Exercise can produce healthy chatter between bone, fat and pancreatic cells

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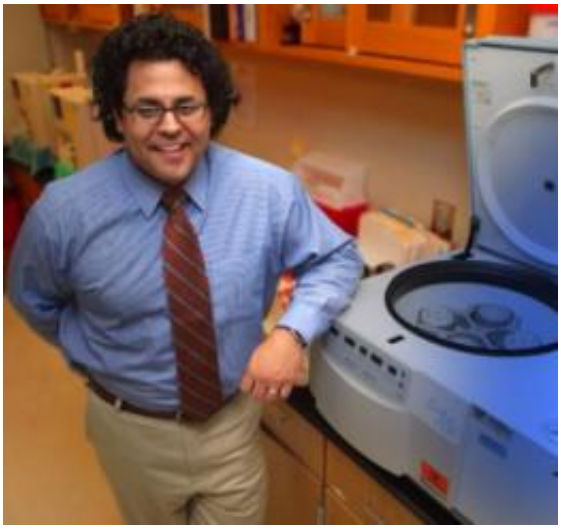

Dr. Norman Pollock of Georgia Health Sciences University has evidence of crosstalk between bone, fat and pancreatic cells in humans. Credit: Phil Jones/GHSU photographer

Cells in bone, fat and the pancreas appear to be talking to each other and one thing they likely are saying is, "Get moving."

A small study of obese children enrolled in after-school exercise programs showed 12 weeks of vigorous exercise resulted in stronger bones, improved insulin sensitivity (reduced diabetes risk) and less of the most-deadly belly, or visceral, fat, Georgia Health Sciences University researchers report.

It also indicated that blood levels of the hormone osteocalcin, made by bone-producing osteoblasts, might be a good indicator of how things are going in all three areas, said Dr. Norman Pollock, bone biologist at GHSU's Georgia Prevention Institute.

Pollock's finding is some of the earliest human evidence of this crosstalk among the divergent cell types. Dr. Gerard Karsenty, Chairman of Genetics and Development at Columbia University Medical Center, provided the first evidence of their conversation in animals. In those studies, animals receiving osteocalcin experienced improved insulin sensitivity, less belly fat and denser bones. Osteocalcin levels have primarily been associated with bone growth.

The work earned Pollock a 2011 American Society for Bone and Mineral Research Young Investigator Award. He is presenting the finding during the society's annual September meeting in San Diego.

There have been pieces of evidence of this communication in humans: people with diabetes get a lot of bone fractures; those with more visceral fat are at risk for diabetes; and bone cells have insulin receptors. Ask Pollock why a bone cell would have an insulin receptor and he says it's a question that many are trying to answer with studies such as this one.

"The idea is that bones can possibly sense environmental stimuli such as being physically active or sedentary and dictate energy regulation accordingly," he said. The reality is bones get bigger and stronger with exercise and they appear to be sharing the good news. "When osteocalcin is released in your blood, that hormone is talking back to the adipocytes, the cells that store fat, and the pancreatic cells that release insulin to improve energy metabolism." Bone researchers like Pollock have previously believed bones were just listening.

His study looked at children who were inactive as well as those who

exercised 20 or 40 minutes daily. Osteocalcin levels were measured at the start and finish of the 12-week period in addition to standard assessments such as a glucose tolerance test for insulin sensitivity. They found a consistent dose-response so that the children who exercised the most experienced the most bone formation, improved insulin sensitivity and reduced visceral and total body fat.

Pollock notes that bone and fat cells do have a common ancestry: they are both derived from mesenchymal stem cells. "It's possible that children's early lifestyle habits and experiences may induce alterations in body composition and predispose them to a lifetime of obesity," he said. "As parents, we must ensure that our children balance out their screen time with enjoyable physical activity."

Provided by Georgia Health Sciences University