Summary

Possibilities of UCP2 (uncoupling protein 2) induction in rat hepatocytes in *in vivo* conditions

Introduction

Uncoupling protein 2, discovered in 1997, is the first described homologue of uncoupling protein 1. Uncoupling proteins increase the permeability of inner mitochondrial membrane for protons, decrease the efficiency of energy conversion, inhibit the ATP synthesis and stimulate energy release in form of heat. Uncoupling proteins also increase the substrate oxidation and reduce production of reactive oxygen species in mitochondria.

Objective, material and method

The aim of this study was to establish and optimised the quntitative real-time PCR for detection of UCP2 mRNA expression kinetics in rat liver tissue. The present study was conducted to assess the effects of acute and chronic treatment with triiodothyronine and the effect of partial hepatectomy on liver uncoupling protein 2 mRNA levels in male Wistar rats.

Results

Intraperitoneal injection of one dose of triiodothyronine (200 μg/kg rat body weight) increased mRNA expression of uncoupling protein 2 in liver tissue almost 2-fold ($P < 0.01$ vs. control group) in rats 12 hours after T_3 administration. Concentrations of total triiodothyronine and free triiodothyronine in serum were increased 122-fold and 77-fold ($p < 0.001$), respectively. Induction of UCP2 mRNA expression was observed also after the administration of three doses of 200 μg T_3/kg rat body weight; nevertheless, this change was not statistically significant. Maximal values of serum concentration of total T_3 were 33-fold and of free T_3 47-fold increased in comparison with control groups ($p < 0.001$). The maximal concentrations were detected 6 hours after application of the last dose of T_3, instead of after single administration of T_3 the highest values were found 3 hours after the hormone injection. Expression of UCP2 mRNA was increased almost 4-fold 3 hours after partial hepatectomy.

Conclusion

Results of our work suggest that gene coding UCP2 is a gene inducible in the liver shortly after single administration of triiodothyronine or partial hepatectomy. The data concerning kinetics of triiodothyronine mediated induction of UCP2 mRNA during the first 24 hours after treatment were not available in literature so far and therefore represent our priority findings.

Triiodothyronine and partial hepatectomy increased the production of reactive oxygen species in mitochondria. This supports the idea that induction of UCP2 in the liver is physiological antioxidant protection against enhanced production of ROS.

Key words: uncoupling protein 2, expression of UCP2 mRNA, triiodothyronine, partial hepatectomy