Probiotics and Prebiotics: An Update from the World Gastrointestinal Organization (WGO)

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SUMMARY

The human intestine harbors a complex microbial ecosystem consisting of an extraordinary number of resident commensal bacteria existing in homeostasis with the host (Eckburg et al., 2005). This endogenous microbiota establishes a symbiotic mutualistic relationship and impacts on numerous physiological functions including nutrition exchange, control of epithelial cell proliferation/differentiation, pathogen exclusion and stimulation of the immune system (Flint et al., 2007; Cerf-Bensussan et al., 2010). Given the emergent evidence of the roles played by the human microbiota in health and disease, there is a growing interest in identifying live microorganisms (probiotics) and dietary compounds (prebiotics) capable of modulating the composition and metabolic activities of the intestinal microbiota in order to confer beneficial effects on the host. In October 2011, a position paper about probiotics and prebiotics has been published by an Expertise Committee updating the World Gastroenterology Organisation (WGO) Practice guideline (http://www.worldgastroenterology.org/assets/export/userfiles/Probiotics_FINAL_20111128.pdf). In this relevant document, probiotics and prebiotics are defined, being quality, safety and labeling criteria discussed. Information on suppliers of prebiotics and probiotics as well as the main strains used as probiotics in the market are shown. The study also summarizes a number of clinical conditions for which there is evidence for the preventive or therapeutic use of probiotics and prebiotics in pediatric or adult populations. Probiotics are defined as live microorganisms that confer a health benefit on the host when administrated in adequate amounts (FAO/WHO 2002). The probiotics are formulated in foods, drugs and dietary supplements. Species of the genera *Bifidobacterium* and *Lactobacillus* are amongst the species most commonly used; both are believed to play an important role in maintaining and promoting a healthy gut environment. The main health benefits of probiotics are associated with regulation of the intestinal tract microbiota by

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reducing the numbers or colonization of pathogenic bacteria, maintenance of the epithelial cell integrity and barrier function as well as induction of immunoregulatory mechanisms that control adaptive immune functions (van Loveren et al., 2012). As reported in the WGO document, the health benefits and efficacy of probiotics can be only attributed to specific strains, timing of administration and dosage previously tested in human trials; however, the number of studies assessing these variables in a comparative manner is rather limited. The vehicle/filler in delivering probiotics plays a critical role given that can significantly affect the microbial viability rates. Other relevant aspects like storage and safety under the conditions of recommended use should be also considered. In last years, a number of potential health benefits associated to probiotics have been reported. In order to support such claims, well-designed double-blind, placebo-controlled human trials are strictly necessary. The strongest clinical evidence for probiotics is related to their use in improving gut health and stimulating gut function, being well documented their beneficial effects on a variety of intestinal disorders. Probiotics affect the intestinal microbiota by stimulating immune and non-immune mechanisms through antagonism and competition with potential pathogens. Several probiotics strains have been reported to be effective in reducing the severity and duration of infectious diarrhea in children (Szajewska et al., 2007a, 2007b), being some specific strains effective in the prevention of antibiotic-associated diarrhea (Vanderhoof et al., 1999; Correa et al., 2005; Ruszczynski et al., 2008). Some probiotic strains have demonstrated to be effective in the prevention of pouchitis (Gionchetti et al., 2003) and remission of ulcerative colitis (Kruis et al., 2004), but not for maintenance of remission in Crohn’s disease. Regarding irritable bowel syndrome (IBS), there are some clinical evidences about the alleviation of abdominal pain after probiotic treatment (Moayyedi et al., 2010). In addition, *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* seems to improve lactose digestion and reduce symptoms related to lactose maldigestion (EFSA, 2010). Although probiotics reduces the risk of colon cancer in animal models, their chemopreventive effects in humans have not been proven yet.

Prebiotics have been recently redefined as ‘non-digestible functional ingredients which are selectively fermented and allow specific changes, both in the composition and/or activity of the gastrointestinal microflora that confers benefits upon host well-being and health’ (Roberfroid, 2007). They favor the growth of beneficial bacteria over that of harmful ones. Among intestinal bacteria stimulated by prebiotics, *Bifidobacterium* spp. and *Lactobacillus* spp. are amongst the species most relevant. The major prebiotic oligosaccharides on the market are fructan inulin, lactulose, fructo-oligosaccharides (FOS) and galacto-oligosaccharides (GOS) (Rastall, 2010). It is generally accepted that the major beneficial effects of prebiotic carbohydrates occur in the large intestine due to the slow transit of the substrates to be fermented and their effects on microbiota diversity which plays an important role in host health (Gibson, 2004). Fermentation of some of these prebiotics in large intestine is reported to exert a positive effect on growth rates of several strains of *Bifidobacterium* and/or *Lactobacillus* (Cardelle-Cobas et al., 2009; 2011); other potential mechanisms might include receptor blockade or production of health-promoting components.

Health claims are conceived to support healthy European consumers to make healthy food choices in order to develop healthy lifestyles (van Loveren et al., 2012). Despite the substantial amount of basic and clinical research on the beneficial effects of probiotics and prebiotics, to date none of the claims submitted to the European Food Safety Authority (EFSA) and reviewed by the Panel on Dietetic Products, Nutrition and Allergies (NDA) have been accepted (Guarner et al., 2011). There are several reasons for health claims to be rejected, such as insufficient characterization of the probiotic strain/s or prebiotic carbohydrate, lack of suitable human intervention studies to validate the claim for the...
intended population group, or a need for identification of novel biomarkers to assess cause and effect between consumption of the probiotic/prebiotic and the claimed health effects, among others (Aggett et al., 2005; Verhagen et al., 2010). However, health claims supported by robust and solid evidence are also being rejected. Some concern in the scientific community about inconsistencies in the nature of the opinions of EFSA as well as its lack of clarity on the criteria to substantiate health claims, from study design to wording, have been recently reported (O’Connor, 2011; Guarner et al., 2011). In addition, there is growing disparity in scientific opinion over whether changes in the number of nonpathogenic microorganisms can be viewed as a beneficial marker for digestive and immune health. Regarding this, EFSA have published a guidance document on scientific requirements for health claims related to gut and immune function to facilitate study design for submissions (EFSA, 2011). EFSA claims that changes in gastrointestinal microbiota should be accompanied by a beneficial physiological or clinical outcome. The use of molecular analytical platforms as well as the identification of biomarkers and/or parameters related to gut and immune function would help us to determine novel criteria for developing effective probiotics and prebiotics. This effort will increase the protection of consumers from misleading or untruthful health claims but also should stimulate innovation in the food industry to offer a wider range of healthier foods to consumers (Buttriss, 2010; van Loveren et al., 2012).

Keywords: Gastrointestinal health; microbiota; prebiotics; probiotics.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES


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