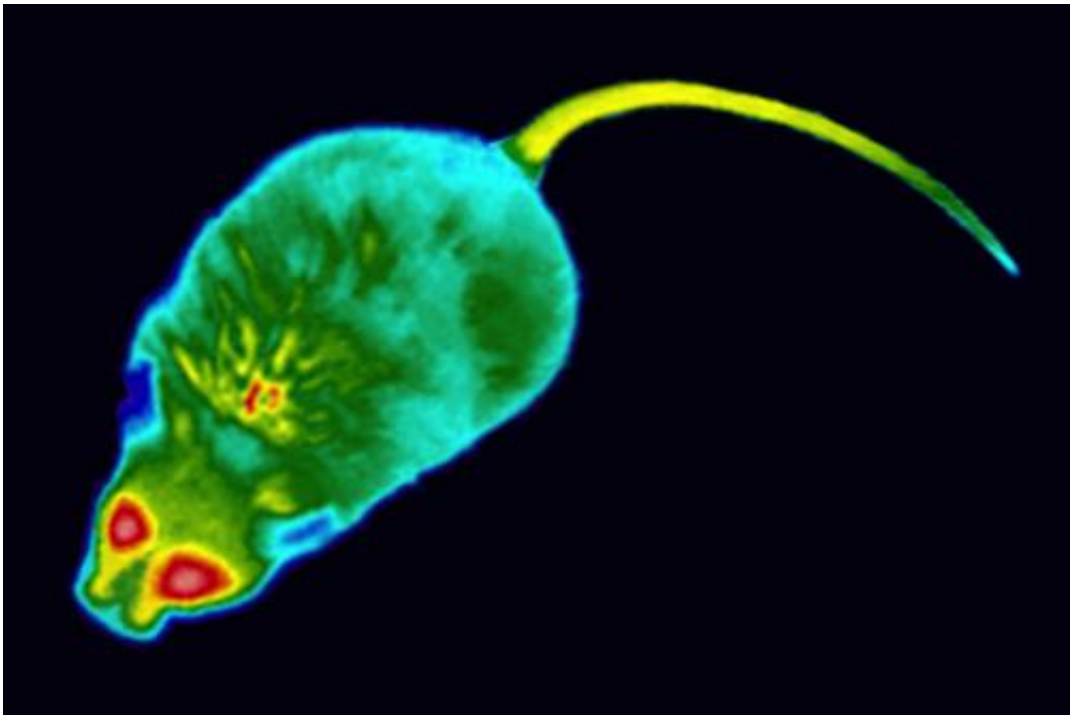
MedicalXpress

Thyroid hormone plays a key part in the vascular regulation of body temperature

September 16 2013



The research team at Karolinska Institutet took infrared images of the mice and noticed that they were losing a considerable amount of heat through their tails. The conclusion was that mice with defective thyroid hormone receptors are unable to properly regulate the constriction of their blood vessels. Credit: Amy Warner, *PNAS*.

Researchers at Karolinska Institutet in Sweden have discovered a reason why people with disorders of the thyroid gland may be more sensitive to environmental temperature. According to the study, published in the

Proceedings of the National Academy of Sciences (*PNAS*), a previously unknown link has been found between the effects of thyroid hormone on blood vessels, and how this in turn affects body temperature.

Patients with hyperthyroidism (an overactive thyroid) or hypothyroidism (an underactive thyroid) often feel that they are too hot or too cold, respectively. The cause of this phenomenon has so far been attributed to the thyroid hormones' general effect on the metabolism in the cells themselves.

The thyroid produces hormones that can influence how much the blood vessels dilate and therefore how much heat can escape.

"Our study shows that the temperature sensitivity experienced by thyroid disorder patients might be due to vascular effects, and this knowledge may help future treatment of these patients who are particularly affected", says Dr Amy Warner, researcher at the Department of Cell and Molecular Biology, and the paper's first author.

The researchers studied mice with a defective type of thyroid hormone receptor, meaning that they are hypothyroid in certain tissues, including in the smooth muscle of blood vessels. It was known from previous studies that these mice have an overactive metabolism, caused by the energy needed to generate heat from brown fat, which might seem contradictory given their impaired thyroid hormone function. When the team behind the study took infrared images of the animals, they noticed that they were losing a considerable amount of heat through their tails. Their conclusion was that mice with defective thyroid hormone receptors are unable to properly regulate the constriction of their blood vessels.

"At room temperature, the mice in our study were unable to properly control the blood flow to their tails, which caused heat loss," says Dr

Jens Mittag, senior author on the paper. "They therefore needed a backup plan to keep themselves warm and so they produced heat through their brown fat. This tells us that people with a thyroid disorder also might be feeling the cold, but unlike mice, they can partially compensate with extra clothing or turning up the thermostat at home."

The thyroid gland, located in the throat, is subject to a wide range of functional disorders. The findings of this study can add to what is already known about the temperature oversensitivity experienced by patients with thyroid disorders. In the long run, the discovery might possibly lead to treatments that correct dysfunctional vascular regulation.

More information: 'Inappropriate heat dissipation ignites brown fat thermogenesis in mice with a mutant thyroid hormone receptor alpha1', Amy Warner, Awahan Rahman, Peter Solsjö, Kristina Gottschling, Benjamin Davis, Björn Vennström, Anders Arner and Jens Mittag, *PNAS* online 16-20 September 2013. www.pnas.org/cgi/doi/10.1073/pnas.1310300110

Provided by Karolinska Institutet