MedicalNewsToday.com

Newly identified compounds in spider venom could help treat chronic pain

Last updated: Wednesday 4 March 2015 at 8am PST

The thought of spiders may make your skin crawl, but a new study suggests that maybe we should put our hatred of the eight-legged beasts to one side; their venom could lead to a more effective treatment for the 100 million Americans who suffer from chronic pain.

The researchers identified one compound - found in the venom of a spider that belongs to the tarantula family - that they say shows strong promise as an effective painkiller in humans.

Chronic pain - defined as pain that lasts longer than 3-6 months - is the most common cause of long-term disability in the US. It occurs when nerves in a part of the body send continuous signals to the brain via pain pathways.

Past studies have found that, in humans, one of the most common pathways involved in chronic pain is Nav1.7. The researchers of this latest study - led by Prof. Glenn King of the Institute for Molecular Bioscience at The University of Queensland in Australia - believe targeting this pathway could help treat a wide range of pain conditions.

"A compound that blocks Nav1.7 channels is of particular interest for us," says Prof. King. "Previous research shows indifference to pain among people who lack Nav1.7 channels due to a naturally-occurring genetic mutation - so blocking these channels has the potential of turning off pain in people with normal pain pathways."

The use of spider venom to relieve pain is not a new idea. Many of the world's 45,000 species of spiders kill their prey by injecting them with venom that contains up to thousands of protein molecules, known as peptides. Some of these peptides block nerve activity, so researchers have

increasingly focused on identifying spider venom peptides that could act as pain relievers in humans.

However, the large number of peptides found in spider venom has presented a challenge for scientists. "A conservative estimate indicates that there are 9 million spider-venom peptides, and only 0.01% of this vast pharmacological landscape has been explored so far," says study author Dr. Julie Kaae Klint, also of the Institute for Molecular Bioscience.

Hd1a compound in spider venom shows strong painkiller potential

As such, the researchers created a system described as a "high-throughput fluorescent-based assay," which allowed them to quickly search for peptides in spider venom that may block the Nav1.7 pathway.

The team used their system to screen the venoms of 205 species of spider. They found 40% of venoms contained at least one peptide able to block the Nav1.7 pathway in humans. They narrowed this down to seven promising compounds, identifying one that was likely to be most effective as a pain reliever.

The compound - Hd1a - was identified in the venom of a species of spider called *Haplopelma doriae*, a member of the tarantula family. Not only does this compound block the human Nav1.7 pathway, the team found it has a chemical structure that makes it chemically, thermally and biologically stable - meaning it has strong potential as an effective painkiller in humans.

Based on their findings, the researchers believe their newly created system will pave the way for further discoveries of potential painkillers for human use. Dr. Klint adds:

"Untapping this natural source of new medicines brings a distinct hope of accelerating the development of a new class of painkillers that can help people who suffer from chronic pain that cannot be treated with current treatment options."

The authors say their system could also be used to isolate protein molecules from other animal venoms. "The venom-based drug discovery pipeline described here provides a paradigm for high-throughput screening of animal venoms against other therapeutic ion channel targets," they add.

In May 2013, *Medical News Today* reported on a study by Brazilian researchers that detailed how they **engineered a protein from spider venom**, paving the way for new antivenom vaccines.

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