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# LETTERS TO THE EDITOR

Dear Sir:

Drs. Calisher and Mahy are to be commended for their editorial "Taxonomy: get it right or leave it alone."[1] These two highly regarded virologists make several good points in their editorial, particularly that virus taxonomy needs to get it right. Unfortunately, these authors don't seem to heed their own advice. In 1758, when Carolus Linnaeus introduced the 10th edition of the *Systema Naturae*, which combined for the first time, naming of plants and animals, he proposed a simplified binomial name consisting of one word for the species plus one word for the generic name. Thus, for instance, the names *Canis familiaris* (dog), *Canis lupus* (wolf), *Canis latrans* (coyote), and *Canis aureus* (jackal), each describe a distinct entity but which share certain common characteristics, and this is clearly evident from the scientific names. This is not to say that the species concept is static. In fact, a great deal of vigorous debate currently surrounds the definition of what a "species" is, including how the ability to interbreed is used as part of the definition of the species concept. (This is evident in the relationship between dogs and wolves used here as an example.)

This system proposed by Linnaeus was the basis of modern naming of species. It could include, as needed, a third name (trinomen), a subspecies name. However, each component of these scientific names, whether binomen or trinomen, was composed of a single word. The genus and species name is italicized.

However, when Calisher and Mahy write "...(family *Flaviviridae*, genus *Flavivirus*, species *Dengue virus*)", they commit several errors and miss the essence of binomial taxonomy: 1) only names at the genus level and below are italicized; thus, Family *Flaviviridae* should be Family Flaviviridae; 2) the species name should be a single word; and 3) the word "virus" in the species name is redundant and unnecessary. Naming organisms is both an art and a science. One should consult various International Codes of Nomenclature for rules about sex, root word origins, Latinization of geographic and proper names, transliteration of Latin and Greek words, and general recommendations on the formation of names.

As the International Commission on Taxonomy of Viruses (ICTV) wrestles with virus taxonomy, they might do well to pattern their code on more long standing codes, specifically, the International Commission on Zoological Nomenclature (ICZN), established in 1895, and their International Code of Zoological Nomenclature (updated, January 2000).[2] This would provide considerable consistency across biological fields.

There will be numerous issues for virologists to wrestle with as they progress along this path, not only selection of names, but also the concept of type species, priority of names, etc. However, if done correctly, scientific names of viruses will come to have the same respect and status as other scientific names, and, at that point, scientific names of viruses will indeed be names of taxa that tell us considerable about their biology, phylogenetic relationships, and other important considerations.

Indeed, as Calisher and Mahy note, virus taxonomy has a ways to go to reach uniformity with taxonomy in other disciplines. However, having a higher order of consistency, with virus taxonomy on par with other biological sciences, would be good for serious virologists as well as interested observers from other scientific disciplines.

## REFERENCES

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Dear Sir:

Mark Eberhard's comments are greatly appreciated as they underline the general problem of acceptance of viral taxonomy and emphasize the reasons we published our remarks in the first place.[1] The title of our Editorial was "Taxonomy: get it right or leave it alone." We did not intend that title to indicate, as Dr. Eberhard suggested, that the virological community as a whole should "get it right," but only that individual virologists should "get it right."

Dr. Eberhard suggested that we were proposing a taxonomic scheme, but we were not. What we were trying to do is let the readers of this journal know what is the reality of current taxonomy.[2] It was not we who suggested italicizing family names; it was the International Committee for Taxonomy of Viruses (ICTV). In 1966, at a meeting in Moscow, the predecessor organization of ICTV, the International Committee for Nomenclature of Viruses, pragmatically decided to italicize the names of virus families, suggesting, "For many years, the dead hand of Linnaeus has hovered uncertainly over the virus kingdom."[3] In subsequent years, it simply became a reality (not accepted by all, to be sure) that virus family names are italicized. We are not arguing for or against this, simply stating a fact.

Since essentially the beginning of the development of viral taxonomic schemes, in 1971, virologists have declared that

they will not follow the rules of biological or bacteriological nomenclature. One reason for this is that viruses do not propagate themselves, as do other life forms. Italicizing family names simply underscores that thesis.

Dr. Eberhard uses the Canidae as an example of proper binomial nomenclature for biological entities. He points out that the Latin species names for dog, wolf, coyote, and jackal are extensions of the genus name *Canis*. True, of course, but what better example could there be than these canids, which can interbreed and therefore could be used to point out the (perhaps fatal) taxonomic flaw when one uses interbreeding potential in regard to species differentiation? Since we have enough problems in sorting out the viruses, we will not get into that debate here or anywhere else.

As for the lack of application of binomial nomenclature in virus taxonomy, that also is not our fault. Its use has been proposed many times, but the virologic community has not accepted it. Viruses are not easily slipped into a universal taxonomic scheme because there has been no agreement as to what they are, for instance whether they are alive or not. There also has been considerable reluctance to change all the existing names of virus species into binomials

The point is not that we have erred in devising a new taxonomic scheme; we have not. We have been simple messengers for those who do not know or do not understand: authors and editors of journals, bacteriologists, mycologists, and parasitologists included. We simply reported the facts about current usage in virology and suggested to those who refuse to get it right that they should "leave it alone."

## REFERENCES

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2. van Regenmortel MHV, Fauquet CM, Bishop DHL, Carstens EB, Estes MK, Lemon SM, Maniloff J, Mayo MA, McGeoch DJ, Pringle CR, Wickner RB, 2000. *Virus Taxonomy. Seventh Report of the International Committee on Taxonomy of Viruses.* San Diego, CA: Academic Press.
3. Wildy P, 1971. Classification and nomenclature of viruses. First report of the International Committee on Nomenclature of Viruses. *Monographs in Virology 5.* Basel: S. Karger.

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