Abstract

A batch process, to produce active human Interleukin-33 (IL-33) protein with an unconventional purification tag extracted from *Escherichia coli* (E. coli) cells via a series of thermal-cavitation-enzymatic lysis, is described. This study features the use of a Strep-tag on the protein along with its associated purification procedure, as opposed to the common His-tag. The popular *E. coli* strain for production of recombinant protein, BL21 DE3 cells, as well as its variation, Lemo21 DE3 cells, were considered for their high expression of protein. An isopropyl β-D-1-thiogalactopyranoside (IPTG) inducible gene encoding IL-33, in the form of plasmid DNA, was transformed into the *E. coli* cells. Produced protein retained inside the cells was extracted by lysis and separated by affinity chromatography with an incorporated endotoxin removal step. The purified IL-33 was analyzed with Bradford assay for protein concentration, with sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) for purity, with western blot for Strep-tag detection, with Limulus Amebocyte Lysate (LAL) assay for endotoxin presence, and with receptor-based Enzyme-Linked ImmunoSorbent Assay (ELISA) for functional activity. The yield of IL-33 was about 37 mg from 500 mL of bacterial culture. A commercial process design for a capacity of 10,000 kg/year was developed.