Biotechnological Potential in Animal Venoms

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Different sources of bioactive compounds have been used to chase new drug leads for pharma industry. Among them, much attention has been paid to animal venoms, which are considered a great source of natural bioactive compounds. These venoms have evolved in both predatory and defensive senses, which contributed to build up a massive repertory of specific-targeted molecules that act in synergy once inside the organism of the inflicted victim. A myriad of highly toxic compounds - most of them being well represented venom constituents - has been purified and characterized so far as neurotoxins, myotoxins, cardiotoxins, hemorrhagic, among others. These toxins were the firstly purified because of their readily observed high toxicity and lethality. Nevertheless, small molecules with micro-effects that are not easily visualized can be relatively neglected or poorly studied. This situation has changed now with the use of the proteomic approaches and peptide synthesis in toxinology. Paving this way, molecules with “newly exploited” activities such as vasoactive, hormone-like, antimicrobial and others have been enlarging the known venom repertoire. Taking advantage of these methodologies we present some of the current works in our laboratory, in which we envisage the prospection, structural and functional characterization of peptides and/or proteins found in venoms from scorpions (Tityus serrulatus), spiders (Lycosa erythrognatha and Phoneutria spp), centipedes (Scolopendra spp) and snakes (Bothrops spp and Micrurus spp) that can be used in biotechnological processes. Among these, four highly similar isoforms of anti-hypertensive peptides were identified in the venom of yellow scorpion and named Tityus serrulatus Hypotensins (TsHpt). The pharmacological activity of TsHpts was scrutinized, together with its synthetic analogs, in order to draw a map of its structure-function connections. Another example came from linear peptides from L. erythrognatha venom that elicits antimicrobial effects. Structural minimization of these peptides can be crucial to biotechnological usage of these molecules and chemical synthesis is enabling further characterization of their biological activities.