Going to the dogs: University's newest patent for improving canine health

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Make no bones about it, a discovery by a Kansas State University research team could mean a longer and healthier life for man's best friend.

University researchers Tonatiuh Melgarejo, an associate professor of human nutrition; Frank Blecha, distinguished professor of immunophysiology; and Yongming Sang and Maria Ortega, former postdoctoral fellows, isolated and characterized a natural antimicrobial peptide that helps dogs to better fight pathogens -- including different bacteria, viruses and fungi.

The peptide's characteristics and production method were recently issued as a patent titled "Antimicrobial Cathelicidin Peptides" to the Kansas State University Research Foundation, a nonprofit corporation responsible for managing the technology transfer activities of the university.

Researchers modeled the synthetic canine antimicrobial on a naturally occurring peptide found in the white blood cells of dogs, then tested it against numerous types of viruses, fungi and bacteria.

"It turned out it's really good at killing these microorganisms," Melgarejo said. "We suspected we had something that could really improve animal health, and maybe eventually human health."

The study that led to the synthetic antibody began in 2003, as Melgarejo

and colleagues intended to find the antimicrobial peptides -- or antibodies -- responsible for canine immunity. Up to that point little data had been collected about the animal's immunology.

"Every single living creature on Earth -- animals, plants, insects and even bacteria -- produce some type of antimicrobial peptides," Melgarejo said. "These peptides are very small molecules that kill microbes like bacteria, viruses and yeast. It's a fairly simple defensive system, and everything from bacteria to humans produce these peptides."

According to Melgarejo, the antimicrobial peptides that each species produces are unique and hardwired to an organism's DNA, giving certain species certain resistances. For example, the immune system in dogs may be able to kill certain pathogens extremely well while the immune system in humans is not.

The team discovered different antimicrobial peptides in the dog but was most interested in canine cathelicidin, commonly abbreviated as K9CATH. Cathelicidins are peptides that play a central role in the early innate immunity against infections.

While animals like domestic cattle and buffalo have several different cathelicidins to help fight infections, dogs have only one type of cathelicidin peptide. This led the team to speculate that the sole cathelicidin in canines is extremely strong.

"Although a dog may be stronger immunologically speaking than a human and many other animals, it's not the strongest animal on Earth," Melgarejo said. "When I worked in the clinical sciences I regularly treated dogs for diarrhea, coughing, ear infections, dermatitis, conjunctivitis and other diseases. So it's evidently not as sturdy of an animal as it could be."

Because dogs are considered man's best friend, the researchers wanted to be dogs' best friend, too. Using the canine genome -- the genetic blueprint of the domestic dog -- the team applied the canine cathelicidin as a temple to develop a synthetic antimicrobial with enhanced biological activity.

Melgarejo and Blecha, along with Annika Linde, research associate, and Kate Osei-Boadi, a doctoral candidate in human nutrition, Ghana, are continuing to develop the synthesized cathelicidin as well as explore new avenues to strengthen it. This currently includes studying hyenas, which are one of the most resilient animals in nature.

Researchers are also in the process of establishing a partnership with the Kansas Bioscience Authority to test the synthesized peptide against canine leishmaniasis, which is a tropical disease that is on the rise. The disease is zoonotic, meaning that it spreads from dogs to humans. Leishmaniasis is found in about 88 different countries worldwide and accounts for an estimated 2 million new cases a year, according to the Centers for Disease Control and Prevention.

Provided by Kansas State University