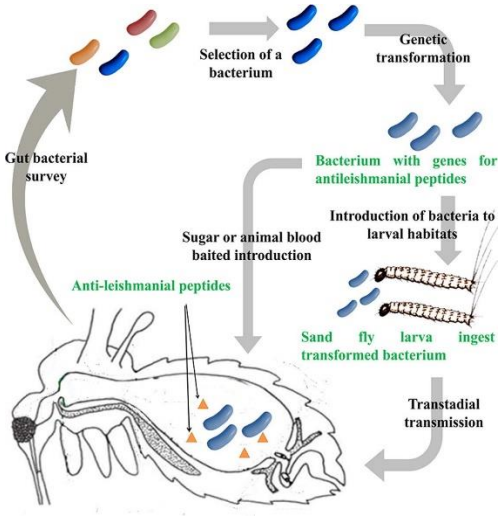
Recent developments and future directions in the paratransgenesis based control of *Leishmania* transmission.

Abstract

Vector-borne diseases are one of the main concerns regarding global health. Among these, leishmaniasis stands as one of the most serious issues. This disease is transmitted via the bite of female phlebotomine sand flies. Due to the drawbacks such as the development of resistance associated with conventional vector control methods, paratransgenesis has become more popular in the recent past. A range of bacteria inhabit the gut of different species of sand flies. *Bacillus subtilis*, *B. megaterium*, and *Enterobacter cloacae dissolvens* are some of the common bacteria with ideal characteristics for this technique. Among the large number of natural anti-microbial peptides (AMPs) recovered from animals, DS hypo-01, Phylloseptin-1 and melittin are found to be the most effective. Hybrids of Cecropin A and melittin such as CA(1–8)M(1–18), D-CA(1–8)M(1–18) and N-Ac-CA(1–8)M(1–18) are also suitable candidates. Use of peptides initially released in an inactive form to activate upon exposure to a specific molecule is a potential solution for the lower specificity of AMPs. Single chain antibodies on the other hand, have high specificity, but effectiveness is lower than AMPs. The genetic transformation of the selected bacteria and the generation of paratransgenic sand flies through transtadial transmission are feasible under laboratory conditions. Safe delivery techniques such as microencapsulation are being tested to increase the specificity reducing environmental issues. Nevertheless, extensive studies with more practical approaches are required before applying this technique in the field.



Keywords
Leishmaniasis; Paratransgenesis; Antileishmanial peptides; Gut microbiota; Biological control

Abbreviations
AMPs, Anti-microbial peptides, GFP, Green Fluorescent Protein; IC50, Half maximal inhibitory concentration; LC50, Lethal concentration required to kill 50% of the population; LPG, Lipophosphoglycans; SIT, Sterile Insect Technique; WHO, World Health Organization