

## **Antioxidant and Anti-Inflammatory Effects of Curcuminoid-Piperine Combination in Subjects with Metabolic Syndrome: A Randomized Controlled Trial and an Updated Meta-Analysis**

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### **Background**

Oxidative stress and inflammation have been proposed as emerging components of metabolic syndrome (MetS). Curcuminoids are natural polyphenols with strong antioxidant and anti-inflammatory properties.

### **Objective**

To study the effectiveness of supplementation with a bioavailable curcuminoid preparation on measures of oxidative stress and inflammation in patients with MetS. Our secondary aim was to perform a meta-analysis of data from all randomized controlled trials in order to estimate the effect size of curcuminoids on plasma C-reactive protein (CRP) concentrations.

### **Methods**

In this randomized double-blind placebo-controlled trial, 117 subjects with MetS (according to the NCEP-ATPIII diagnostic criteria) were randomly assigned to curcuminoids (n=59; drop-outs = 9) or placebo (n=58; drop-outs = 8) for eight weeks. Curcuminoids were administered at a daily dose of 1g, and were co-supplemented with piperine (10 mg/day) in order to boost oral bioavailability. Serum activities of superoxide dismutase (SOD) and concentrations of malondialdehyde (MDA) and CRP were measured at baseline and at study end. Regarding the importance of CRP as a risk marker and risk factor of cardiovascular disease, a random-effects meta-analysis of clinical trials was performed to estimate the overall impact of curcuminoid therapy on circulating concentrations of CRP. The robustness of estimated effect size was evaluated using leave-one-out sensitivity analysis.

### **Results**

Supplementation with curcuminoid-piperine combination significantly improved serum SOD activities ( $p<0.001$ ) and reduced MDA ( $p<0.001$ ) and CRP ( $p<0.001$ ) concentrations compared with placebo. Quantitative data synthesis revealed a significant effect of curcuminoids vs. placebo in reducing circulating CRP concentrations (weighed mean difference:  $-2.20$  mg/L; 95% confidence interval [CI]:  $-3.96, -0.44$ ;  $p=0.01$ ). This effect was robust in sensitivity analysis.

### **Conclusions**

**Short-term supplementation with curcuminoid-piperine combination significantly improves oxidative and inflammatory status in patients with Metabolic Syndrome. Curcuminoids could be regarded as natural, safe and effective C-reactive protein (CRP) lowering agents.**