

Prebiotics supplementation improves the endothelial dysfunction induced by a nutritional deficiency in n-3 polyunsaturated fatty acids

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Introduction – Current nutritional disorders are often associated with a high risk to develop cardiovascular diseases, endothelial dysfunction being an early key marker. We have previously demonstrated that metabolic alterations induced by a nutritional depletion in n-3 polyunsaturated fatty acids (PUFA) are improved by a supplementation in prebiotics (non-digestible fructans). The present work focusses on the impact of prebiotics on the endothelial dysfunction induced by the n-3 PUFA depletion in ApoE^{-/-} mice model.

Material & methods – Nine-weeks-old C57Bl/6J (WT) and ApoE^{-/-} (KO) mice were fed a n-3 PUFA depleted-diet (DEF) for 12 weeks. For the last fifteen days, WT and KO mice were or not supplemented with prebiotics (PRE). The vascular function was evaluated in first, second and third order mesenteric arteries by immunohistology and a wire myograph.

Results – KO DEF + PRE micro-arteries develop an increased basal tone and present a larger vessel diameter, compared to non-supplemented. The PRE supplementation in KO DEF mice leads to an increased media thickness in first order mesenteric artery, this is even higher in the second order in comparison to non-supplemented. KO DEF + PRE micro-arteries contract significantly more than vessels, in response to a KCl challenge. As expected KO DEF micro-arteries present an endothelial dysfunction after 12 weeks of n-3 PUFA depletion as attested by a significant decrease of endothelial-dependent relaxation in comparison to WT DEF arteries. Interestingly, PRE supplementation for only fifteen days is able to improve the endothelial function by restoring the endothelial-dependent relaxation in KO DEF mice.

Discussion & conclusion –We point out fructan-type prebiotics as a potential therapeutic tool in endothelial dysfunction. Our results argue in favor of an outward muscular remodeling in mesenteric arteries, leading to an increased blood flow and a better vascular reactivity. The results on endothelial function evoke an important involvement of the nitric oxide pathway in this phenomenon.