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Intestinal immune system of rats influenced by oral administration of short-chain fructo-oligosaccharides and Quercetin

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The gut and the immune system form a complex integrated structure that has evolved to provide effective digestion and defence against ingested toxins and pathogenic bacteria(1). Fructo-oligosaccharides (FOS) are prebiotics, which are selectively fermented ingredients that allow specific changes, both in the composition and/or activity in the gut microbiota that confers benefits upon host well-being and health, having an influence on local immune system(2). Moreover, in a previous report, our group demonstrated that Quercetin (CAS No. 117-39-5), a naturally occurring dietary polyphenol, would have a potential immune-regulatory effect in allergic processes(3).

The aim of this report was to evaluate *ex vivo* the effect of consumption of FOS alone or in combination with Quercetin on cellular immune responses in intestinal villi (IV). An experimental model was used to evaluate the effect of protein malnutrition and allergy response. 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* (R + FOS) at 2.5%, equivalent to 13 g/kg body weight/d – mean value – or FOS plus Quercetin (R + FOS + Q) (FOS idem R + FOS; $Q = 280\,\mu g$/kg body weight/d, mean value), both added to drinking water during 40 days. Three well-nourished groups were used as normal controls (C), which were fed with standard commercial diet or the same diet plus FOS (C + FOS) or plus FOS and Quercetin (C + FOS + Q). The small intestine was removed and processed by Saint-Marie's technique. IgA^+ and IgE^+ B cells, $CD5^+$ T-cells and $CD4^+$ T sub-population in IV were assessed by indirect immunofluorescence technique. The animal protocol was approved by the ethical committee of the University of Buenos Aires and all procedures were in accordance with the department's guide for the care and use of laboratory animals.

Results showed: (1) T lymphocytes, CD4 helper sub-population on intestinal Lamina Propria showed no significant difference. Instead, CD5 population showed significant difference ($P = 0.024$) for R: (mean; SE) 189; 9 compared to C: 217; 8. (2) IgA^+ B lymphocytes showed significant lower levels in R: 182; 17 compared to C: 273; 17 ($P = 0.0001$) and significant difference in R related to FOS or FOS + Q consumption (R + FOS: 319; 2; R + FOS + Q: 277; 20) reaching both groups the level of IgA in C. These results imply that FOS consumption alone or with Quercetin was efficient in order to raise IgA levels indicating that FOS would have a potential immune-modulatory effect in intestinal mucosa. (3) IgE^+ B cells were increased in R: 165; 7 as compared to C: 62; 7 ($P < 0.0001$) probably due to the administration of the experimental diet in this model of malnutrition. The IgE^+ B cells population was significantly decreased in R + FOS + Q: 131; 7 ($P < 0.0001$) but not in R + FOS: 179; 7. These last findings showed that Quercetin combined with FOS would not have a potential immune-regulatory effect in allergic processes.

*Composition of BENEO P95: oligofructose (degree of polymerisation: 2–8) 95%; glucose + fructose + sucrose, 5%.

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