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Unlocking the potential of snake venom-based molecules against the malaria, Chagas disease, and leishmaniasis triad

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Abstract

Malaria, leishmaniasis and Chagas disease are vector-borne protozoal infections with a disproportionately high impact on the most fragile societies in the world, and despite malaria-focused research gained momentum in the past two decades, both trypanosomiases and leishmaniases remain neglected tropical diseases. Affordable effective drugs remain the mainstay of tackling this burden, but toxicity, inneficiency against later stage disease, and drug resistance issues are serious shortcomings. One strategy to overcome these hurdles is to get new therapeutics or inspiration in nature. Indeed, snake venoms have been recognized as valuable sources of biomacromolecules, like peptides and proteins, with antiprotozoal activity. This review highlights major snake venom components active against at least one of the three aforementioned diseases, which include phospholipases A2, metalloproteases, L-amino acid oxidases, lectins, and oligopeptides. The relevance of this repertoire of biomacromolecules and the bottlenecks in their clinical translation are discussed considering approaches that should increase the success rate in this arduous task. Overall, this review underlines how venom-derived biomacromolecules could lead to pioneering antiprotozoal treatments and how the drug landscape for neglected diseases may be revolutionized by a closer look at venoms. Further investigations on poorly studied venoms is needed and could add new therapeutics to the pipeline.