

Production of extracellular L-asparaginase: from bioprospecting to the engineering of an antileukemic biopharmaceutical.

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Abstract

The L-asparaginase (L-asparagine amino hydrolase, E.C.3.5.1.1) catalyzes the hydrolysis of L-asparagine into L-aspartic acid and ammonia. The effective depletion of L-asparagine results in cytotoxicity for leukemic cell. Therefore the enzyme has been a clinically acceptable anti-tumour agent for the effective treatment of acute lymphoblastic leukemia (ALL) and lymphosarcoma. L-asparaginase production using microbial system had attracted considerable attention, owing to the cost effective and eco friendly nature. A wide range of microorganisms such as filamentous fungi, yeasts and bacteria have proved to be the good sources of the enzyme L-asparaginase. Thus, in this review mainly focuses on the biochemical aspects of L-asparaginase production, aiming to comprehend the physiochemical characteristics, such as stability, bioavailability, toxicity, allergenic aspects, application, and enzyme properties and kinetics of recombinant enzyme production by fermentation. Processes central to these biochemical aspects, including fermentation of L-asparaginase producing organisms and downstream processing of the enzyme are also discussed.