Editorial

Mastic gum and gastrointestinal diseases

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Pistacia lentiscus var. Chia (Anacardiaceae) is a tree unique to the island of Chios and grows only in the Southern part of the island. A resinous exudate is produced after longitudinal incisions are made at close intervals from the base of the trunk up to the thicker branches of the tree. Once the resin is coagulated, gum mastic or "Mastiha" is produced, of which Chios is famous. The Syrians used to call the island "the country of Mastic". Mastic has a history which can be traced back to classical ages. The ancient Greeks, Babylonians and Egyptians used it in many products, from chewing gum to healing formulas. In the 2nd century B.C., Galenus wrote that mastic was used for improving the condition of the blood and for bronchitis. Many other ancient Greek authors, including Dioscurides, Theophrastus, Paulos of Aegina, and Appolodorus, mentioned mastic for its healing properties in the stomach, intestine and liver. In "De simplicium Medicamentorum temperamentic ac facultatibus" it is prescribed for inflammation of the stomach, intestine and liver. Christopher Columbus wrote of its antibacterial value and its use against cholera. According to Columbus, if spices were worth their weight in silver, mastic was worth its weight in gold. Thomas Fuller's Pharmacopoeia extemporanea, published in 1710, lists many ancient formulas that include mastic. Yet, despite all the references more than five hundred years after Columbus' estimation, research to justify the high valuation of mastic is limited.

Perhaps the greatest research activity on mastic and gastrointestinal diseases has been the effect of the resin on peptic ulcers. The interest stems from the evidence that traditional healers used the resin for the relief of peptic ulcers, as well as for upper abdominal discomfort, gastralgia and dyspepsia.[1] Al-Habbal and co-workers[2] first reported that mastic produced symptomatic relief in 80% of patients with duodenal ulcer orally administered with 1 g of mastic daily, compared to 50% of patients on placebo, while, endoscopically it produced complete ulcer healing in 70% of patients, compared to 22% of the placebo group. The differences between treatments were highly significant and mastic was well tolerated producing no side effects. Moreover, in order to provide a rationale for its clinical use, the resin was studied in experimentally induced gastric and duodenal ulcers in rats.[3] Systematic administration of mastic proved ineffective, while oral administration was highly effective in preventing the gastric lesions induced by pyloric ligation, aspirin, phenylbutazone, reserpine, ethanol and cold and restraint stress. This supports a localized protective activity on the gastric mucosa. Since the methods applied to produce ulceration of the gastric mucosa trigger a variety of phenomena - breaking of mucosal barrier, inhibition of mucosal cells, stimulation of gastric secretion and increased turnover of histamine, serotonin and catecholamines- these observations supported the results of the earlier study on the clinical effectiveness of mastic on the one hand, while on the other, the mechanism to nullify the deleterious effects of these ulcerogenic drugs and stress remained non-specific. In 1998, Huwez and co-workers[4] reported the first observation on the mechanism underlying the anti-ulcer properties of mastic. Added to *Helicobacter pylori* cultures, the ethanolic extract of mastic was proven to significantly inhibit bacterial growth and exhibit a clear postantibiotic effect, even at the lowest concentration used. *Helicobacter pylori* causes chronic infection of the gastrointestinal tract from the lower to the upper portion, where it is implicated in dyspepsia and ulcerative problems, as well as life-threatening diseases such as squamous cell carcinoma of the larynx. Huwez and co-workers demonstrated by transmission electron microscopy that mastic induced clear ultrastructural changes in the bacteria. This report was the

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first to at least partly explain the anti-peptic-ulcer properties of mastic. The antibacterial effect was further supported by Marone et al.[5] Their experiments showed that the *lentiscus* resin induced blebbing, morphological abnormalities and cellular fragmentation in *Helicobacter pylori* cells. However, despite the hopeful *in vitro* findings, two recent reports on *Helicobacter pylori* infected experimental animals[6] and humans[7] failed to reveal any antibiotic effect. In *Helicobacter pylori* infected mice, mastic failed to eradicate infection and there was no significant reduction in gastric bacterial load. Likewise, in none of eight patients with *Helicobacter pylori* infection and without gastroduodenal ulceration, treated with mastic 1 g for 14 days and screened by [^{13}C]urea breath tests, did the regimen have any bactericidal activity.

Consequently, *in vitro* findings on anti- *Helicobacter pylori* activity do not coincide with the *in vivo*. Nevertheless, despite the fact that the mechanism may not be due to the bactericidal activity, the observations on the anti-peptic-ulcer healing properties which the resin exhibits have been established. Given the fact that *Helicobacter pylori* colonization triggers inflammation and oxidative stress and that mastic contains some polyphenols[8] –well known antioxidant compounds- and is very rich in triterpenoids that have been proved to be anti-inflammatory[9] and antioxidant,[10] a novel approach to the anti-peptic-ulcer effect could be the potential of the resin to inhibit the secretion of inflammatory cytokines and the depletion of antioxidant enzymes in the gastric mucosa. Examination of the individual effect of the various constituents of mastic might pinpoint the active ingredient. The evolution of a regimen based upon gum mastic with relevant effectiveness on peptic ulcer offers an exciting opportunity to reduce the burden imposed by peptic ulcer and remains a significant challenge for the future. In the future, this agent may realistically be a very important complementary treatment option.

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