An overview of the use of Gum Arabic in health and disease

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Gum Arabic (GA) is a safe dietary fiber obtained from gummy exudates of Acacia Senegal. It is a water soluble polysaccharide based on branched chains of 1-3 linked β-D-galactopyranosyl units containing α-L-arabinofuranosyl, α-L-rhamnopyranosyl, β-D-glucuronopyranosyl and 4-O-methyl- β-D-glucuronopyranosyl units. It is widely used in both pharmaceutical and food industry to serve as an emulsifier and stabilizer. GA is primarily indigestible for both humans and animals and after passing the small intestine, it is fermented in the colon under the influence of microorganisms to short chain fatty acids mainly butyrate and propionic acid. Because of its physical properties, it retards glucose absorption, increases stool mass, and traps bile acids and has a potential to beneficially modify the physiological status of human subjects. Clinically, it has been tried in patients with chronic renal failure in many centers. It was reported that it decreased urea and creatinine plasma concentrations, reduced the need for dialysis from 3 to 2 times per week and had a significant effect on reducing blood pressure.

Our recent work using a series of experiment on mice treated with GA should that it resulted in moderate but significant increase of creatinine clearance and altered electrolyte excretion, which were effects favorable in renal insufficiency. In another set of experiment it selectively inhibited intestinal glucose absorption and decreased intestinal SGLT1 expression and activity and thus it counteracted glucose induced obesity. An animal experiment was set to see its effect on colonic cancer and it was observed that it reduced formation of tumors in the colon and decreased the expression of the oncogen β-catenin. Another experiment was designed to explore whether the administration of GA may photochemical reactions. First derivative spectrophotometric, high-performance liquid chromatographic (HPLC) and thin-layer chromatographic (TLC) methods were developed for the study of the effect of the pH, alkaline and temperature on the degradation of cefquinome sulphate and niclosamide. Cefquinome sulphate degradation was found to be pH and temperature dependent. The pH-rate profile indicated a first order dependence of $K_{obs}$ on $[OH^-]$ at pHs ranging between 9 and 11. Arrhenius plot obtained at pH 10 was linear between 65° and 100°C. The estimated activation energy of the hydrolysis was found to be 21.1 kcal mol⁻¹. While niclosamide was found to undergo alkaline hydrolysis with insignificant temperature variation effects, the degradation process was found to resemble the metabolic hydrolytic cleavage of niclosamide to 5-chlorosalicylic acid (fluorescent compound) and 2-chloro-4-nitroaniline (yellow colored product). The pH-rate profile of the alkaline pH-dependent hydrolysis of niclosamide was studied within the pH range 5-7 which indicate a first order dependency of $K_{obs}$ on $[OH^-]$.

In this study, new stability-indicating thin-layer chromatographic methods were also developed for the separation of the drugs and their degradation products in addition to the photochemical stability study that shows the photostability of cefquinome sulphate and photosensitivity of niclosamide.