Inflammatory disease treatments will improve through the use of lipidomics

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Charles Brown is an associate professor of veterinary pathobiology in the MU College of Veterinary Medicine. Credit: Photo courtesy of Dr. Charles Brown.

According to the National Center for Chronic Disease Prevention and Health Promotion, 46 million Americans have arthritis. Many of these people take over-the-counter anti-inflammatory medications that block production of certain molecules, known as bioactive lipids, to reduce pain and swelling.

Yet, the role of these lipids is not yet understood completely, and medications may have adverse side effects. Recently, University of Missouri researchers completed the first comprehensive analysis of bioactive lipids in an inflammatory response triggered by the Lyme

disease agent, Borrelia burgdorferi. This analysis could shed light on the role bioactive lipids play in inflammatory diseases.

"Many diseases, such as arthritis, cardiovascular disease and diabetes are associated with chronic inflammation," said Charles Brown, associate professor of veterinary pathobiology in the MU College of Veterinary Medicine. "The first step in finding an effective treatment is to understand the basics of an inflammatory response, including the role of bioactive lipids. Understanding how bioactive lipids regulate the disease processes will lead to the development of drugs that have more specific targets and less adverse side effects."

In the study, researchers investigated the role of certain bioactive lipids in mice infected with Borrelia burgdorferi, the bacteria responsible for Lyme disease. Eicosanoids, which are bioactive lipids that play an important role in inflammatory disease, were extracted from mice that displayed symptoms of Lyme arthritis and from mice who showed no symptoms. The researchers found differences in the amounts of specific eicosanoids in the samples, which correlated with the severity of arthritis in the mice.

"The process of inflammation is not a passive event, but instead is a coordinated, orderly process actively signaled by specific protein and lipid molecules," Brown said. "Previous studies investigating eicosanoids have focused on singular pathways or phases of the inflammatory response. These studies provided an incomplete picture and gave the impression that some bioactive lipids function in isolation. In our study, we were able to measure virtually all of the known eicosanoids at the same time and examine a more complete picture of the inflammatory response."

The findings from this study also could translate into a diagnostic tool for assessing individual patients, assist with the development of more

disease-specific therapies, and facilitate the progress of individualized medicine, resulting in more effective treatments for inflammatory diseases with fewer side effects.

Lyme arthritis occurs in 60 to 80 percent of individuals not treated with antibiotics at the time of their infection, and patients are typically given anti-inflammatory drugs to treat their pain and swelling. Arthritis in mice caused by Lyme disease is a good model for how bioactive lipids regulate the process of inflammation, because researchers can observe the process from start to finish, Brown said.

The study, "Lipidomic Analysis of Dynamic Eicosaniod Responses During the Induction and Resolution of Lyme Arthritis," was published in the June issue of *The Journal of Biological Chemistry*.

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