Letter to the Editor

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Cyanide and uncoupling protein function

Uncoupling proteins (UCPs) are mitochondrial transporters that lower the efficiency of oxidative phosphorylation. The molecular mechanism of transport of the UCPs is not established, but their activity leads to a regulated dissipation of the mitochondrial proton gradient. The result of the increase in proton conductance will be a higher rate of respiration and generation of heat.

Uncoupling the mitochondrial oxidative phosphorylation is a physiological means of heat generation and, in fact, thermogenesis in brown adipose tissue relies on this mechanism. In this tissue, the uncoupling protein UCP1 is the key to the heat-generating capacity.

Van de Parre et al. have recently published an article in Cardiovascular Research where they found a correlation between local plaque temperature and UCP2 expression. They proposed that the observed temperature heterogeneity in atherosclerotic plaques may be mediated by the uncoupling protein UCP2. Researchers in the UCP field would probably analyse whether the presence of UCP2 also correlates with an increase in oxidative stress.

The authors have presented (in Figure 6) a control experiment with the human embryonic kidney cell line HEK293T where the overexpression of UCP2 leads to an increase in heat generation (temperature). Similar results were obtained when J774A.1 macrophages were treated with sodium cyanide. The authors alleged that sodium cyanide is 'a well-known uncoupler of mitochondrial respiration' while it is well established that cyanide inhibits mitochondrial respiration by binding to cytochrome c oxidase. The expected result of the treatment with cyanide would be the opposite than with an uncoupler: an inhibition of respiration.

The observed increase in temperature is puzzling and the explanation is not apparent. In any case, it does not seem to be an appropriate control experiment to elucidate the role of UCP2 in the atherosclerotic plaque.

References


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