MedicalXpress

Chemical In Blood May Explain Susceptibility To Bladder Pain

June 15 2009

A marker in the blood of both cats and humans that was identified in a recent study might signal both species' susceptibility for a painful bladder disorder called interstitial cystitis, a condition that is often difficult to diagnose.

Follow-up studies of the chemicals that appeared in blood samples suggest that the way tryptophan, an essential amino acid, is processed in cats and humans with interstitial cystitis ultimately could affect the way signals are transmitted in the brain. The results, while preliminary, suggest that the disease is not just a malfunction of the bladder, but might instead have origins in the central nervous system, researchers say.

Symptoms of interstitial cystitis, known as IC, include recurring discomfort or pain in the bladder and pelvis, and often both an urgent and frequent need to urinate. A diagnosis typically follows tests to rule out other diseases, such as infections or cancer. No diagnostic test currently exists for IC, and the cause is unknown. Treatments range from oral medications to exercise for humans, and maintaining a safe environment for cats.

"What we know now is that this testing method is very sensitive and specific for the disorder in both humans and domestic cats. So far it hasn't missed one diagnosis," said Tony Buffington, senior author of the study and professor of veterinary clinical sciences at Ohio State University.

The research is published in the current issue of the journal Analyst.

Buffington and colleagues collected samples from cats with feline interstitial cystitis, healthy cats and cats with other diseases, as well as samples from humans with the painful bladder syndrome, healthy humans and humans with other urological illnesses.

He and colleagues used infrared microspectroscopy to tell the difference between blood samples indicating the presence or lack of disease based on the samples' molecular profiles. Infrared spectroscopy identifies the biochemical content of a blood sample based on where peaks of molecules appear in the infrared spectrum. Samples from humans and cats with interstitial cystitis demonstrated nearly identical molecular peaks.

"It's a powerful enough technique that we might even be able to identify subtle differences in patients with multiple diseases that exist in addition to, but that are unrelated to, the interstitial cystitis," he said.

The researchers then determined the chemical structures within those molecular profiles, which showed that blood from cats with the syndrome contained at least 20 percent more tryptophan and kynurenine than did samples from healthy cats. Kynurenine is a brain compound produced when tryptophan breaks down in the body. An elevated level of kynurenine suggests that tryptophan is being diverted from its conversion into a chemical responsible for sending signals in the brain.

This testing method differentiated between diseases in humans as well, classifying the samples as coming from either healthy subjects, IC patients, or patients with another urological disorder, Buffington said.

In addition to improving the potential to diagnose interstitial cystitis, understanding chemical processes related to this chronic disease could offer new directions for the pursuit of treatments and even prevention strategies, he said.

“It’s all speculative, but it may be that there is some kind of primary central nervous system disorder that results in problems in the bladder in some people, and in the gut or other organs in others,” Buffington said. “It is possible that this is a biomarker for the underlying vulnerability or susceptibility.”

Buffington has led studies that show that in cats, feline interstitial cystitis can be managed through a series of changes to the affected animals’ environment that reduce stressors and promote stability and predictability.

“We can put these cats into recovery, but I don’t think we cure them. It’s a chronic condition. It’s like lactose intolerance - you won’t get that gene back, but you can learn to avoid milk,” he said.

So far, humans with the disorder have the option of bladder distention, dietary changes, exercise, oral drugs, electrical nerve stimulation or surgery. But all treatments target only symptoms because the underlying cause of the disease is unknown.

Buffington plans to test human samples from patients diagnosed with irritable bowel syndrome and fibromyalgia to see if the same biomarker is associated with these chronic pain disorders as well. These disorders, like IC, are categorized as what are known as medically unexplained or functional syndromes, and Buffington has explored the possibility that a common link exists among these types of diseases.

He published a review paper in the April issue of the journal Psychotherapy and Psychosomatics in which he suggested that traumatic events experienced by pregnant females might transmit to fetuses a genetic change associated with the stress response.

Buffington suggests that such a genetic change would mean offspring

born to these mothers might then have a genetic predisposition to be more vulnerable to certain stressors, and that in some individuals that vulnerability could lead to development of a chronic pain disorder in response to stress.

“When products of the stress response cross the placenta, they can change gene expression in offspring,” Buffington said. “My guess is that there are patterns or groups of genes that are changed. And these groups could have something to do with the magnitude and quality of the stress response. I think it’s another useful way to look at how these things develop.”

Source: The Ohio State University (news : web)