Induction of Lipid Bodies in Leishmania infantum-infected C57BL/6 macrophages of male versus female origin

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Introduction
Leishmania spp. are protozoan parasites that cause a spectrum of human diseases, including visceral leishmaniasis (VL) with 50,000 deaths annually (1). Lipid bodies (LB) are organelles involved in lipid homeostasis and immune modulation (2). Various intracellular pathogens stimulate LB accumulation in host cells (3). A recent study showed that LB induction is mediated by host factors (4). Further examination of C57BL/6 macrophages showed differential expression of LBs in cells of male versus female origin. Our preliminary data (2018 experiment, N = 3) showed that upon infection, the number of LBs increased from 89 to 317 in male-derived macrophages, whereas in female-derived macrophages, LBs increased from 60 to 327. Related work from our group demonstrated increased visceral Leishmania burden in the spleen of male versus female C57BL/6 mice (5). The mechanisms underlying these sex differences have yet to be elucidated. We hypothesize that increased LB expression in macrophages of male origin facilitates parasite survival and provides a basis for the increased male susceptibility observed in L. infantum infection.

Materials and methods
Male and female C57BL/6 mice were infected (intraperitoneally) with axenic LcJ amastigotes (1:5) based on the total number of LBs by 3.3 fold in macrophages derived from males and by 3.6 fold in macrophages of female origin. Infected and non-infected mouse macrophages were stained with DAPI (red) and BODIPY 493/503 (green) and nuclei and LBs were visualized by confocal microscopy. Micrographs were quantified for LBs. Data are representative of at least 200 cells evaluated per each of 3 individual experiments (mean ± SD).

Results
A. Lipid bodies (LBs) greater than 3 microns in infected macrophages

B. Percentage of LB+ cells in non-infected and infected cultures

C. Total number of LB in non-infected and infected cultures

Discussion
Leishmania infection increases the total number of LBs in C57BL/6 macrophages from male versus female origin (9). Infection increases LB accumulation in host cells, which may serve as a reservoir for the parasite and contribute to disease pathogenesis. LBs are organelles comprised of neutral lipids which accumulate in response to stimuli, such as infection. LBs mediate innate responses through the production of microRNAs. Additionally, pathogens may use LBs as a source of nutrients and structural components. To examine the role of LBs in L. infantum infection, we infected bone marrow-derived macrophages with axenic Leishmania spp. in macrophages of male versus female origin. The mechanisms underlying these sex differences have yet to be elucidated. We hypothesize that increased LB expression in macrophages of male origin facilitates parasite survival and provides a basis for the increased male susceptibility observed in L. infantum infection.

References