

The *Leishmania mexicana* cell cycle: Patterns of organelle duplication and segregation revealed by 3D electron microscopy and their implications for parasite biology

Authors

Molly Hair¹, Richard Wheeler², Ryuji Yanase¹, Sue Vaughan¹, Jack Sunter¹

Department of Biological and Medical Sciences, Oxford Brookes University, Oxford, UK

Peter Medawar Building for Pathogen Research, Nuffield Department of Medicine, University of Oxford, Oxford, UK

Abstract body

The cell cycle of *Leishmania* spp. has previously been studied using fluorescence light microscopy combined with thin section transmission electron microscopy. Yet, little is still known about the intrinsic spatial organisation of organelles within the cell body and their manner and pattern of duplication and inheritance. Using an advanced volume EM approach - serial block face scanning electron microscopy, we have produced a three-dimensional spatial and quantitative overview of the *L. mexicana* cell cycle. This has generated important insights into organelle positioning, division and inheritance. Firstly, during the cell cycle for all organelles there is a general increase in number and volume. Interestingly, at earlier time points in the cell cycle the volume of the glycosomes and acidocalcisomes remained constant yet there was an increase in organelle number. This suggests these organelles are able to divide in addition to being generated de novo by the endoplasmic reticulum. Secondly, *Leishmania* undergoes closed mitosis and we demonstrate that during late mitosis nuclear pores are no longer present on the nuclear bridge. The nuclear bridge is therefore a specialised region of the nuclear envelope, with the absence of nuclear pores likely required for accurate nuclear envelope resolution. Overall, our data provides a detailed spatiotemporal framework for the *Leishmania* cell cycle, which is fundamental to our understanding of the cell division processes required to produce daughter cells in the image of the mother.

Funding

Funded by Nigel Groome PhD Sponsorship, Oxford Brookes University