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LETTER TO THE EDITOR

In *Chlamydia* veritas

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To the Editor

Microbial taxonomy is an essential tool used to classify strains into different clades, that is, taxonomic units. A natural classification system should be based on evolutionary history, but this is often incompletely known. Hence, taxonomy remains an evolving field changing as new information becomes available. While such a classification system is essential for both researchers and clinicians, it is often poorly adhered to by those who should value it most. Indeed, despite the obvious importance of taxonomy, it is often considered by clinical and basic researchers as an arbitrary tool of little use or scientific value, and to some, it is just a painful reminder of years fruitlessly spent learning Latin in high school. Nevertheless, the science we do is only as good as the words we use to report it, and taxonomic denomination and its derivatives lie at the very core of the myriad of scientific words microbiologists use.

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 that causes widespread disease in animals and humans, some of which was first described in antiquity (Trompoukis & Kourkoutas, 2007). *Chlamydia* provides a rich taxonomic history from one of its early scientific descriptions in 1945 when it was known as *Miyagawanella* (Jones *et al*., 1945), and variably later as *Chlamydia*, *Bedsonia* or *Rakeia* (Page, 1966). Fast forward to 1957, and the taxonomic authorities 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 (Rake, 1957). This taxonomy could not withstand the introduction of new, molecular methods, which began to reveal the diversity of the *Chlamydiaceae,* and in 1999, Everett *et al.* (1999) proposed a new chlamydial taxonomy with two genera, *Chlamydia* and *Chlamydophila,* and nine species. What followed is best described as the era of the 'Taxon Wars' (www.chlamydiae.com), during which fleets of *Chlamydia*-philes and Chlamydophiles took over the *Chlamydia* universe. The former group 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 (Schachter *et al*., 2001). Others felt that, as a tool, taxonomy should be practical to its users (Greub, 2010) and that a new genus was simply unnecessary. More significantly, however, the Everett *et al.* paper sparked a healthy scientific discussion among *Chlamydia*-philes and Chlamydophiles alike about the unique evolutionary path of *Chlamydia* (and *Chlamydophila*). Indeed, as described by Stephens *et al.* (2009) these obligate intracellular pathogens have evolved more slowly than their free-living cousins owing to the sequestration and evolutionary constancy of their own environment, the cytosolic vacuole better known as the chlamydial inclusion. The Everett classification, however, provided a much-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 Bergey's manual (Horn, 2011; Kuo & Stephens, 2011), 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 (*abortus, caviae, felis, muridarum*, *pecorum*, *pneumoniae, psittaci*, *suis* and *trachomatis*).

We hope this clarifies a confusing situation and 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 and hence should be used when referring globally to the *Chlamydiaceae, Parachlamydiaceae* and all other so-called *Chlamydia*-like organisms not catalogued or discovered yet.

Below the Phylum, there is the Class *'Chlamydiia'* (not a typo, two '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*.

Among the ever-expanding Families are the '*Chlamydiaceae*', '*Parachlamydiaceae*', '*Waddliaceae*', '*Simkaniaceae*', '*Rhabdochlamydiaceae*', '*Criblamydiaceae*', and Candida-

tus '*Chlavichlamydiaceae*' and '*Piscichlamydiaceae*'. The *Chlamydiaceae* are primed for expansion at the species level, and all other families at the genus and species levels, 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 because 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 *Chlamydiiiiiia* will surely have emerged, then you should use *Chlamydiales* when referring to the *Chlamydiaceae*, *Parachlamydiaceae*, *Waddliaceae*, *Simkaniaceae*, etc.

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