



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : Aruna Rani

Roll Number : 11610622

Programme of Study : Ph.D.

Thesis Title: Structure and functional characterization of recombinant chondroitin sulphate AC lyase of family 8 polysaccharide lyase (*PsPL8A*) from *Pedobacter saltans* for its *in vitro* applications in therapeutics and production of chondroitin oligosaccharide with anti-cancer and prebiotic properties.

Name of Thesis Supervisor(s) : Prof. Arun Goyal

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SHORT ABSTRACT

Chondroitin sulphate (CS) is a part of connective tissues and involved in major biological processes such as cell migration, proliferation, adhesion, pathogenesis, cell-matrix interactions, chemokine and cytokine activation. The CS degrading enzymes, chondroitin lyases are therapeutically important enzymes. Chondroitin AC lyase (*PsPL8A*) from *Pedobacter saltans* DSM12145 was cloned expressed functionally and structurally characterized. The time dependent TLC analysis of *PsPL8A* degraded products of C4S revealed that it follows initially a concomitant endo-and exo-lytic mode which finally shifted to exolytic mode of catalysis. Small angle X-ray scattering (SAXS) analysis revealed that the solution shape of *PsPL8A* is in good correlation with modeled structure and its homologous crystal structures. Chondroitin AC lyase (*PsPL8A*) showed anti-proliferative effect on human melanoma (SK-Mel 28) and fibrosarcoma (HT-1080) cell lines. *PsPL8A* disrupts the mitochondrial cell potential and induce apoptosis in fibrosarcoma and melanoma cells causing cell death and hence prospects as a potential agent for therapeutic approach in cancer treatment. Chondroitin sulphate was isolated from chicken keel bone and was explored as cheaper and sustainable source for isolation of CS for its future use in pharmaceutical industry. CS was physico-chemically characterised by ESI-MS, NMR, HPSEC, DLS, FESEM, AFM, TGA, DSC and DTG analyses. CS-Keel showed antioxidant and emulsifying activity. CS-Keel disaccharide (CSD) was prepared by degradation of CS-Keel using *PsPL8A* enzymes and structurally characterized. CSD showed prebiotic properties by offering resistance to hydrolysis by gastric juice, served as carbon source for probiotic bacteria, enhancing their growth and finally fermented into SCFA products. CSD showed anti-proliferative effect against HT-29 cell lines, induced apoptosis and causing cell death. CSD having the prebiotic and anticancer properties can be used as functional food ingredient to improve gut health, treat colorectal cancer and hence can maintain the gastrointestinal health.