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Letters to the Editor

Terminology for the Life Cycle of *Pneumocystis carinii*

The letter by Schuh et al. (3) and the reply by Hanano and Kaufmann (1) address the need for changes in the terminology that describes the life cycle stages of *Pneumocystis carinii* because this organism is now widely recognized as a fungus rather than a protozoon. We wish to point out that J. J. Ruffolo (2) published a detailed proposal to adopt fungal terminology for the morphological forms of *P. carinii*. In that review chapter he discussed the fungal terms to be used in place of the protozoan ones. The following terms (in quotation marks) were introduced and defined to replace the protozoan usages, which appear in parentheses: "trophic form" (trophozoite), the primary proliferative stage of the life cycle, which is presumably haploid and replicates by binary fission; "spore case" (cyst), the thick-walled reproductive stage consisting of eight haploid progeny that develop from a parent cell by meiosis and partitioning of the cytoplasm; "spores" (intracystic bodies, or sporozoites), the progeny cells within the spore case; "sporocyte" (precyst), an intermediate stage of sexual reproduction during which a large parent cell (zygote) undergoes encystment, "sporogenesis." "Spore release" (excystment) follows the process of sporogenesis, resulting in the release of the progeny cells as trophic forms.

The precise taxonomy of *Pneumocystis* remains in question. However, there is a growing body of literature published by investigators in the *Pneumocystis* research area, and we can expect increasing knowledge to resolve these issues. International workshops on *Pneumocystis* are held every 1 to 3 years, and the most recent meeting was held in September 1997 in Lille, France. These meetings provide a forum for discussion among experts in the field and help to establish a consensus of opinions and eventual standards of terminology and nomenclature.

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Pneumocystis carinii Delanoë & Delanoë (1912) has been placed in the Archiascomycetales, a class of the Ascomycota

The contributions of Schuh et al. (8) and of Hanano and Kaufmann (3) address the taxonomy of *Pneumocystis carinii*, a eukaryotic microorganism disseminated by air (6), causing not only pneumonitis in AIDS patients but also disseminated extrapulmonary infections in various immunosuppressed patients (1, 5).

This organism has been definitively placed in the new order Pneumocystidales (2). Therefore, the newly created class Archiascomycetales of the phylum Ascomycota currently consists of the orders Neolectales, Pneumocystidales, Protomycetales, Schizosaccharomycetales, and Taphrinales (4). Consequently, the cyst of *P. carinii* should be referred to as the ascus (2). This taxonomic placement of *P. carinii* was based on the results of molecular phylogenetic analyses using sequence data from 18S rRNA, 5.8S rRNA, and transcription factor IID genes besides other morphological and biochemical analyses (2) and has received acceptance (4, 7). Despite obvious genetic differences (6) of *P. carinii* strains isolated from different mammalian hosts (ferret, horse, man, mouse, shrew, and squirrel), an establishment of further taxonomic entities (i.e.,

species, subspecies, formae specialis, or varieties) (5) has yet to be done.

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Authors' reply

We are encouraged by the additional information and comments provided by Cushion et al. and Haase regarding appropriate terminology for *Pneumocystis carinii*. *P. carinii* is of interest to a variety of disciplines; therefore, we would encourage these consensus groups to publish their results widely. In order to correct the long-standing confusion and self-perpetuating errors of previous publications, mycologists, parasitologists, pathologists, immunologists, and anyone with an interest in infectious disease should be made aware of the current and future consensus decisions as expediently as possible.

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