A REPORT ON RESEARCH VISIT TO UNIVERSITY OF BERGEN, NORWAY
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A huge daily need across the world to treat bone defects/problems made bone tissues among the most transplanted organs, with an enormous need to alternative treatment strategies. Bone tissue engineering is a promising approach to compete with these challenges and expected to replace most of the current clinical approaches that are merely transplanting autologous bones (autografts) or augmenting bone defects with synthetic materials (allografts). Tissue engineering approaches are based on combining cells, degradable scaffolds and biological molecules in order to mimic the natural healing process to regenerate tissues. However, recent studies employed biomaterials-based concepts depending on tuning the physical and mechanical properties of the scaffolds to interact with cells or micro-environment in order to promote bone tissue regeneration activities. In this setting, various natural or synthetic biomaterials were introduced to restore, maintain and improve the structure and function of bone. However, some limiting factors are present in each type of these biomaterials among their physical, chemical, biological or mechanical properties that interfere with their application exclusively [3]. Accordingly, blends and composite biomaterials have been designed for bone tissue engineering applications, combining natural and/or synthetic polymers with or without bioceramics

During this visit, I carried out a research on the fabrication and characterization of 3D porous polymeric scaffolds for the bone regenerative applications. Poly(lactide-co-trimethylenecarbonate) (PLTMC) is a novel and ever reported material for bone tissue engineering using 3D printing architecture. Hence, it is printed as pristine and a composite was also made with nano hydroxyapatite (nHA) to analyze its performance. Moreover, in order to increase the hydrophilicity, silk fibroin was coated over the PLTMC and PLTMC-nHA to perform the enhanced activities.

Followed by, the biomaterial was characterized by spectral, contact angle measurements, wettability tests, *in vitro* degradation, and biocompatibility, surface analysis by SEM, pore size distribution by micro-CT, nature observations by XRD, tensile strength assessed by mechanical properties, thermal stability by TGA & DSC and were extensively studied. Bone marrow stem cells are adopted for the bone regeneration studies and parameters like cell attachment, proliferation and differentiation performances by *in vitro* and *in vivo* studies would be studied. It is planned to have a big project and results are expected to be published in a high impacted journal.