In vitro models will minimize animal use in arthritis studies

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It’s hard to think of scientists in laboratories working toward solutions for medical problems without mice or other laboratory animals, but animals’ roles in at least one major research laboratory may soon be minimal.

Researchers at the University of Missouri-Columbia's Comparative Orthopaedic Laboratory (COL) have developed an in vitro model using small sections of joint capsule and cartilage typically discarded that mimics arthritic joints. This "joint in a test tube" model can be used to investigate causes and mechanisms for the development and progression of arthritis and to screen new treatments such as pharmaceuticals. The MU research team which developed this model has shown that the results have valid and direct clinical implications for arthritis in dogs and humans.

Often, clinical research is limited by patient numbers, accessibility to appropriate samples and ethical considerations. Using in vitro models eliminates some of these barriers and allows researchers to better understand of the disease’s development, characteristics and responses to various injuries, treatments and loads. The in vitro model acts similar to an actual joint with the same histological, biochemical and molecular changes.

“These in vitro models will allow us to perform our research without using animals while still accurately mimicking situations in real life,” said James Cook, professor of veterinary medicine and surgery and the

William C. Allen Endowed Scholar for Orthopaedic Research. “We can screen new drugs for arthritis in a more efficient and cost-effective way such that real progress is achieved more quickly.”

The in vitro models allow for all of the tissue in a normal joint to be "grown" together such that the different types of tissues can "communicate" as they do in the actual joint. COL researchers have shown that this system maintains the tissues' appearance, composition, and function so that they react to health and disease as they would in real life. The system then allows drugs, nutritional supplements and even exercise regimens to be tested on the in vitro model.

For example, scientists can determine the effects of pressure to the joints after running or walking using a bioreactor, a device which loads the tissues in the "test tube" environment. Using this new model, MU researchers will unlock clues, on a molecular level, as to why recovery is important in healthy athletes as well as people with arthritis.

“Using the joints in the test tubes will allow for greater flexibility when studying arthritis,” Cook said. “We can test literally hundreds of different loads on joints in a single day and show results in real time. It is strengthening our research as we are able to explain data on a molecular level and then translate it to what happens to people and pets that struggle with arthritis every day.

“These in vitro models also provide a much safer mechanism for investigating new drugs and therapies. If severe side effects occur, all we have do is assess what has happened to the tissues rather than trying to treat a laboratory animal or a patient with an adverse reaction.”

Source: University of Missouri-Columbia