2. Cantino EC (1966) In: *The Fungi, Vol 2* (Ainsworth, GS and Sussman AS, eds), Academic Press, New York and London, 283-330
3. Wubah DA, Fuller MS Akin DE (1991) *Mycologia* 83, 40-47

A common evolutionary origin for mitochondria and hydrogenosomes.

M van der Giezen, RA Prins *(University of Groningen, Department of Microbiology, PO Box 14, NL-9750 AA Haren, The Netherlands)*

Although it has been known for about ten years that anaerobic fungi contain hydrogenosomes [1] little biochemical or morphological data is available about these organelles compared to their homologues in *Trichomonas vaginalis*. This paucity of data makes it difficult to determine the evolutionary origin of these organelles.

Hydrogenosomes are a site of substrate-level phosphorylation in anaerobic fungi and therefore of great energetic importance for these amitochondriate eukaryotes. For this reason and because of ultrastructural similarities it has been suggested that hydrogenosomes are derived from mitochondria [2,3]. The presence of the typical anaerobic prokaryotic enzymes hydrogenase and pyruvate:ferredoxin oxidoreductase in hydrogenosomes has inspired Müller [4] to suggest that hydrogenosomes originated by the endosymbiotic uptake of an anaerobic Gram-positive bacterium. A third hypothesis regards peroxisomes as the progenitor organelle for hydrogenosomes [5,6].

Our recent work has provided evidence that fungal hydrogenosomes are probably derived from mitochondria. This data includes primary sequences of hydrogenosomal enzymes which seem to have mitochondrial-like targeting signals [3,7]. Recently we discovered that, like mitochondria, fungal hydrogenosomes play a role in Ca^{2+}-homeostasis [8] and that fungal hydrogenosomes are surrounded by a double membrane like all other hydrogenosomes [9]. In summary, all these data suggest a common evolutionary origin for mitochondria and hydrogenosomes.

Professor Rudolf A. Prins passed away on the 26th February 1997. For many years he has been an inspiration to those in the field of fungal hydrogenosomes.

1. Yarlett N, Orpin CG, Munn EA, Yarlett N, Greenwood C (1986) *Biochem J* 236, 729-739
2. Finlay BJ, Fenchel T (1989) *FEMS Microbiol Lett* 65, 311-314
3. van der Giezen M, Rechinger KB, Svendsen I, Durand R, Hirt RP, Fèvre M, Embley TM, Prins RA (1997) *Mol Microbiol* 23, 11-21
4. Müller M (1980) In: *The Eukaryotic Microbial Cell, 30th Symposium of the Society for General Microbiology, University of Cambridge* (Gooday GW, Lloyd D, Trinci, APJ eds) Cambridge University Press, London, 127-142
5. Marvin-Sikkema FD, Lahpor GA, Kraak MN, Gottschal JC, Prins RA (1992) *J Gen Microbiol* 138, 2235-2241
6. Marvin-Sikkema FD, Kraak MN, Veenhuis M, Gottschal JC, Prins RA (1993) *Eur J Cell Biol* 61, 86-91
7. Brondijk THC, Durand R, van der Giezen M, Gottschal JC, Prins RA, Fèvre M (1996) *Mol Gen Genet*, 253, 315-323
8. Biagini G, van der Giezen M, Hill B, Winters C, Lloyd D (1997) *FEMS Microbiol Lett* 149, 227-232
9. van der Giezen M, Sjollema KA, Artz RRE, Alkema W, Prins RA (1997) *FEBS Lett* (in press)