Accepted Manuscript

Translocation of nanoparticles and *Mycobacterium marinum* across the intestinal epithelium in zebrafish and the role of the mucosal immune system

Signe Dille Løvmo, Martin Tobias Speth, Urska Repnik, Erling Olaf Koppang, Gareth Wyn Griffiths, Jon Paul Hildahl

PII: S0145-305X(16)30198-7

DOI: 10.1016/j.dci.2016.06.016

Reference: DCI 2665

To appear in: *Developmental and Comparative Immunology*

Received Date: 14 March 2016

Revised Date: 20 June 2016

Accepted Date: 20 June 2016

Please cite this article as: Løvmo, S.D., Speth, M.T., Repnik, U., Koppang, E.O., Griffiths, G.W., Hildahl, J.P., Translocation of nanoparticles and *Mycobacterium marinum* across the intestinal epithelium in zebrafish and the role of the mucosal immune system, *Developmental and Comparative Immunology* (2016), doi: 10.1016/j.dci.2016.06.016.

Translocation of nanoparticles and *Mycobacterium marinum* across the intestinal epithelium in zebrafish and the role of the mucosal immune system

Signe Dille Løvmo[1]*, Martin Tobias Speth[1]*, Urska Repnik[1], Erling Olaf Koppang[2], Gareth Wyn Griffiths[1§], Jon Paul Hildahl[1]

[1] Department of Biosciences, University of Oslo, Blindernveien 31, 0371 Oslo, Norway

[2] School of Veterinary Medicine, Norwegian University of Life Sciences, Ullevålsveien 72, 0454 Oslo, Norway

* These authors contributed equally; [§] Corresponding author

Abstract

Nano- and microparticles are promising carrier systems for oral delivery of drugs or vaccines, particularly in fish aquaculture. However, the mechanisms of uptake, trans-epithelial transport and immune response to nano/micrometer sized particles, or microorganisms such as bacteria are poorly understood in fish. Here, adult zebrafish were used to study the uptake of different nano- and microparticles and the pathogenic bacteria *Mycobacterium marinum* in the intestine, and their interactions with epithelial cells and the mucosal immune system. Fluorescent particles or bacteria were delivered directly into the adult zebrafish intestine by oral intubation and their localization was imaged in intestine, liver and spleen sections. Zebrafish do not appear to have M-cells, but both nanoparticles and bacteria were rapidly taken up in the intestine and transported to the liver and spleen. In each tissue, both bacteria and particles largely localized to leukocytes, presumably macrophages.