

## **Preparation, characterization and therapeutic properties of gum Arabic-stabilized gallic acid nanoparticles**

### **ABSTRACT**

Gallic acid (GA) is a natural phenolic compound with therapeutic effects that are often challenged by its rapid metabolism and clearance. Therefore, GA was encapsulated using gum arabic into nanoparticles to increase its bioavailability. The formulated nanoparticles (GANPs) were characterized for physicochemical properties and size and were then evaluated for antioxidant and antihypertensive effects using various established in vitro assays, including 1,1-diphenyl-2-picrylhydrazyl (DPPH), nitric oxide scavenging (NO),  $\beta$ -carotene bleaching and angiotensin-converting enzyme (ACE) inhibitory assays. The GANPs were further evaluated for the in vitro cytotoxicity, cell uptake and cell migration in four types of human cancer cell lines including (MCF-7, MDA-MB231) breast adenocarcinoma, HepG2 hepatocellular cancer, HT-29 colorectal adenocarcinoma, and MCF-10A breast epithelial cell lines. The GANPs demonstrated potent antioxidant effects and have shown promising anti-cancer properties in a dose-dependent manner with a predilection toward HepG2 and MCF7 cancer cells. The uptake of GANPs was successful in the majority of cancer cells with a propensity to accumulate in the nuclear region of the cells. The HepG2 and MCF7 cancer cells also had a significantly higher percentage of apoptosis and were more sensitive to gallic acid nanoparticle treatment in the cell migration assay. This study is the first to confirm the synergistic effects of gum Arabic in the encapsulation of gallic acid by increasing the selectivity towards cancer cells and enhancing the antioxidant properties. The formulated nanoparticles also had remarkably low toxicity in normal cells. Based on these findings, GANPs may have promising therapeutic applications towards the development of more effective treatments with a probable targeting precision in cancer cells.