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Effects of silicon-enriched spirulina on metabolic syndrome components in an obese Zucker rat strain

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Statement of the Problem: The prevalence of metabolic syndrome components (obesity, non-alcoholic fatty liver disease, insulin resistance, diabetes and cardiovascular diseases) is rapidly increasing and becomes a major public health problem. Silicon (Si) has marked beneficial effects in cardiovascular, bone and skin pathophysiology. Incorporating Si into spirulina increases Si bioavailability for many food supplement applications. The objective of this project is to study the effects of silicon-enriched spirulina on metabolic syndrome components and mitochondrial activity in Zucker fatty rats and to determine whether these effects pass through mitochondrial activity and/or oxidative stress and inflammation.

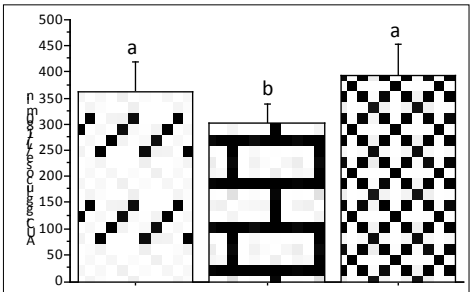

Figure 1: Area under the curve of oral glucose tolerance test

Materials & Methods: 30 male obese Zucker rats were used and divided into three groups and received placebo or spirulina or Si-enriched spirulina. An oral glucose tolerance test (OGTT) was performed on 6 and 12 weeks. After 12 weeks of diet, rats were sacrificed and insulin, leptin and blood and liver lipids were quantified. Liver citrate synthase and mitochondrial chain respiratory complexes as well as inflammation and oxidative stress markers were also determined.

Findings: The spirulina intake decreased the dietary consumption without effect on body rat weight. Interestingly, it ameliorated the glucose tolerance on 6 weeks but not on 12 weeks of diet intake. However, it increased plasma triglycerides level. Finally, it decreased hepatic NADPH oxidase activity. However, spirulina+Si intake had no significant effects on rat characteristics and on blood/hepatic metabolic parameters explored in the present study. Otherwise, there was no effect for spirulina or Si-enriched spirulina intake on mitochondrial chain respiratory complexes activity.

Conclusion & Significance: If the intake of spirulina alone seems to have some effects, spirulina+Si intake itself has no effect on any measured parameter. It is likely that spirulina+Si may have more significant effects on skin or bone and in atherosclerosis pathologies than in obesity and other metabolic syndrome components.

Recent Publications

1. Coudray C, Fouret G, Lambert K, Ferreri C, Rieusset J, Blachnio-Zabielska A, Lecomte J, Ebabe Elle R, Badia E, Murphy MP and Feillet-Coudray C (2016) A mitochondrial-targeted ubiquinone modulates muscle lipid profile and improves mitochondrial respiration in obesogenic diet-fed rats. *Br J Nutr;* 115(7): 1155-66.
2. Fouret G, Tolika E, Lecomte J, Bonafos B, Aoun M, Murphy MP, Ferreri C, Chatgilialoglu C, Dubreucq E, Coudray C and Feillet-Coudray C (2015) The mitochondrial-targeted antioxidant, MitoQ, increases liver mitochondrial cardiolipin content in obesogenic diet-fed rats. *Biochim Biophys Acta;* 1847(10): 1025-1035.

Biography

Christine Feillet-Coudray has graduated from Montpellier Biological and Food Engineering School in 1991 and obtained PhD in 1995 at the Faculty of Medicine of Montpellier. She works at the National Institute of Agronomic Research. Her research interests range over both micronutrients and oxidative stress physiopathology, and more generally malnutrition and its relation to the development of metabolic syndrome components.

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