

Researchers find disease-causing fat cells in those with metabolic syndrome

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UC Davis Health System researchers have discovered biological indicators that help explain why some obese people develop chronic diseases such as diabetes and heart disease, and others do not.

The researchers took a novel approach of looking specifically at the body fat of people with metabolic syndrome -- a condition characterized by increased blood pressure, high-fasting blood-sugar levels, excess abdominal fat and abnormal [cholesterol levels](#). They found the fat cells released biomarkers associated with [insulin resistance](#) and [chronic inflammation](#), conditions often leading to diabetes and [cardiovascular disease](#).

"Our study shows that not all obesity is the same and some body fat may actually be toxic," said Ishwarlal Jialal, UC Davis professor of endocrinology, diabetes and metabolism and senior author of the article, "Adipose Tissue Dysregulation in Patients with Metabolic Syndrome," published online today in the *Journal of Clinical Endocrinology & Metabolism*. "We have shown that the dysfunction in the fat of people with metabolic syndrome is more than can be explained by obesity. It tells us that metabolic syndrome is a high-risk condition for people who are obese."

While previous studies using circulating blood have found some of these biomarkers in people with metabolic syndrome, the current study is the first to pinpoint fat as a contributing source of these markers. The study is also unique in that it involved patients newly diagnosed with metabolic

syndrome who had not yet developed diabetes or cardiovascular disease. Researchers compared fat from study subjects to fat from people who were also obese, but did not have metabolic syndrome.

"This drives home the point that clearly metabolic syndrome is high-risk for obesity and needs to be treated seriously," said Jialal, who directs the UC Davis Laboratory for Atherosclerosis and Metabolic Research.

The Centers for Disease Control and Prevention estimates that 35 percent of American adults have metabolic syndrome, and its prevalence is increasing even in children and young adults globally. It doubles a person's chances of developing cardiovascular disease -- which can lead to heart attack or stroke -- and is at least five times the risk for developing diabetes.

"This is the plague of our time," said Jialal, who is also the editor-in-chief of the peer-reviewed journal *Metabolic Syndrome and Related Disorders*.

In the current study, biopsies were performed to remove subcutaneous adipose tissue, which accounts for about 80 percent of body fat, from the buttocks of 70 patients: 39 newly diagnosed with metabolic syndrome and 26 who were obese. Researchers also took standard measurements, such as fasting glucose and blood pressure, waist circumference and body mass index (BMI). Glucose measurements were used to estimate insulin resistance, and both waist size and BMI were used in the statistical analysis to match test subjects with their control counterparts.

Jialal and his collaborators then measured 11 biomarkers for diabetes and cardiovascular disease, as well as counting the number of macrophages in the fat tissue. These macrophages form crown-like structures around [fat](#) cells that have outgrown their blood supply and

died. The presence of macrophages -- immune system cells that engulf and destroy cellular waste -- indicates the kind of inflammatory response implicated in cardiovascular disease.

Last year, Jialal published a study on these same 65 patients showing that they have both dysfunctional and fewer endothelial progenitor cells (EPCs) than control subjects. These cells eventually form the lining of blood vessels and are used as a measure of cardiovascular health. As in the current study, this abnormality cannot be explained simply by obesity. Jialal's team now is looking at differences in monocytes between the two study groups. The new data suggests intrinsic defects in the critical adipose tissue cells and EPCs that are relevant to increased risk for diabetes and cardiovascular disease.

While metabolic syndrome can be reversed through diet and exercise resulting in weight loss, other kinds of treatment may be needed, Jialal said.

"I have done this for 34 years. It is hard to get people to stick to therapeutic lifestyle changes," he said, adding that researchers need to address the dysfunction of [fat cells](#), using existing or novel drug therapies to block the production of damaging biomarkers.

"Once people have cardiovascular disease or diabetes, it's too late and far more expensive given the complications that ensue. [Metabolic syndrome](#) is the antecedent. This is where we need to intervene," said Jialal.

Provided by University of California - Davis

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