

BACTERIAL TAXONOMY

SERIES ONE: IDENTIFYING BACTERIA

Every life form on earth can be divided into three domains (Bacteria, Archaea and Eukarya) within the tree of life, which are then subdivided into further groupings of increasing specificity, giving us an efficient way of classifying all life forms. From the graph below it is clear that identical nomenclatural levels can be used for living things.

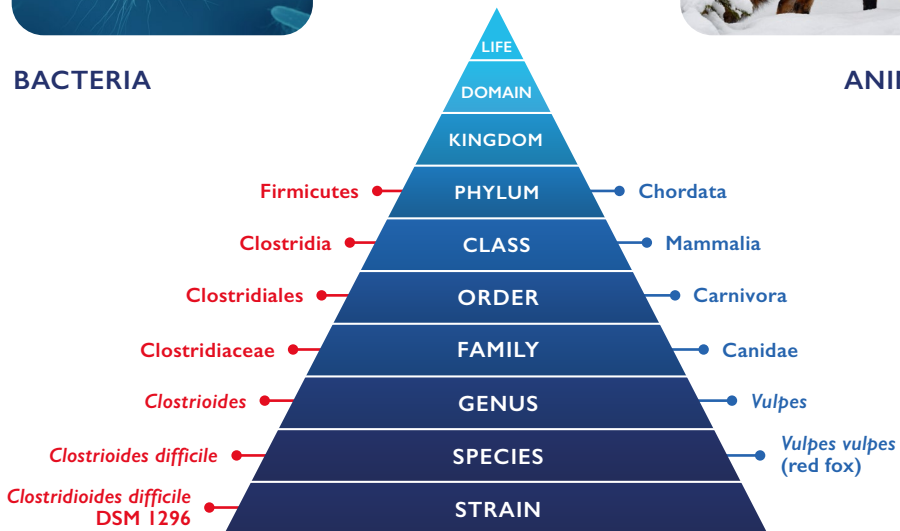
HOW LIVING ORGANISMS ARE NAMED



BACTERIA



ANIMALIA



According to this universal scheme, the full and formal name of a single bacterial strain consists of the *genus*, *species* and strain designation, in that order, with the genus and species names always written in italics. Often the name says something about the origin or the morphology of the bacterium.

e.g. *Bifidobacterium adolescentis* XYZ – or *B. adolescentis* XYZ – is a Y shaped (bifid-shaped) bacterium isolated from human faecal samples.

WHAT DISTINCTIONS ARE MADE AT EACH HIERARCHICAL LEVEL?

Genera are further grouped into Families, Families into Orders, Orders into Classes, etc. This grouping used to be based on functional or morphological characteristics (cell shape, colony shape and colour, oxygen sensitivity, metabolism). With the arrival of molecular methods, groupings tend to be based on molecular markers, like the genome sequence. These new approaches have led to huge changes in the earlier classifications for bacteria. For example, recently, the “old” genus *Lactobacillus* was split into 25 genera.¹

The advantage of molecular markers like DNA is also that the resulting groups can reflect evolutionary relationships, represented in *phylogenetic* trees. These trees also allow researchers to look for new common characteristics, like pathogenicity or health beneficial factors. The more we know about the classification of a bacterium, the more we then can predict about its function. Today, most classification schemes are based on phylogenetic markers.

WHO DECIDES?

Any new bacterial strain should be named according to the International Code of Nomenclature of Prokaryotes.² New taxa (whether species, genus or family) need to be published in the International Journal of Systematic and Evolutionary Microbiology or validated in this journal when published elsewhere. This process avoids duplication and ensures classification is sensible.

IS STRAIN SPECIFICITY IMPORTANT?

As different strains have different properties, correct strain designation is important. Some *Escherichia coli* strains may make you sick, others not. Some *Lactobacillus* strains may have positive health benefits, others not.

¹ Zheng J et al. (2020). Int J Syst Evol Microbiol

² Parket CT et el. (2019) Int J Syst Evol Microbiol

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