

## Ultrasound assisted synthesis of Starch functionalized PMMA microspheres for the treatment of Acute Lymphoblastic Leukemia

Sripadh Guptha Yedire<sup>1</sup>, Vividha K. Landge<sup>1</sup>, Dr. Shirish H. Sonawane<sup>1\*</sup>.

<sup>1</sup>National Institute Of Technology, Warangal, Telangana

\* Corresponding author: shirish@nitw.ac.in

### Abstract

Acute lymphoblastic leukemia (ALL) is a type of blood cancer that is attributed to the development of large number of immature lymphocytes. In ALL, the immature lymphocytes do not function effectively and this hampers the immunity system of the body, often leading to easy bleeding, anemia and other fatal infections. These abnormal cells are called leukemia/cancer cells. One approach to control acute lymphoblastic leukemia is to control it in early stages after diagnosis. This paper presents a novel approach for the treatment of ALL by the delivery of L-asparaginase using starch functionalised Poly methyl methacrylate (PMMA) microspheres. These microspheres are synthesized using ultrasound assisted emulsion polymerization technique, with different ratios of starch (2wt%, 5wt%, 10wt%). The underlying strategy is that, L-asparaginase is enzyme that catalyzes the conversion of L-asparagine to aspartic acid and ammonia. L-asparagine is an essential enzyme for the metabolism and survival of leukemic as well as normal lymphocytes. The normal lymphocytes are capable of synthesizing L-asparaginase required for survival, whereas leukemic cells cannot survive in absence of L-asparagine.

The presence of starch on the surface of microspheres, helps in immobilization of L-asparaginase. This is attributed to the hydrophilic nature of both compounds. The L-asparaginase gets delivered when L-asparagine is in the vicinity. In vitro, drug release analysis is carried out. Microspheres are characterized by using XRD, FT-IR and SEM analysis. In vitro tests also showed an enhanced hydrophilicity of PMMA microspheres, thus resulting in increased biodegradability.

**Key words:** Acute lymphoblastic leukemia, L- Asparaginase, PMMA, starch, microspheres.

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