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Letter to the Editor

Evidence on the role of prebiotics, probiotics, and synbiotics in gut health and disease prevention in the elderly

To the Editor

In their review article, Patel et al[1] elegantly described the process of ageing of the small bowel under normal conditions. In order to properly introduce the topic, it is reasonable to add information about the aging stomach and colon, as evidence shows age-related declines in these structures.

Along with hypochlorhydria (that can predispose the elderly to small intestine overgrowth, Fe malabsorption, and vitamin B12 deficiency), evidence suggests that reduction in gastric compliance, particularly of the fundus, plays an important role in the anorexia of ageing and satiety response.[2] The loss of neurons in both submucosal, gastric and enteric plexus begins early in life, along with a reduction in the expression of acetylcholine (ACh) and nitric oxide (NO).[1,2] Furthermore, orexigenic factors like neuropeptide Y decline with ageing, and leptin (a hormone related to satiety) have been shown to increase, particularly in men, probably due to a decrease in testosterone.[2]

The increase in colonic transit time and decline in propulsive activity are hypothesized to be related to neurodegeneration and reduction in NO and ACh, making the elderly prone to constipation.[2] The colon plays little role in nutrition, but is an important element for gut microbiome; the number of colony-forming units (CFU) increases from 10^2 CFU in the upper small bowel to 10^{12} CFU in the colon.[2]

As the authors stated,[1] the gut microbiota plays an important role in the maintenance of the host health and disease in all age groups, but particularly in the elderly.[3] The mechanisms related to the benefits of probiotics are incompletely understood. However, four general benefits have been described: (1) suppression of growth or epithelial binding/invasion by pathogenic bacteria, (2) improvement of intestinal barrier function, (3) modulation of the immune system, and (4) modulation of pain perception.[1,3,4]

The majority of bacteria in the colon are anaerobes that can ferment carbohydrates that escape digestion, to form short chain fatty acids (SCFAs) and anions that have a distinct role in promoting gut health (e.g., acetate, propionate, and butyrate).[3] Studies in the elderly described a shift in the composition of intestinal microbiota, with a lower number of beneficial organisms such as bifidobacteria and lactobacilli[1] and an increase in Enterobacteriaceae and certain Proteobacteria.[3] Compared to younger adult controls, aged persons seem to have a lower number of Firmicutes and more abundant Bacteroidetes.[3] Butyrate is the major energy source for the colonic epithelium, and its levels are usually lower in the elderly, with concomitant increased levels of SCFAs, ammonia, and phenols.[3] Evidence showed that lactate accumulation in the colon might be indicative of gut microbiome imbalance, and it was suggested that this could be a target for the development of novel probiotics to prevent lactate accumulation.[3]

Despite previous good to moderate evidence of the beneficial effects of probiotic and synbiotic administration, recent larger randomized controlled trials reported contradictory results related to the reduction in the risk of infections [*Clostridium difficile*-associated diarrhea (CDAD), upper respiratory tract infections, antibiotic-associated-diarrhea (AAD), etc.]. The *PLACIDE Trial* reported no evidence of a multi strain preparation of lactobacilli and bifidobacteria in the prevention of AAD and CDAD.[4] Another recent large trial evaluated the evidence of the preventive effect of probiotics on upper respiratory tract infections (URTI) in an aged sample, and was unable to find differences between groups.[5] Only in the subgroup analysis did the authors find that probiotics probably reduced the duration of acute URTI.[5]

Despite good evidence of the clinical benefit of probiotic use in children and under some specific conditions, there are no meta-analysis and systematic reviews, to date, that address the use of probiotics in the elderly for infection prevention and control. This issue, we hope, will soon be covered by a systematic review protocol that we are already developing.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

References

1. Patel PJ, Singh SK, Panaich S, Cardozo L. The aging gut and the role of prebiotics, probiotics, and synbiotics: a review. *J Clin Gerontol Geriatr* 2014;**5**:3–6.
2. Britton E, McLaughlin JT. Ageing and the gut. *Proc Nutr Soc* 2013;**72**:173–7.
3. Duncan SH, Flint HJ. Probiotics and prebiotics and health in ageing populations. *Maturitas* 2013;**75**:44–50.
4. Allen SJ, Wareham K, Wang D, Bradley C, Hutchings H, Harris W, et al. Lactobacilli and bifidobacteria in the prevention of antibiotic-associated diarrhoea and *Clostridium difficile* diarrhoea in older inpatients (PLACIDE): a randomised, double-blind, placebo-controlled, multicentre trial. *Lancet* 2013;**382**:1249–57.

http://dx.doi.org/10.1016/j.jcgg.2014.01.001

5. Fujita R, Iimuro S, Shinozaki T, Sakamaki K, Uemura Y, Takeuchi A, et al. Decreased duration of acute upper respiratory tract infections with daily intake of fermented milk: a multicenter, double-blinded, randomized comparative study in users of day care facilities for the elderly population. *Am J Infect Control* 2013;**41**:1231–5.

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