In vitro Rat Muscle Mitochondrial and Peroxisomal Capacity to Oxidize *cis* and *trans* Monounsaturated Fatty Acids.

Al Tardy*, B Morio*, O Loreau**, JM Chardigny*,
*INRA, UMR1019, Clermont-Ferrand, F-63000, France
** CEA Saclay, Gif sur Yvette, 91191, France

Trans monounsaturated fatty acids (MUFA) are present in partially hydrogenated vegetable oils of industrial origin, but also in the products of ruminants (dairy products and meat). In this last case, vaccenic acid (*trans*-11) is the major isomer, while industrial hydrogenated fat contains mainly *trans*-9 (elaidic acid) and *trans*-10 isomers. Distinctions between *trans* fatty acid chemistry and conformation may result in diverse cellular fates, one being the oxidative rate in lipid-dependent tissues such as skeletal muscle. Data on the whole human body suggest that *trans* fatty acid were slightly more oxidized than their *cis* counterparts but a tissue approach is needed to distinguish hepatic, cardiac and skeletal muscle contribution to whole body oxidation rate. This present study, thus, has for objective to determine *in vitro* muscle mitochondrial oxidative rate of *cis* and *trans* C18-MUFA, with comparison with palmitic acid. Muscle fat oxidative capacities were performed *in vitro* on *soleus* (oxidative) and *tibialis anterior* (glycolitic) muscle from Wistar male rat fed with standard chow. Total and peroxisomal oxidation rate of [1-^{14}C] palmitic acid, [1-^{14}C] oleic acid, [1-^{14}C] vaccenic acid and [1-^{14}C] elaidic acid were assayed. Total, peroxisomal and mitochondrial (calculated from the difference between total and peroxisomal oxidation) oxidation rates were on average (48.0$\pm$3.4%) higher in *soleus* than in *tibialis anterior* ($p<0.0001$). In *soleus*, total oxidation rate of elaidic acid was 35% higher ($p<0.05$) compared to that of palmitic and oleic acid. No differences were observed for vaccenic acid. The enhanced total oxidation rate of elaidic acid is due to a higher mitochondrial oxidation rate. Indeed, the latter was 35% higher compared to that of palmitic and oleic acid ($p<0.08$). Besides, peroxisomal oxidation rates were similar for the four fatty acids (p=NS). In *tibialis anterior*, no differences of total, mitochondrial and peroxisomal oxidation rates were observed between the four fatty acids. In conclusion, the present *in vitro* data show that the two major sources of *trans* fatty acids in food have different metabolic fates as their distinct isomer conformation results in different rates of mitochondrial oxidation in the oxidative muscle of rats. These findings may be useful in elucidating the mechanisms by which *trans* fatty acids may deregulate lipids metabolism in skeletal muscle.