Antibacterial Action of Novel Gallium-Lactoferrin Nanocomplex on *Streptococcus mutans* NCTC10449

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**Objectives:** Lactoferrin in saliva acts as a key defense factor against bacterial injuries including those related to caries associated bacterium, Streptococcus mutans. Gallium emerged as an antibacterial agent capable of inhibiting *S. mutans* growth with a new mode of action. In this study a synergistic action of gallium ions and lactoferrin was explored by preparing gallium-lactoferrin nanocomplex (GaLtf) and evaluating its antibacterial activity on *S. mutans* NCTC10449.

**Methods:** Gallium-lactoferrin nanocomplex (GaLtf) was prepared by conventional reduction complexation procedure from gallium trichloride and lactoferrin. Complex formation was confirmed by Differential Scanning Calorimetry (DSC) and Fourier transform infrared spectroscopy (FTIR) analyses. GaLtf was investigated for its ability to inhibit *S. mutans* NCTC10449 growth using the agar diffusion method. One hundred µL of GaLtf, 0.2% chlorhexidine (positive control) and sterile distilled water (negative control) were placed in designated wells 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 that developed around the test samples and controls were measured. The experiment was repeated 3 times and statistical analyses were conducted using the GraphPad software (San Diego, California, USA),Tukey-Kramer multiple comparison tests were used to compare values.

**Results:** DSC analyses confirmed gallium complexation to lactoferrin in the GaLTf by double transition with the second transition at 160ºC. FTIR analyses showed reduction in amide I and absence of amide II indicating formation of GaLTf. Agar diffusion assay established zone of inhibition of *S. mutans* NCTC10449 to be 31.5 ± 0.5 mm for Ga-LTf compared with 0.2% chlorhexidine (41± 3.5 mm) and lactoferrin (1± 0.5 mm).

**Conclusions:** Ga-LTf achieved a statistically significant (p<0.05) growth inhibition of *S. mutans* NCTC10449 compared with controls. Ga-LTf may complement currently available antibacterial agents and have potential use in caries treatment.