

Four-week ingestion of fresh and commercial orange juice on pro-inflammatory cytokines levels: A randomized cross-over study in healthy volunteers

M. Keshvari¹, M. Afshani², S. Asgary^{3,*}, S. Rozbahani⁴, R. Monajemi⁴, S. Haghjoo javanmard⁵

¹Falavarjan Branch, Islamic Azad University, Falavarjan, Iran

²Department of Cardiology, Faculty of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

³Isfahan Cardiovascular Research Center, Isfahan, Iran

⁴Falavarjan Branch, Islamic Azad University, Falavarjan, Iran

⁵Physiology Research Center, Isfahan, Iran

Background and Aims: Orange juice (OJ) consumption has become a worldwide dietary habit. OJ product has a great flavonoid content; such as polymethoxylated flavones, hesperitin and naringin. This juice is a rich source of dietary flavonoids. Flavonoids have antioxidant and anti-inflammatory properties that preventing the development of atherosclerosis. The aim of this study was to examine the effects of 4-wk intake of fresh OJ (*Citrus sinensis*) and commercial OJ on pro-inflammatory cytokines levels in healthy volunteers.

Methods: Twenty-two healthy subjects (age 18–59Y) were included in a randomized crossover study; they were randomly divided into two groups. Throughout the two 4-wk periods, volunteers daily consumed with 500 mL/day, twice a day with breakfast and dinner, of either fresh OJ or commercial OJ. There was a 2-wk washout period between each treatment. Volunteers made 4 visits to the clinical research unit on the before (visits 1, 3) and after (visits 2, 4) day of each of experimental period. Fasting blood was obtained at baseline (visits 1, 3) and after 4-wk (visits 2, 4) treatment periods.

Results: This study indicated fresh and commercial orange juice were significantly decreased ($p \leq 0.05$) Intercellular cell adhesion molecule1 (-20.28% and -18.95%; $p \leq 0.000$), vascular cell adhesion molecule1 (-22.53% and -20.50%; $p \leq 0.000$), High-sensitivity C-reactive protein (-37.07% and -35.00%; $p \leq 0.000$) and Eselectin (-28.62% and -24.61%; $p \leq 0.000$) after 4 wk consumption relative to baseline. While interleukin-6 (-1.41% & -2.38%; $p \geq 0.05$) has not significantly changed.

Conclusions: Consumption of 500 ml/day of OJ for 4 weeks, effectively decreased biomarkers of inflammation. While reactivity compared differences mean for fresh OJ and commercial OJ respectively were no significantly. Our study suggests both OJ ingestion significantly prevent the development of atherosclerosis reactivity.

Keywords: Orange juice; Pro-inflammatory cytokines levels; ICAM; VCAM