Research provides new insights into bone biology

November 8 2013, by Diane Kukich

Rhonda Prisby is conducting research on bone biology. Credit: Evan Krape

Bone marrow, the spongy tissue inside long bones, produces new blood cells and helps the lymphatic system work properly. But it may also turn out to be a progressively hostile microenvironment that induces vascular dysfunction and ossification, or hardening, of blood vessels.

Rhonda Prisby, who is using a rat model to study bone vascular

physiology and morphology, was recently surprised when she used light microscopy to look at bone marrow vessels.

"I was shocked to see bone marrow vessels that looked like bone tissue," she says.

Subsequently, she looked at femoral bone and bone marrow vessels with FT-IR.

"We looked at cortical bone and bone marrow vessels from the femurs of young and old animals," says Prisby, assistant professor in the Department of Kinesiology and Applied Physiology at the University of Delaware.

"The FT-IR spectra of old cortical bone and bone marrow vessels are very similar," she says. "In contrast, the spectra of young cortical bone and bone marrow vessels are quite different."

MicroCT analysis showed much the same thing—significant bone marrow microvascular ossification in older femurs.

"Our results are very preliminary," Prisby says, "but what we're seeing is severely calcified blood vessels that start to form in youth and progress with age, culminating in 'microvascular dead space'—that is, a loss of vessel function—and coinciding with a loss of blood supply to the skeleton. Under these conditions, nutrients may be unable to get to where they need to be, and the ability to deliver drugs may also be limited."

If the same phenomenon can ultimately be shown in humans, the findings will contribute to knowledge about why diseases like osteoporosis develop and whether these conditions can be prevented or reversed.

Prisby is cautiously optimistic about her discovery.

She recently obtained a leg bone sample from Christiana Care and observed the same type of staining pattern and the same look to the vessels that she had seen in the animal bone.

However, the bone was from an older individual with arteriosclerotic disease, so it is not clear whether the findings are a function of age or disease. The next step will be to look at leg bones from younger, healthier individuals.

Prisby presented a poster on the work at the American Society for Bone and Mineral Research conference, held in Baltimore from Oct. 4-7, and her abstract was chosen as a plenary poster and selected to be part of the welcoming reception.

Provided by University of Delaware