2.1: Taxonomy and Phylogeny

Taxonomy vs. phylogeny?

- **Taxonomy** is the science/study of classification.
- **Phylogeny** is the science/study of evolutionary relationships between organisms.

Modern taxonomy is based on phylogeny.

- Nucleic acid sequencing (of DNA and/or RNA) is used to establish evolutionary relationships between organisms.
- Taxonomic levels for cellular organisms from most inclusive to least inclusive:
  - Domain, Kingdom, Phylum, Class, Order, Family, Genus, specific epithet (genus + specific epithet= unique species name)

Binomial nomenclature and naming cellular organisms

- cellular=made of cells
- All cellular organisms have a “scientific name”
- the scientific name consists of a **genus** name (*Capitalized*) and a **specific epithet** (*lower case*)
  - together this 2-part name is the "**species**" name.
  - This system of naming was developed by Carolus Linnaeus and is called the “**binomial nomenclature**” ("two term name")
<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>humans</td>
<td>Homo sapiens</td>
</tr>
<tr>
<td>bacterium in gut</td>
<td>Escherichia coli</td>
</tr>
</tbody>
</table>

- Note in the examples, *Homo* and *Escherichia* are the genus names, *sapiens* and *coli* are the specific epithets. Also note the convention of making the scientific name/species name appear different from surrounding text; this is usually accomplished by using *italics* or *underlining*. Also note that the genus name can be abbreviated by using the first letter only.

- *Homo sapiens* = *H. sapiens*
- *Escherichia coli* = *E. coli*

**Sizes of microbial pathogens**

“microbial” = so small, requires microscope to visualize. Metric units used in microbiology:

- **mm** = millimeter = $10^{-3}$ meter (one thousandth meter)
- **µm** = micrometer $10^{-6}$ meter (one millionth meter)
- **nm** = nanometer $10^{-9}$ meter (one trillionth meter)

Resolution limit of human eye ~ 100 micrometers $µm = ~ 0.1$ mm

- bacteria ~ 1µm ($µm = 10^{-6}$ meter)
- viruses 30-300 nm (nm=$10^{-9}$ meter)

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