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## **In *Chlamydia* veritas**

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To the Editor:

Microbial taxonomy is an essential tool used to classify strains into different clades, i.e. taxonomic units. While such a classification system is essential for both researchers and clinicians, it is often dismissed, or worse mutilated beyond recognition by the very people who should value it most. Indeed, despite the obvious importance of taxonomy, it is often considered by clinical and basic researchers as a useless arbitrary tool without much scientific basis, and to some it is just a painful reminder of years fruitlessly spent learning Latin in high school. Taxonomy is a necessary evil to all who ever use it, but many scientists simply botch it out of pure laziness. Yet the science we do is only as good as the words we use to report it, and at the very core of the myriad of scientific words microbiologists use lay taxonomic denomination and its derivatives.

Take *Chlamydia* as an example!

*Chlamydia*, known as a sexually transmitted pathogen by some and as an ocular pathogen by others, is actually a pathogen, first described in antiquity (1), that causes widespread infections in humans and animals. *Chlamydia* provides a rich taxonomic history since its first scientific description in 1945 when it was then known as *Miyagawanella* (2). Fast forward to 1957, and the taxonomic powers of the time decided on one family, the *Chlamydiaceae*, including two species, *Chlamydia psittaci* encompassing all veterinary chlamydial infections, and *Chlamydia trachomatis* encompassing ocular and genital infections of humans (3). This would not last as new molecular typing methods started to reveal the diversity of the *Chlamydiaceae*, and in 1999 Everett *et al* proposed a new chlamydial taxonomy based on two genera, *Chlamydia* and *Chlamydophila*, and nine species (4). What followed is best described as the era of the “Taxon Wars” (refer to [chlamydiae.com](http://chlamydiae.com)) where fleets of Chlamydia-philis and Chlamydophiles took over the *Chlamydia* universe. The former group however vastly exceeded the latter and the recommended use of *Chlamydophila* was poorly adhered to. At the root of the taxonomic dysfunction was a relatively minor distortion of the taxonomic rules set out in the Everett *et al* paper that were not applied to the letter in the proposed classification (5). Others felt that as a tool, taxonomy should be practical to its users (7) and that a new genus was simply unnecessary. More significantly however, the Everett *et al* paper sparked a healthy scientific discussion among Chlamydia-philis and Chlamydophiles alike about the unique evolutionary path of *Chlamydia* (and *Chlamydophila*). Indeed, as described

by Stephens *et al*, these obligate intracellular pathogens have evolved on a slow time scale relative to their free-living cousins owing to the sequestration and evolutionary constancy of their own environment, the cytosolic vacuole better known as the chlamydial inclusion (6). The Everett classification however provided a very needed practical classification at the species level that is now well respected across all *Chlamydia* research disciplines. We refer the reader to the latest rendition of Bergeys' manual (8), the taxonomic 'bible' for a detailed description of the current taxonomy of *Chlamydia* and *Chlamydia*-like organisms, whereby a single genus, *Chlamydia*, is now used, as well as nine species (*trachomatis*, *muridarum*, *suis*, *pneumoniae*, *pecorum*, *abortus*, *felis* and *caviae*), as originally proposed by Everett et al.

We conclude this letter by providing a lexicon of commonly used *Chlamydia* terms.

'*Chlamydia*' (italics, always cap C) is the genus (*Chlamydophila* *requiescat in pace*), and is most appropriate when referring to *Chlamydia* in general terms.

'chlamydia' or 'chlamydiae' (plural) (no italics, lower case, cap C only at the start of a sentence) are the latinized common descriptors, and should be used equivalent to 'bacterium' or 'bacteria'. As a rule, if you can easily replace chlamydia/chlamydiae with bacterium/bacteria in a sentence, then that is the way it should be written.

'chlamydial' (no italics, lower case, cap C only at the start of a sentence) is the adjective, and should be used equivalent to 'bacterial'. If you can replace chlamydial with bacterial in a sentence, then you are good.

Then there are the taxonomic groups:

'*Chlamydiae*' (always cap C, italics) strictly speaking is the Phylum, hence should be used when referring globally to the *Chlamydiaceae*, *Parachlamydiaceae* and all other so-called *Chlamydia*-like organisms not cataloged or discovered yet.

Below the Phylum, there is the Class '*Chlamydiia*' (not a typo, 2 i's!!!) which no one ever uses because it only includes one Order, the *Chlamydiales*, so why bother!

Next, '*Chlamydiales*' is the Order and should be used when referring to more than one Family-level lineage, for instance the *Chlamydiaceae* and *Parachlamydiaceae*.

The Families are the '*Chlamydiaceae*', '*Parachlamydiaceae*', '*Waddliaceae*' and '*Simkaniaceae*'. All four families are primed for expansion at the species level for the *Chlamydiaceae*, and at the genus and species levels for the *Parachlamydiaceae*, *Waddliaceae* and *Simkaniaceae*, reflecting their greater diversity.

In all matters that matter, including taxonomy, there exists a grey area: Many will use *Chlamydiae* to refer to all taxonomic groups that are below the Phylum level and since there is currently only one Class, and one Order within the Class, the *Chlamydiales*, in essence *Chlamydiae* is synonymous to *Chlamydiales*. However, if you do not want to confuse readers in about 1 million years from now, when a new Class named *Chlamydiia* will surely have emerged, then you should use *Chlamydiales* when referring to the *Chlamydiaceae*, *Parachlamydiaceae*, *Waddliaceae* and *Simkaniaceae*.

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