Wound healing, anti-ulcerogenic, anti-inflammatory and anti-proliferative properties of Chitosan

F. Tavaria [1*], M. Jorge[2], G. Marchetti [2], V. Souza[2], A.L. Ruíz[2], X. Malcata[1], M. Pintado[1], J. Carvalho[2]

1 Universidade Católica Portuguesa, Porto, Portugal
2 Brazil

Chitosan, is one of the most abundant, renewable, nontoxic and biodegradable carbohydrate polymers, and is largely available in the exoskeletons of shellfish and insects. It has recently attracted great attention in the pharmaceutical, biomedical and food arenas, due to its favourable physico-chemical and biological properties. In this research effort, we have assessed wound healing, antiulcerogenic and anti-inflammatory properties of chitosan *in vivo*, and the anti-proliferative activity *in vitro*.We used three chitosans differing in their molecular weight and degree of deacetylation.

The wound healing study was performed using healthy adult (250—300 g) maleWistar rats (*Rattus norvegicus*), *n* = 5/group. After thiopental anaesthesia, excision wounds sized 1.5cm2 in average were made. Wounds were treated topically for ten days by applying 200_L/wound of each sample (0.2 mg/mL) and protected by a wound curative. On day 11, animals were sacrificed and tissue samples from wound site of each animal were removed for histopathological analysis and for total collagen determination.

The anti-ulcerative assay was done in healthy adult (250—300 g) male Wistar rats (*R. norvegicus*), *n* = 5/group, using carbenoxolone as a positive control. Compounds were administered orally according to their body weight (1000 mg/kg). After 30 min, each animal received 1mL of absolute ethanol orally. After one hour, animals were sacrificed by cervical displacement and their stomachs were removed, opened along the greater curvature and the ulcerative lesion index was determined. Ear oedema was used to evaluate the anti-inflammatory effect of chitosans in Swiss adult mice (*Mus musculus*) weighing approximately 30—40 g. Croton oil was used as the inflammatory agent and dexamethazone as positive control. The oedema was measured by subtracting the weight of the ear receiving only acetone (vehicle) by that receiving the irritating agent. The oedema inhibition (%) was determined by the formula: [(*w*C − *w*T)/*w*C] × 100, where *w*C was the ear weight in the croton oil group and *w*T was the ear weight in the treatment groups.

The anti-proliferative activity of chitosan was evaluated *in vitro* against eight human tumor cell lines. The Total Growth Inhibition (cytostatic activity) was determined for each compound.

The *in vitro* cytotoxic activity of chitosan was found to be minimal, whereas it showed wound healing ability. The ear oedema assay showed no differences among the croton oil group and chitosan groups, demonstrating no anti-inflammatory activity. High molecular weight chitosan seems to render gut protection, but the medium molecular weight is the best anti-ulcerative compound.