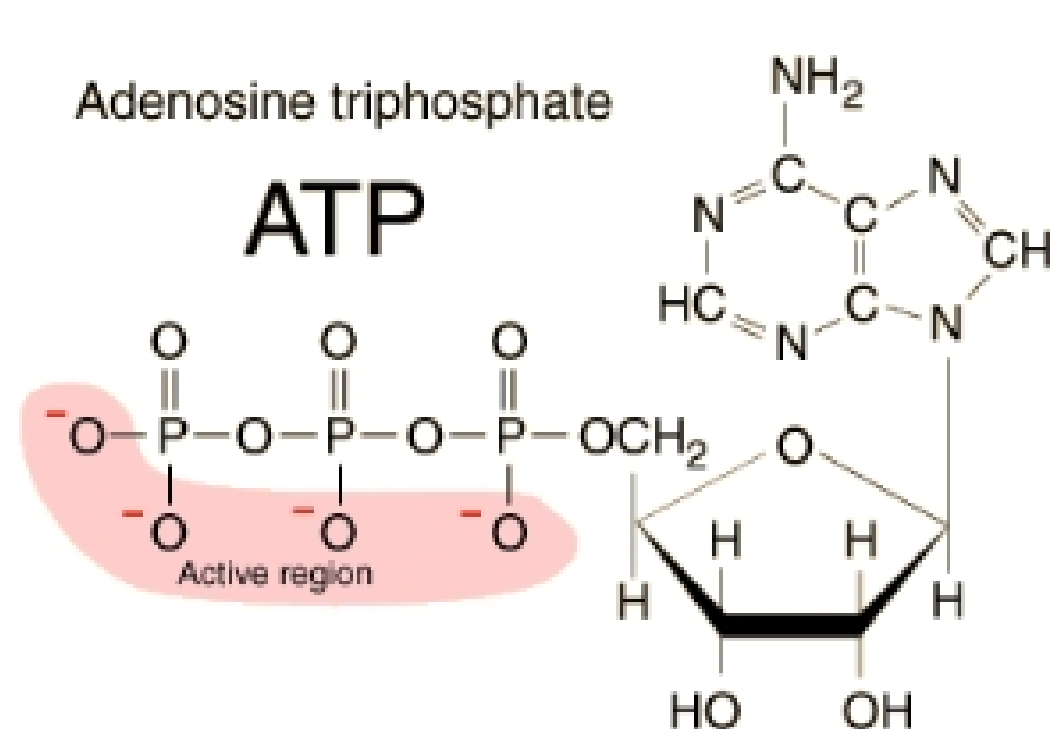


Introduction and History

- Microbiology-study of very small organisms
 - began with Anton van Leeuwenhoek, who ground glass lenses to make primitive microscopes
 - he used the term “animacules” to describe organisms he saw and sent drawings for publication
 - he died in 1723 and interest decreased. No connection made between m.o. seen and diseases
 - disease seen as caused by “miasma” – altered chemical quality of atmosphere from diseased or decaying things- no “infection” concept
- By Mid 1700s, people began to look at the laws of nature
 - belief in spontaneous generation- 4th century = belief that lifeless substances give rise to living creatures, ex. maggots arising from meat
 - Redi- 1st to dispute spontaneous generation- gauze over jars w/ meat in them
 - People refused to believe that spontaneous generation was false
 - Needham- spontaneous generation accounted for growth of m.o. He also boiled gravy and sealed jars, and yet m.o. grew
 - Spallanzani- boiled longer and sealed by melting glass and no m.o. grew. Needham said that “a vital force” was destroyed. Controversy continued
 - Meantime, scientists began to consider how disease is transmitted
 - They knew it could be transmitted, but did not know cause of disease
- By Mid 1800s- Began to understand transmission could be interrupted
 - Semmelweiss- believed “blood poisoning” was transmitted to maternity patients by physicians from autopsies. Showed that washing hands with water and chlorine stopped spread of disease
 - Lister- carried on Semmelweiss’ work – used carbolic acid on bandages and instruments
 - John Snow- traced cholera outbreak in London to one pump- Most cases occurred around this pump. Showed water was a vehicle transmission of disease.
- “Golden Age of Microbiology”
 - Began in mid 1800s and continued until WWI and II
- **Names to Know:**
 - Pasteur
 - saved the French wine industry by showing that sour wines were the result of bacterial contamination. Led to development of “pasteurization”
 - Related m.o. to human disease- developed “germ theory” of disease
 - Developed rabies vaccine
 - Settled the question of Spontaneous Generation- “Swan-necked flasks” trapped m.o.

- Koch (German, lived in same time as Pasteur)
 - Proved “germ theory” using the disease anthrax
 - Procedures became known as Koch’s Postulates: used to prove particular organisms causes particular disease
 - Suspected m.o. must be present in every sick animal
 - m.o. must be isolated and grown in pure culture (only one m.o. per culture)
 - Same disease must be produced when pure cultures are given to an experimental well animal
 - Same m.o. must be recovered from sick experimental animal
 - Developed method for isolating pure cultures of m.o. by using solidified culture medium (agar) made from seaweed
 - Isolated TB microorganism
- Paul Ehrlich- Chemist
 - Looked for “magic bullet” that would cure disease w/o hurting man- instead of arsenic
 - interested in syphilis
- Many Other Scientists led to:
 - Development of modern concepts of disease transmission and awareness that m.o. cause some diseases and that transmissions can be stopped
 - Development of vaccines
 - Use of sterile techniques
 - Water Purification
 - Care in food preparation
- Basic Concepts of all Microbiology
 - Used to be called “Bacteriology”- now includes other m.o.
 - Distinguish between prokaryote and eukaryote. See text pg 11.
 - karyon= Greek for “nut” (refers to nucleus)
 - pro = Primitive
 - eu = true
- What we consider as Microorganisms?
 - Bacteria, cyanobacteria (blue- green algae)
 - Protozoa- eukaryotic
 - Fungi- eukaryote
 - Algae – eukaryote
 - Viruses
- Classification:
 - kingdom
 - phylum

- o class
- o order
- o family
- o genus
- o species
- Taxonomy- the science of classification
 - o Carolus Linnaeus- developed use of “binomial nomenclature”- 2 names to describe organism (genus and species); species- a group that have overall similarity but differ significantly from other groups;
 - o Bacteria- have some groupings below species level. indicate special characteristics. subspecies names- strain, variety , serotype; Always underline
 - o Binomial Nomenclature-
 - Genus- always capitalized, always in italics
 - Species- never capitalized, always in italics
 - Ex.
 - *Escherichia coli*- T. Escherich; found in colon
 - *Hemophilus ducrey*; blood loving; discovered by Ducrey
 - *Staphylococcus aureus*- cluster of spheres; golden color
 - o Basic Classification- shape, size, oxygen requirements, pH requirement, staining reaction, movement, biochemistry
- Metabolism- sum total of biochemicals in living cells
 - o Anabolism- synthetic reaction
 - o Catabolism- degradative reaction
 - o Both catabolized by enzymes
- Energy- some chemical reactions yield energy, some require energy; energy usually supplied for reactions is in the form of ATP- adenosine triphosphate



- o ~ = high energy bond, energy released when enzyme ATPase breaks bond holding last phosphate onto the molecule; resulting molecule is ADP, adenosine diphosphate
- o storage of energy is in bonds of compounds such as glucose or lipids
- o Therefore we need to see how ATP is derived from catabolism of glucose