

Brown fat cells make 'spare tires' shrink

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(PhysOrg.com) -- Scientists at the University of Bonn have found a new signalling pathway which stimulates the production and function of so-called brown fat cells. They propose using these cells that serve as a "natural heating system" in order to just 'burn' unwanted excess fat. The results will be published in the journal *Science Signaling* on Dec. 1.

Brown adipose tissue is different from white fat pads. It contains loads of mitochondria, miniature power stations which among other things can 'burn' fat. In doing this, they normally generate a voltage similar to that of a battery, which then provides energy for cellular processes. However, the mitochondria of brown [fat cells](#) have a short circuit. They go full steam ahead all the time. The energy released when the fat is broken down is released as heat.

'This is actually what is intended,' Professor Alexander Pfeifer from the Bonn PharmaCentre explains. 'Brown fat acts like a natural heating system.' For example, babies would get cold very quickly without this mechanism. Up to now, it was thought that brown fat only occurred in newborn babies and was lost with age. However, this year different groups were able to show that this is not true: even adults have a deposit of brown fat in the neck area. But with very overweight people this deposit is only moderately active or is completely absent.

PKG turns on the heating

The scientists from Bonn, Heidelberg, Cologne, Martinsried and the Bundesinstitut für Arzneimittel und Medizinprodukte, BfArM, were now

able to show which signals prompt the body to produce brown fat cells. A signalling pathway which is controlled by the PKG enzyme takes on a key role in this process. This signalling pathway results in the [stem cells](#) of the fatty tissue becoming brown fat cells. For this it switches on the mass production of mitochondria and ensures that UCP is formed, the substance that creates the short circuit. 'Furthermore, we were able to show that PKG makes brown fat cells susceptible to [insulin](#),' Alexander Pfeifer explains. 'Therefore PKG also controls how much fat is burnt in general.'

Mice without PKG have a lower body temperature, as the researchers were able to show with a thermographic camera. Above all, animals in the thermal image lack an 'energy spot' between the shoulder blades, i.e. the place where normally the brown fat is active.

Fighting fat with fat

The researchers suspect that a disorder of the brown fatty tissue can lead to obesity in adults. If it were possible to turn on the 'natural heating system' on again, the problem of unwanted fat would be quickly solved: according to estimates, 50 grams of active brown fatty tissue is sufficient for increasing the basal metabolic rate by 20 per cent. '

With the same nutrition and activity the fat reserves would melt at a rate of five kilos per year,' Professor Pfeifer explains. This makes our results interesting from a therapeutic perspective. By blocking the PKG signalling path in the brown fat we basically want to fight fat with fat.'

More information: doi: 10.1126/scisignal.2000511

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