Abstract

Leishmaniasis is an infectious disease caused by protozoa of the genus *Leishmania* (Kinetoplastida: Trypanosomatidae) which are transmitted by phlebotomine sand flies (Diptera: Phlebotominae). For the dixenous life cycle, leishmania parasites are equipped with enzymes that facilitate survival in both insect vectors and mammalian hosts. Gene for the enzyme catalase which protects cells from reactive oxygen species by the elimination of H_2O_2 and is present in related monoxenous trypanosomatids is, however, missing in *Leishmania* genome. Chitinase can be involved in the interaction of leishmania parasites with chitin-containing structures in sand flies (peritrophic matrix, stomodeal valve). The expression of the enzyme in amastigotes suggests its significant function also in the mammalian host.

I tested the role of these enzymes in the life cycle of leishmania by direct comparison of *L. mexicana* mutants (i) with inserted catalase gene and (ii) with deleted chitinase gene with control groups. I conducted experimental infections of *Lu. longipalpis* including transmission of leishmania to the hosts by bite, tested the survival of leishmania in macrophages and performed experimental infections of BALB/c mice followed by xenodiagnoses.

The experiments confirmed that the presence of catalase in leishmania does not affect their ability to divide and survive in sand flies but is incompatible with the dixenous life cycle. The metacyclogenesis of the mutants in vectors was significantly decreased (2,6 % of metacyclic promastigotes vs. 21,6 % in the control group) as well as the success of transmission to the host (the numbers of transmitted leishmania were reduced by several orders). Moreover, leishmania producing catalase showed both significantly decreased survival in macrophages and the infectivity and virulence in BALB/c mice.

Deletion of chitinase genes did not affect leishmania development in sand flies including colonization of the stomodeal valve, suggesting that chitinase does not necessarily participate in leishmania escape from the peritrophic matrix. However, when compared with the control groups, the sand flies infected by mutant leishmania transmitted a significantly lower number of leishmania which confirms the important role of chitinase in the damage of the stomodeal valve. In the host part of the leishmania life cycle, this enzyme is probably not essential as the leishmania with the gene deletion developed identically in the BALB/c mice as the control groups.

Key words: *Leishmania, Lutzomyia*, *Phlebotomus*, catalase, chitinase, peritrophic matrix, stomodeal valve, metacyclogenesis