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Effects of silicon-enriched spirulina on metabolic syndrome components in obesogenic diet-fed rats

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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 issue. Silicon (Si) has marked beneficial effects in bone, skin and cardiovascular 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 in obesogenic diet-fed rats and to determine whether these effects pass through mitochondrial activity and/or oxidative stress and inflammation.

Materials & Methods: 40 male Wistar rats were used. 10 rats were fed control diet containing 5% soybean oil and 30 rats were fed HFD containing 30% lard. The HF groups received placebo or spirulina or Si-enriched spirulina. After 12 weeks, rats were sacrificed and insulin, leptin and adiponectin and blood and liver lipids were quantified. Liver citrate synthase and mitochondrial chain respiratory complexes activities as well as inflammation and oxidative stress markers were also determined.

Findings: The high fat diet induced obesity and several blood metabolic alterations. In addition, the high fat diet induced huge hepatic metabolic alterations subjectivized by higher plasma ALAT activity and hepatic triglycerides level. The high fat diet intake was associated with lower levels of SH groups and GSH content and with higher NADPH oxidase activity. Both spirulina and spirulina+Si have showed only minor effects on rat characteristics and on blood/hepatic metabolic parameters explored in the present study. In fact, intake of spirulina or spirulina+Si ameliorated the glucose intolerance and decreased NADPH oxidase activity.

Conclusion & Significance: The intake of spirulina+Si was not better than spirulina in 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

Charles Coudray has completed his graduation from the Faculty of Pharmacy in 1980 and obtained PhD in 1989. He has worked in different French (Grenoble, Clermont-Ferrand and Montpellier) and English laboratories (London and Norwich).

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