

Nutraceuticals and gastro-intestinal inflammation

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The gastro-intestinal tract represents an important barrier between the human host and microbial population (i.e. microbiota). One potential consequence of host-microbial interactions is the development of gastric mucosal inflammation, which can lead to gastritis and ulcer. It has been demonstrated that gastric epithelial cells, during *H. pylori* infection, show higher levels of cytokines including IL-1 β , IL-6, TNF- α , and IL-8, a potent neutrophil-activating chemokine that plays a key role in gastric diseases (Crabtree et al., 1993; Crabtree et al., 1995). This response depends on activation of NF- κ B and the early-response transcription factor Activating Protein-1 (AP-1) (Yasumoto et al., 1992). Moreover, unbalanced proliferation of a variety of bacterial strains may lead to development of chronic inflammatory-based diseases in the gut, including colitis ulcer, and inflammatory bowel diseases. Botanicals, particularly flavonoids and tannins, are often ingredients of nutraceuticals used as adjuvant to the pharmacological treatment or as dietary approach to prevent or reduce gastro-intestinal diseases.

As an example, root from liquorice (*Glycyrrhiza glabra* L.) has been efficiently used to treat gastritis and ulcers and clinical trials demonstrate the therapeutic effects following two-months treatment. Moreover, liquorice extract reduce *H. pylori* adhesion to human gastric epithelium.

Dietary polyphenols, including ellagitannins from strawberry (*Fragaria x ananassa* Dutch and *Fragaria vesca* L.) show anti-inflammatory activities both in vitro and in vivo at the gastric level, and the effect is due to inhibition of IL-8 release and NF- κ B pathway (Fumagalli et al. 2016). Thus, these compounds may be used as ingredients of nutraceuticals for gastric inflammation in the future.

Among botanicals acting in the gut, pomegranate (*Punica granatum* L.) fruit, juice and seeds deserve particularly attention; punicalagins and their metabolites show anti-inflammatory effect in animal models of colitis, whereas punicic acid from pomegranate seeds is an agonist of PPAR γ able to ameliorate DSS or TNBS-induced colitis in rats. Other interesting ingredients, as anti-inflammatory agents in Crohn's disease and colitis, are extracts from *Aloe vera* L., *Boswellia serrata* Roxb. (gum resin), and *Artemisia absinthium* L.

In conclusion, some botanicals as ingredients of nutraceuticals are active as anti-inflammatory agents in the gastro-intestinal tract. Most of them deserve human clinical studies to confirm their beneficial effects as adjuvants to the pharmacological treatment.

Crabtree et al. (1993). Scand J Immunol 37, 65-70.

Crabtree et al. (1995). J Clin Pathol 48, 967-969.

Yasumoto et al. (1992). J Biol Chem 267, 22506-22511.

Fumagalli et al. (2016). Pharmacol Res 111, 703-712

