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Scorpion toxins to unravel the conundrum of ion channel structure and functioning

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1 **Scorpion toxins to unravel the conundrum of ion channel structure and functioning**

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11 **Abstract:**

12 The consequences of scorpion stings on the affected victims, including humans, have  
13 been known since ancient times. The effects of the venom, first on neurotransmission and  
14 thereafter on many physiological processes at the organism, tissue, cellular or molecular  
15 levels, have been the subject of intense research. It is, therefore, not surprising that a  
16 large number of toxins acting on a variety of ion channels have been isolated and  
17 described to date. Many of these toxins show high specificities and affinities towards  
18 their natural targets. Along with their own biochemical and biophysical characterization,  
19 scorpion toxins have been used as invaluable tools for studies regarding the structure and  
20 function of ion channels. They have also become important leads in drug development  
21 aiming at diagnosing, targeting or direct treatment of channelopathies caused by the  
22 improper function of those channels they recognize, as well as other anomalous  
23 physiological conditions, including autoimmune diseases and cancer. The main families  
24 of scorpion toxins are reviewed here, among which are those specific for Na<sup>+</sup>, K<sup>+</sup> and  
25 ryanodine-sensitive Ca<sup>2+</sup> channels. The focus is placed on the historical events that led to  
26 their discovery and their use in the identification and characterization of the structure and  
27 function of ion channels. Their potential use in medicine is also presented.

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