

Effects of a Diet enriched in *trans* Fatty Acids on Muscle Mitochondrial Functions and Development of Insulin Resistance in Rodents.

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Epidemiologic data suggest that a chronic consumption of *trans* monounsaturated fatty acids (*trans* MUFA) could be noxious for insulin sensibility but the mechanisms are still unknown. *Trans* MUFA are present in partially hydrogenated vegetable oils of industrial origin (*trans*-9 (elaidic acid) and *trans*-10 isomers), but also in the products from ruminants (*trans*-11 isomer (vaccenic acid)). The two major sources of *trans* MUFA in food have a different isomeric profile and thus probably different metabolic effects. Those effects may imply a disturbance in muscle mitochondrial functions known to be linked to insulin resistance development. Thus, the aim of this work was to find out the impact of elaidic and vaccenic acids on muscle mitochondrial oxidative phosphorylation (OXPHOS) activity and insulin resistance in rodents. Wistar rats were randomly divided into 3 groups and received during 8 weeks either : oleic acid (OLE), elaidic acid (ELA) and vaccenic acid (VAC) enriched diet. Insulin sensitivity was evaluated by the glycemic and insulinemic responses to an intra-peritoneal injection of glucose. Mitochondrial OXPHOS activity was assayed on isolated mitochondria from *soleus* and *tibialis anterior*. State 3 oxygen uptake and ATP production were measured (ADP 360 μ M; glutamate, malate, succinate : 5; 2.5; 5mM). P/O ratio which estimate OXPHOS coupling was calculated. In addition, mitochondrial superoxide anion (MSR) radical production was assessed using lucigenin. At slaughter, no differences in total body (588 \pm 28g) and tissue weight were observed. Insulin and glucose area under curve (AUC) were similar in all groups (AUC_I=26.7 \pm 7.8nM and AUC_G=1457 \pm 256mM). In *soleus*, no differences in state 3 oxygen uptake rate was observed between the groups, but ATP production and P/O ratio were higher in OLE group than in *trans* groups (p<0.01 vs ELA and VAC). Furthermore, in comparison with *trans* groups, MSR production was increased, in presence or not of rotenone, in the OLE group (p<0.05 vs VAC and ELA). In *tibialis anterior*, state 3 oxygen uptake, ATP production, P/O and MSR production were similar in the three groups. Those results suggest that *trans* fatty acids of natural and industrial origin have the same effects on mitochondrial OXPHOS activity and do not induce the development of insulin resistance.