INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
PhD-17 SHORT ABSTRACT OF THESIS

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Thesis Title: Interfacial activity and membrane interaction of *Duttaphrynus melanostictus* cathelicidin

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SHORT ABSTRACT

Cathelicidin-DM is a host defence peptide isolated from the Asian common toad *Duttaphrynus melanostictus*. The peptide has been reported in the literature to exhibit antibacterial and wound-healing activities. The mechanism of antimicrobial activity, however, remains unclear. As most cathelicidins reported in the literature exhibit their antimicrobial activity through membrane perturbation, we investigated cathelicidin-DM's interfacial and membrane binding activities using molecular dynamics simulations and experimental methods that include surface activity at air/aqueous interface, binding with liposomes using fluorescence spectroscopy, binding with lipid monolayers using Langmuir set-up, and dye release assay. The peptide exhibits interfacial activity, with a saturation surface pressure of ~10-11 mN/m at the air/aqueous interface. Lipid monolayer penetration assays with POPC/CHL (10:1) and POPE/POPG (7:3) monolayers exhibited critical insertion pressures of ~33.2 and ~46.7 mN/m, respectively. Preferential binding to negatively charged membranes is further established using tryptophan (Trp) fluorescence assays. Counterintuitively, however, the peptide causes preferential perturbation of the zwitterionic vesicles, while sparing the negatively charged ones. Antimicrobial peptide molecules usually act cooperatively to bring about the membranolytic effects. Tight binding with membranes, therefore, could affect cooperativity, thereby negatively impacting activity.