Preparation of Novel Gallium-Curcumin Nanocomplex to treat *Streptococcus mutans* NCTC10449

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Curcumin and Gallium is reported to have anti-caries characteristics. In this study a synergistic action of Curcumin and gallium was explored by preparing Curcumin complexed gallium (Cur-c-Gal) nanoparticles and evaluating antibacterial activity on *S. mutans* NCTC10449.

Curcumin complexed gallium (Cur-c-Gal) nanoparticles were prepared by the reduction of gallium chloride utilising curcumin as a reducing and stabilizing agent. Complex formation was confirmed by UV-Vis absorption spectra and Fourier transform infrared spectroscopy (FTIR) analyses. Particle size distribution of Cur-c-Gal was investigated using dynamic light scattering (DLS) technique. Cur-c-Gal was investigated for its ability to inhibit *S. mutans* NCTC10449 growth using the agar diffusion method on Iso-Sensitest agar plates which were inoculated with standardised cultures of *S. mutans* NCTC10449 (OD 600=0.03), and incubated for 48h anaerobically at 37°C. The diameters of zones of inhibition around test samples and controls were measured in triplicate. Statistical analyses were conducted using the GraphPad software (San Diego, USA) andTukey-Kramer multiple comparison tests.

Particle size analysis by DLS of Cur-c-Gal showed an average size of 62 nm (range24-105 nm). UV-Vis absorption spectra of Cur-c-Gal nanoparticles shifted to 475 nm indicating involvement of the carbonyl group of curcumin in metal complexation. Absence of 1640 cm-1 (C=O stretching), 1383 cm-1, 1233 cm-1 and 962 cm-1 peaks in the FTIR spectra of Cur-c-Gal suggests interaction of GaCl at these sites. Agar diffusion assay established zones of inhibition of *S. mutans* NCTC10449 to be 18 ± 0.5 mm for Cur-c-Gal compared with 0.2% chlorhexidine (41± 3.5 mm) and curcumin (0 mm).

Cur-c-Gal achieved a statistically significant (p<0.05) growth inhibition of *S. mutans* NCTC10449 compared with controls and may have potential use in caries treatment.

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