Study finds scorpion venom able to heal bacterial infections in mice

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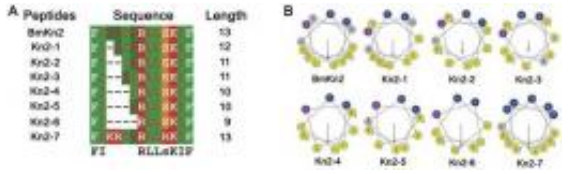

Screening, antimicrobial and hemolytic activities of Kn2-7 in vitro. (A) Multiple alignments of Kn2-7 and its seven derivatives. (B) Predicted secondary structure of Kn2-7 and its seven derivatives. Image from *PLoS ONE* 7(7): e40135. doi:10.1371/journal.pone.0040135

(Phys.org) -- Though it might seem counterintuitive to use the venom from a scorpion for healing purposes, researchers in China have found that applying an amount of a peptide found in scorpion venom to bacterial infections festering in wounds on the skin of test mice, caused the bacteria to be killed allowing the wounds to heal. The team, from Wuhan University, has published a paper documenting their research on *PLoS One*.

Anyone following medical research knows that the antibacterial agents currently being used to treat infections are growing less effective over time as bacteria develop a resistance to them. Some types such as MRSA, the CDC has reported, have doubled in hospital patients over the past two decades. Because the day will soon come when doctors won't have any medicines left to use to help infected patients, researchers have increasingly turned to other sources, one of which are peptides (compounds consisting of two or more amino acids linked in a chain) found in many plants and animals, which have been shown to be effective in killing bacteria.

In this new research, the team shaved the skin off the backs of several test mice, cut the skin and then infected them with several different types of bacteria. Once the infections were raging, the team applied an ointment containing the peptide Kn2-7 which was a modified form of another peptide BmKn2 that had been extracted from scorpion venom. After watching to see what would happen, the team found that the ointment killed a whole variety of bacteria allowing the wounds to heal naturally thereafter. Those infections in control groups on the other hand, continued to fester.

In looking closer to find out how the peptides killed the bacteria, the researchers found that it bound itself to their cell walls, coating them with microspheres, eventually causing them to burst. Unfortunately, they found that the natural peptide found in the scorpion venom tended to do the same thing to the host's red blood cells. To get around that problem, they modified the peptide in such a way as to keep its ability to coat bacteria cells, while lessening its tendency to do so with red blood cells. The end result might just be one of the new tools given to medical professionals in the near future to replace existing bacterial treatments.

More information: Cao L, Dai C, Li Z, Fan Z, Song Y, et al. (2012) Antibacterial Activity and Mechanism of a Scorpion Venom Peptide Derivative In Vitro and In Vivo. *PLoS ONE* 7(7): e40135. doi:10.1371/journal.pone.0040135

Abstract

BmKn2 is an antimicrobial peptide (AMP) characterized from the venom of scorpion Mesobuthus martensii Karsch by our group. In this study, Kn2-7 was derived from BmKn2 to improve the antibacterial activity and decrease hemolytic activity. Kn2-7 showed increased inhibitory activity against both Gram-positive bacteria and Gram-negative bacteria. Moreover, Kn2-7 exhibited higher antibacterial activity against clinical antibiotic-resistant strains such as methicillin-resistant Staphylococcus aureus (MRSA). In addition, the topical use of Kn2-7 effectively protected the skin of mice from infection in an S. aureus mouse skin infection model. Kn2-7 exerted its antibacterial

activity via a bactericidal mechanism. Kn2-7 killed S. aureus and E. coli rapidly by binding to the lipoteichoic acid (LTA) in the S. aureus cell wall and the lipopolysaccharides (LPS) in the E. coli cell wall, respectively. Finally, the hemolytic activity of Kn2-7 was significantly decreased, compared to the wild-type peptide BmKn2. Taken together, the Kn2-7 peptide can be developed as a topical therapeutic agent for treating bacterial infections.