

TH₁/TH₂ balance in intestinal fluid after oral administration of short-chain fructo-oligosaccharides and quercetin

E. M. Insani¹, S. Sucar¹, A. A. Pazos¹, M. E. Roux^{2,4} and N. H. Slobodianik³

¹Institute of Food Technology (INTA), ²Laboratory of Mucosal Immunity, Department of Cellular Biology, ³Department of Nutrition, School of Pharmacy and Biochemistry, University of Buenos Aires and ⁴CONICET, Buenos Aires, Argentina

The aim of this research was to evaluate the effect of short-chain fructo-oligosaccharides (FOS) and quercetin intake on TH₁/TH₂ balance by means of TNF α and IL-4 cytokines.

An experimental model of protein malnutrition was used to evaluate the effect of FOS and quercetin. Weanling rats of *Wistar* strain were fed a protein-free diet until they lost 25% of their initial body weight. Re-feeding was performed by the administration of an experimental diet containing 20% casein as the only source of protein (re-nourished group; R). Other experimental groups received this experimental diet plus Beneo P95 (oligofructose (degree of polymerisation: 2–8) 95%; glucose + fructose + sucrose, 5%; RFOS) at 2.5%, equivalent to 13 g/kg body weight per d or plus quercetin (RQ) ($Q = 280 \mu\text{g/kg}$ body weight per d), both added to drinking water during 40 d. Three well-nourished groups were fed with standard commercial diet and used as normal controls: C, CFOS and CQ. The small intestine was removed and the intestinal fluid obtained. IgE, IL-4 and TNF α were measured (ELISA). The animal protocol was approved by the ethical committee of the University of Buenos Aires.

Results showed that IgE levels (ng/ml) were significantly higher in R (59.8 ± 1.29) than in C (52.9 ± 0.98) ($P = 0.0001$) revealing an allergic state of the *in vivo* model.

IL-4, a TH₂-derived cytokine characteristic of allergic states, was higher in R (114 ± 6) than in C (99 ± 7) and FOS consumption increased these values. Instead, quercetin diminished IL-4 to 65 ± 8 for R and 80 ± 6 for C, in both cases compared with the groups without supplements, all values expressed in pg/ml.

For TNF α R values were 201 ± 17 pg/ml and FOS increased them, presenting RFOS the highest value (343 ± 29). Quercetin consumption diminished TNF α to 171 ± 26 (Figs 1 and 2).

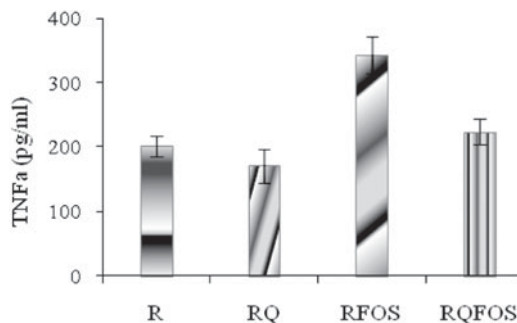


Fig. 1. TNF α in re-nourished groups.

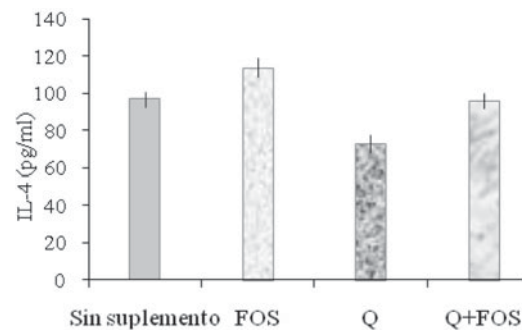


Fig. 2. IL-4 by supplement intake.

In brief, FOS intake increased IL-4 and TNF α . It was probably due to an increased intestinal permeability⁽¹⁾ and a consequent disruption in barrier function and inflammation due to amplified contact with local microflora.

Quercetin instead, decreased IL-4 and TNF α , but the last one to a lesser extent. Quercetin provided improvements in barrier function⁽²⁾.

FOS intake gave a higher immunological surveillance and quercetin did a change in TH₁/TH₂ balance towards TH₁ phenotype.

1. Rodenburg W, Keijzer J, Kramer E *et al.* (2008) *BMC Genomics* 9, 144–158.
2. Suzuki T & Hara H (2009) *J Nutr* 139, 965–974.