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Toxins and Haematophagy



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How do sanguivores use toxins to help them suck blood while at the same time ensuring a healthy food supply? A remarkable diversity of creatures has evolved to use blood as the primary source of sustenance while a few oddities (notably moths and birds) have acquired a taste for blood. True sanguivores - like hookworms, leeches, ticks, mosquitoes, and vampire bats - have modified mouthparts and bioactive secretions that facilitate blood meal acquisition. The salivary secretions comprise a rich cocktail of proteins, peptides, and non-peptidic molecules. A combination of gene duplication with lineage specific expansion and diversification has created millions of proteinaceous saliva molecules; particular protein folds - notably Kunitz and lipocalin - have been widely exploited.



Bioactivity of these saliva constituents counteracts the range of mechanisms their hosts have evolved to prevent and stop blood loss, and heal the inflicted wound. Thus bloodsuckers produce anti-hemostatic molecules (vasodilators, platelet aggregation inhibitors, anticoagulants, etc.), anti-inflammatory agents (antihistamines, complement inhibitors, leukotriene sequestrators, etc), immunomodulators (e.g. manipulators of leukocyte activities), and inhibitors of wound healing. Rarely do they produce neurotoxins. Generally their effect is benign and often they are poorly immunogenic, properties ideal for drug development. Surprisingly, only one bloodsucker molecule - hirudin, the leech-derived thrombin inhibitor - has been turned into a drug for use in the clinic. Surely this will change.