation [Recombination- exchange of DNA and incorporation of that DNA into the host genome/chromosome]
-cell reading coded message in own genes and make expected products

-DNA is transcribed to make RNA (mRNA, tRNA, rRNA). — RNA polymerases synthesizes strand of RNA from 1strand of DNA [synthesized from nucleotides: A,T,C,G]; RNA synthesized also in 5'->3' direction
-mRNA is translated in codons (3 nucleotides) by ribosome. [ribosome attach to mRNA at specific sequences] to create protein
-one such sequence is shine dalgarno sequence
-Each codon corresponds to one amino acid
-Amino acids form long chain to make protein
*prokaryotes = no nucleus in bacterial cells SO can have transcription and translation occurring in tandem w/one another; nearly no processing of mRNA molecule

Regulation of bacterial gene expression
-constitutive enzymes/proteins are expressed at a fixed rate
-other enzymes are expressed ONLY as needed
-Repressible enzymes
-Inducible enzymes — Lac operon {lactose operon} -genes transcribed here required for lactose breakdown, if lactose binds repressor/operator (trigger conformational change; protein no longer binds to operator so can start transcription again at promoter region and move across operator)
-Able to do these by : packaging lots of genes that function together in small regions of DNA : control region (promoter- where enzyme assembly that transcribe genes occur and operator - binding site for regulatory protein) & structural genes = Operon [regulated by product of the regulatory gene]
Regulatory gene - > operator -bound or not, if is, don't need promoter/enzyme assembly -> promoter

4.4 genetic Mutations
-change in the genetic material
-DNA polymerase fidelity - the ability to make an exact copy of the chromosome
-Mutations can be neutral, beneficial or harmful
-Mutagen - agent that causes mutations
-Spontaneous mutations - occur in absence of a mutagen
-spontaneous mutation rate: 1 in 10^9 replicated base pairs of 1 in 10^6 replicated genes
-Mutagens increase this rate to 1 in 10^5 or 1 in 10^3 per replicated gene
-STOP codons: UAA, UGA, UAG
-redundancy built into system but product/protein could be changed
-change codon but still get same amino acid
-START codon: AUG (a.a.=Met)
-Mutation — point mutations:
-Base substitution (point mutation) - change in 1 nitrogenous base/nucleotide
-Silent mutation - no amino acid change
-Missense mutation - change codon such that result in change in amino acid

-Sulfonamides – target metabolic pathway that leads to creation of floase [unique to prokaryotic cells]—ultimately kill cell

-Synthesis

-Rifampin – similar to macrolide in strcure, inhibits mRNA synthesis –stops RNA polymerase

-ciprofloxacin – broad spectrum – target gram pos and gram neg, inhbit enzymes assoc w/ replication process & therefore, cell divison process

-penicillin – target synthesis of peptidoglycan (gram pos more so bc have more than gram neg) – weaken cell wall for bacterial cell and may undergo lysis – impact growing cells NOT those already grown

-natural penicillins -- narrow spectrum against gram-pos bacteria ; had to be injected (penicillin G) → penicillin E more stable and could take orally

-semi-synthetic penicillins ex. Ampicillin – changes structure enough to affect gram pos and gram neg bacteria

-penicilinase (Beta-lactamase)

-penicillin and related drugs are Beta-lactams (beta lactam rings -CH/-CH/-C/-N)

-clavulanic acid – non-competitive inhibitor of beta-lactamase/penicilinase

-added to some beta-lactams (augmentin)

-use penicillin derivative to kill cell/cell wall creation while @ same time stop defensive enzyme of bacteria

*amoxicillin w/clavulanic acid = augmentin

5.6 antibiotic use

-kirby bauer disk-diffusion test-[- how select concentration for given antibiotic ; if organism sensitive to given drug [zone of inhibition – where bacteria inhibited/killed]

-drawback: disc can contain only one concentration

-be followed up with more detailed testing

---so do broth dilution test

-MIC – min inhibitory concentration

-if no growth then concentration not effective ; minimize issue of toxicity bc can find lowest dose need

-MBC - minimal bactericidal concentration

**find out which is which

-transplant to new broth

-if no growth then microbe killed

-if is growth then show microbes ONLY inhibited by antibiotic

-Effects of combo of drugs:

-Synergism – effect of 2 drugs together greater than effect of either alone

-Antagonism – effect of 2 drugs together is less than the effect of either alone

-Antiobiotic Resistance

-variety of mutations can lead to antibiotic resistance

-mechanisms of antiobiotic resistance:

-enzymatic destruction of drug (beta-lacatam)

-prevention of penetration of drug

-alteration of drug's target site – change to protein or enzymes

-animal control measures
-lyme disease
-public health failure –ppl not get vaccinated or not get booster shots etc

CDC
-collects and analyzes epidemiological info in the US
-published morbidity and mortality weekly report
-morbidity – incidence of a specific notifiable disease
-notifiable disaease – doctors must reports these to US public health authority
-mortality – deaths from notifiable diseases
-morbidity rate - # of ppl affected/total population in a given time period
-mortality rate - # of deaths from a disease/total population in a given time

6.4 – pathogenicity
-pathogenicity – ability to cause disease
-virulence – extent of pathogenicity (avirulent- does not cause disease)

-portals of entry: - many microbes have preferred portal of entry and will not cause disease if they enter some other way
-mucous membranes
-GI tract
-Respiratory tract
-Genitourinary tract
-conjunctiva of eye
-skin
-hair follicles , sweat glands, pores, cuts
-parenteral route (under skin)
-punctures, bites, injections, surgery etc

-portals of exit: microbes usually enter same way exit
-respiratory tract
-coughing , sneezing
-GI tract
-feces, saliva
-genitourinary tract
-urine, vaginal secretions
-skin
-blood
-biting arthropods, needles/syringes

-#s of invading microbes
-ID50: infectious dose for 50% of the test population (required to cause disease)
-LD50 – lethal dose for 50% of test population
EX) bacillus anthracis

-Adherence – adhesions / ligands bind to receptors on host cells (long enough to cause damage)
-glycocalyx (slimy layer outside of cell -> biofilm)
-fimbriae [allow cell to move around] -ex) E.coli; endocytosis may occur in some cases
-M protein -------mycolic acid
-Opa protein
-Tapered end [use own cellular shape to adhere – in spirochete]