Stress-induced overweight: Mechanism for fat distribution discovered

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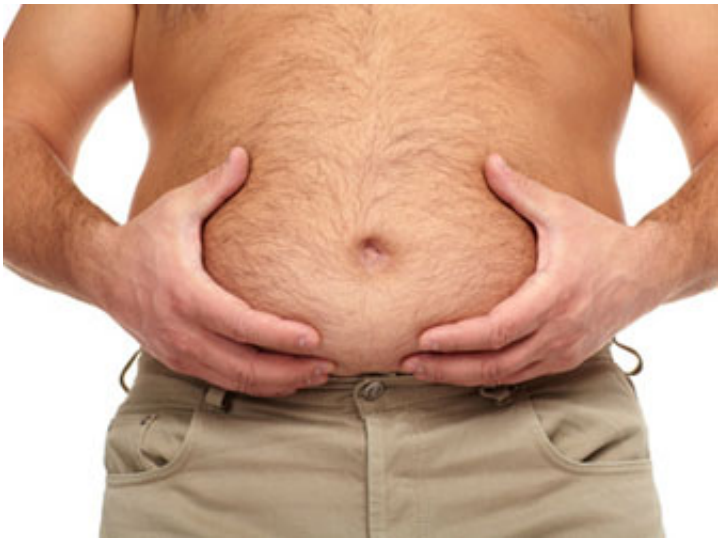

(Medical Xpress)—When someone is suffering from raised stress levels increased amounts of glucocorticoids are secreted. These play a part in becoming overweight. Up until now it has not been clear why fat tissue is formed primarily in the belly as abdominal or visceral fat. Scientists from the Clinical Institute of Laboratory Medicine at the MedUni Vienna have now decoded a mechanism responsible for the distribution of fat.

These scientists under the leadership of Martin Bilban from the Clinical Institute of Laboratory Medicine at the MedUni Vienna discovered a

chain of molecular mechanisms, which is kick-started by the formation of glucocorticoids. Here the glucocorticoid-dependent gene "LMO3" and the 11?HSD1 enzyme are the deciding factors: changes in the formation of LMO3 play an important role in the re-distribution of the fat tissue in the direction of belly fat – these changes are triggered by the higher glucocorticoid level and by the 11?HSD1 enzyme.

"The enzyme is, so to speak, the charger for LMO3, which then completes the re-distribution," declares Bilban. The study's authors were thus able to demonstrate that LMO3- and 11?HSD1- levels in the belly fat of obese patients are closely correlated. Furthermore, both also promote the formation of fat cells. "In this, LMO3 has a stimulating effect at molecular level on PPAR?, the key gene in the formation of fat," says Bilban.

In general, a differentiation is made between two types of fat deposits: between visceral (internal) belly fat and subcutaneous fat tissue which sits under the skin. The pattern of fat distribution is a significant factor for the health risk in being overweight or obese. If there is too much belly fat – the fat distribution type typical for men – there is increased risk of serious health issues such as type 2 diabetes, strokes, cardio-vascular diseases and several significant types of cancer. Says co-head of the study Harald Esterbauer: "Belly fat is not only a bad fat, it is also the one that is most often formed when a person is under stress."

According to Bilban, the de-coding of this molecular mechanism could in future contribute to developing new treatment possibilities for metabolic syndrome (visceral fat, high blood pressure, raised blood fats and insulin resistance). It would be conceivable that the build-up of visceral fat could be expressly prevented by blocking LMO3.

Glucocorticoids – only dangerous in excess

Basically glucocorticoids perform various important physiological tasks in the human body: they influence metabolism, water and electrolyte balance, the cardio-vascular system and the nervous system. "We couldn't live without them," says Esterbauer. Disorders of the glucocorticoid balance can manifest in so-called Cushing's syndrome. This syndrome is triggered either by the body's own over-production of cortisone or the long-term taking of cortisone preparations. Both increase the risk of metabolic syndrome – through an increased formation of visceral fat tissue amongst other things.

The current study was conducted within the context of the "Cell Communication in Health and Disease" doctorate programme by the PhD student Josefine Lindroos and has now been published in the leading journal *Cell Metabolism*.

More information: Lindroos, J. et al. Human But Not Mouse Adipogenesis Is Critically Dependent on LMO3, *Cell Metabolism*. dx.doi.org/10.1016/j.cmet.2013.05.020

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