International Journal of Peptide Research and Therapeutics
https://doi.org/10.1007/s10989-021-10215-x

Design and Synthesis of a Novel Antimicrobial Peptide Targeting β-catenin in Human Breast Cancer Cell lines

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Accepted: 30 March 2021
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Abstract
Antimicrobial peptides which play a vital role in an innate immune defense mechanism of various organisms can be regarded as novel therapeutic agents for targeted therapy to cure cancer. In the present study, a novel antimicrobial peptide which has a prominent anticancer property was identified by investigating the binding efficiency of it with the target protein, β-catenin, and named as SKACP003. Further SKACP003 was synthesized chemically and its cytotoxic effect against the following breast cancer cell lines, namely, MCF-7, MDA-MB-231 and MDA-MB-453 were explored. It was observed that SKACP003 induced dose-dependent cytotoxicity in all the above mentioned cell lines. Moreover, by using the AO/EB, Hoechst, and JC1 staining procedures we recokned that the peptide SKACP003 brought out effective morphological changes, apoptosis, and mitochondrial membrane potential loss, respectively, on the three cell lines considered. In addition to that, there was a great extent of DNA damage noticed in the cell lines concerned with the aid of comet assay. Altogether, we conclude that the anticancer property of SKACP003 can be meticulously invoked, after further evaluations at the molecular level to design a new valiant drug, to cure breast cancer.

Keywords Antimicrobial peptides · Anticancer peptides · Breast cancer · β-Catenin · Apoptosis

Introduction

Cancer is a dreadful disease which invariably affects men and women ranging from newborn to old-aged. Particularly, women suffer mostly from breast cancer all around the world and the quantum of patients has been increasing terribly in recent years (Roberts 2016; World Health Organization 2016; Lengacher et al. 2016; Bamodu et al. 2015). Although the occurrence rate of breast cancer cases stands equal in nations irrespective of whether they are being developed or developed, the number of survivors in developing countries is comparatively very lesser than in the developed countries due to the accessibility of therapeutic measures (Coleman et al. 2008). Depending upon the ailment, age of the patient, kind of damage and its location, severity and so on the mode of treatment which includes surgery, radiotherapy, immunotherapy, hormone therapy or chemotherapy can be recommended and undertaken accordingly. Amongst others, chemotherapy proves to be one of the most efficient methods of treatment for various types of cancers. In spite of its abundance, the use of chemotherapy drugs becomes limited because of its severe side effects, poor water solubility, short duration circulation and so on (Morad et al. 1831; Kumar et al. 2012; Iijima et al. 2006; Bourzac 2012). The unfavorable side effects bring additional distress to the patients (Mantyh et al. 2002; Ghafoor et al. 2003). Another important factor which hurdles the therapy is the drug resistance (Shi et al. 2019). In order to overcome the above-said drawbacks, researchers have started looking at target-specific as well as side-effect free cancer therapies. Along these lines, the anticancer peptides (antimicrobial peptides with anticancer property or simply ACP) ought to be potential candidates which can promote the target-specific cancer therapy at a larger scale.

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Published online: 12 April 2021

Springer

International Journal of Peptide Research and Therapeutics
formerly known as "Letters in Peptide Science"

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