Invited Speaker Plenary 6: Sports Nutrition

**Role of dietary fatty acids in exercise and insulin resistance**

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Consumption of a Western diet rich in animal fats is associated with obesity and insulin resistance and skeletal muscle fatty acid accumulation is observed in some insulin resistant phenotypes. Paradoxically, intramuscular fat stores are often increased in endurance trained athletes. Our group has been focussing on the effects of dietary fatty acid subtype on 1) insulin sensitivity 2) skeletal muscle lipid accumulation and 3) lipid use during exercise. We have employed a high fat feeding model in rodents, whereby animals are fed a control chow diet (CON) or a diet rich in either saturated (SAFA) or polyunsaturated (PUFA) fats. We have been able to show that consumption of a diet rich in SAFA induces insulin resistance, whereas a diet high in PUFA induces insulin sensitivity, as assessed by plasma glucose and insulin responses after an oral glucose tolerance test. Although the PUFA diet results in a small increase in diacylglycerol (DAG) content, the excess fatty acids were directed more towards triacylglycerol (TAG) storage, a lipid subtype thought to be relatively inert. In contrast, the SAFA diet resulted in a marked increase in muscle DAG but a concomitant small increase in TAG, consistent with our insulin sensitivity data. Acute, prolonged exercise results in reductions in both DAG (20%) and ceramide (47%) content in high-fat fed rats, irrespective of dietary fatty acid subtype. Our results indicate that increasing saturated fatty acids induces insulin resistance in association with increased diacylglycerol content. Polyunsaturated fatty acids appear to prevent insulin resistance by directing fat into triacylglycerol, rather than other lipid metabolites.