IA-34

Automated image analysis methods for the quantification of cell damage and adherent fungal cells

S. Dietrich, P. Dasari, N. Engert-Ellenberger, I. Jacobsen, P. Zipfel, M.T. Figge

01/03/2018

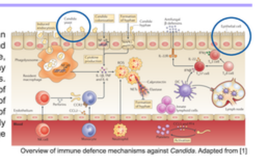
Automated image analysis methods for the quantification of cell damage and adherent fungal cells

Stefanie Dietrich[1,2], Prasad Dasari[3], Nicole Engert-Ellenberger[2,4], Ilse Jacobsen[2,4], Peter Zipfel[2,3], Marc Thilo Figge[1,2]

[1] Applied Systems Biology, Leibniz Institute for Natural Product Research and Infection Biology, Hans Knöll Institute, Jena, Germany
[2] Faculty of Biological Science, Friedrich Schiller University, Jena, Germany
[3] Infection Biology, Leibniz Institute for Natural Product Research and Infection Biology, Hans Knöll Institute, Jena, Germany
[4] Microbial Immunology, Leibniz Institute for Natural Product Research and Infection Biology, Hans Knöll Institute, Jena, Germany

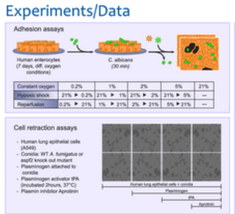
Introduction

Epithelial tissues are the first line of defence against many microbial invaders like human pathogenic fungi. An impaired functionality of these barriers can lead to invasion and infection, but the exact mechanisms on host and pathogen side are still unknown. Therefore, experiments were conducted by the research group Infection Biology to study the interplay between *Aspergillus fumigatus* aspf2 mutants and wildtype and human lung epithelial cells. The effect of mesenteric ischemia on the barrier function of enterocytes and adhesion of *Candida albicans* was studied by the group Microbial Immunology. Microscopic images of both assays were generated in order to quantify damage of the cell layer and the number of adherent fungal cells. We developed tailored image analysis algorithms to automatically analyse the image data in a fast and objective manner. We combine standard image analysis techniques with machine learning and advanced segmentation methods.

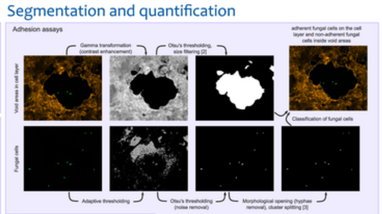


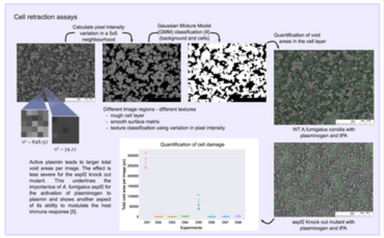
Overview of immune defence mechanisms against *Candida*. Adapted from [1]

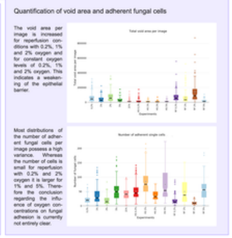
Experiments/Data



Segmentation and quantification







References

[1] Netea, M.G. et al., *Nat. Rev. Immunol* 15, 630-642 (2015)[2
[2] Otsu, N., Automatica C (1), 62-66 (1975)
[3] Farhan, M. et al., Pattern Recognit. 46 (3), 741-751 (2015)
[4] Brandes, S., Dietrich, S., Hünniger, K., Kurzai, O., Figge, M.T. *Medical Image Analysis* (2016)
[5] Dasari, P. et al. [under revision]

Contact: stefanie.dietrich@leibniz-hki.de