## MS35-P22 | MEDIUM CHAIN LENGTH (MCL)-PHA-BASED NANOCOMPOSITES FOR BIOMEDICAL APPLICATIONS: SYSTEM EVALUATION THROUGH XRD

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Medium-chain polyhydroxyalkanoates (mcl-PHA) are flexible, elastomeric polymers produced by wide range of bacteria as intercellular storage of carbon and energy. They represent attractive components in biomaterial design because they are biocompatible, biodegradable and can be obtained using variety of carbon sources including waste streams [1]. However, being semi-crystalline, all mcl-PHAs are characterized by low melting temperature and poor tensile strength which can interfere with processing methods and wider biomedical application. Simple way to improve mcl-PHAs properties is to incorporate a nanophase within biopolymer to obtain nanocomposites. Nano-sized constituents interact with biopolymer more intimately affecting in turn the obtained nanocomposite properties as well as functionality. Among inorganic nanofillers, $TiO_2$ nanostructures with high aspect ratio (*e.g.* nanofibers) have unique properties that support osteogenic phenotype which makes them suitable for bone tissue engineering [2].

The aim of this study was to synthesize novel mcl-PHA-based nanocomposites for potential biomedical applications. The effects of nanophase incorporation on the obtained nanocomposites structural properties, namely phases, nano-sizes and crystallinity, are evaluated by X-ray diffraction techniques [3]. The relationship between nanocomposites structure and corresponding mechanical and thermal properties is investigated. In addition, functionality in terms of cytotoxic effect against normal human fibroblasts is evaluated.

[1] Rai, R. et al. *Biomacromolecules*, **2011**, (12), 2126-2136.
[2] Wang, X.; Gittens, R. A.; Song, R.; Tannenbaum, T.; Olivares-Navarrete, R.; Schwartz, Z.; Chen, H.; Boyan, B. D. *Acta Biomater.* **2012**, (8), 878-885.
[3] Maurya, A. et al. *Nanoscale*, **2019**, 11(15), 7176-7187.