Recombinant Anticancer Peptides

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Cationic peptides have high aptitudes to interact with cancer cells, especially multidrug resistance (MDR) cells. This interaction occurs due to the more negative charge of the membrane of cancer cells compared to normal cells. Recent studies have shown the application of cationic peptides in cancer therapy minimized the side effects of chemotherapy on normal cells. The main limitation of developing the cationic peptides for practical applications is the high cost of automated chemical production. For that reason, it is important to develop a cost-effective method for the production of mass quantities of biologically active peptides.

Anticancer peptide, Recombinant protein, E coli

1. Introduction

The recombinant forms of anticancer peptides could be considered as an alternative manufacturing strategy. In particular, *Escherichia coli* expression systems have been producing many recombinant proteins in mass quantities with low production costs. However, there are certain limitations to their large-scale production, such as the low efficiency of *E. coli* in the formation of disulphide bonds for cysteine-rich peptides and short peptides are almost always produced insoluble, often misfolded forms, which warrant additional steps, as in-column refolding and purification.

The short cationic peptides with anticancer activities were linked to a central protein with similar activity to facilitate production as inclusion bodies in *E. coli*. Tachyplesin 1 (TACH) and Latarcin1 (LATA), the cationic peptides with anticancer activities, were fused to the N- and C-terminus of MAP30 (Momordica protein of 30 kDa), a ribosome-inactivating protein with potential anti-cancer activity. Tachyplesin 1, an antimicrobial peptide present in the leukocytes of the horseshoe crab (*Tachypleus tridentatus*), inhibited the proliferation of both cultured tumor and endothelial cells and reduced the colony formation of prostate cancer cells. Latarcin1 (LATA) peptide is produced in the venom gland of *Lachesana tarabaevi*, a central Asian spider. Recent studies showed a considerable interaction of the LATA peptide with the cell membrane. MAP30 was originally identified as a single chain ribosome-inactivating protein. It was isolated from bitter gourd (*Momordica charantia*) seeds, possesses potential anticancer activity against human hepatocellular carcinoma (HepG2) cells *in vitro* and *in vivo* using HepG2-bearing mice models. MAP30 showed anti-tumor effects that attributed to reducing the expression levels of growth factor receptors such as the transmembrane tyrosine kinase receptor HER2 (also known as neu or c-erb-2), which has been implicated in breast cancer.

2. Production

The production of anticancer cationic peptides as a part of a peptide-fusion protein that can be produced by *E. coli* and has an effective anticancer function. Our purification strategy depended on the production of the recombinant peptides in inclusion bodies that were easy to isolate, solubilize and refold without column and cleaving steps. The recombinant peptide-fusion protein was produced in a scalable method, exhibited considerable activity against cancer cells compared with normal cells and enhanced the selective delivery of an anticancer chemotherapy agent. [1][2][3][4][5][6][7]

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