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Editorial

Cytotoxicity and Apoptotic Effect of Nisin as an Effective Bacteriocin on the Cancer Cells

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HIGHLIGHTS

- The search for novel anti-cancer agents with minimal toxicity for normal cells is significantly growing.
- Nisin can elevate the apoptotic index through alteration in the bax/bcl2 ratio.

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ABSTRACT

Different therapeutic approaches, comprising surgery, radiotherapy, chemotherapy are used for cancer treatment. There is an extreme need for novel anti-cancer agents with minimal toxicity for normal cells is significantly growing. Nowadays, bacteriocins or antimicrobial peptides (AMPs) are considered tumor cell killers. In this regard, Nisin is one of the natural AMPs produced by Lactococcus lactis. Considering that Nisin could make apoptosis through inherent pathways and cause cancer cell death, it was suggested that at appropriate doses it might be efficient and safe for cancer treatment, room for future studies.

Keywords: Cancer; Nisin; Cancer Cells; Chemotherapy

Editorial: Cancer is the second utmost dominant reason for death worldwide and the mortality rate is meaningfully increasing in the past decades. As said by a current report by the World Health Organization (WHO), there have been around 18.1 million novel cases of cancer, which has killed about 9.6 million people in 2018 (1). Besides mortality, undesirable effects of human cancer treatment pose an important global economic and psychological burden to the affected nations (2). Typically, different therapeutic approaches, comprising surgery, radiotherapy, chemotherapy are used for cancer treatment. Surgery and radiotherapy are usually not suitable for dispersed cancers but effective against localized ones. Chemotherapy remains the single choice for the majority of disseminated cancers. Chemotherapy is only reasonably effective along with the adverse effects because of the non-selective cytotoxicity against target cells, relapse capacities, and appearance of multidrug-resistant (MDR) cells (3) Therefore, the search for novel anti-cancer agents with minimal toxicity for normal cells is significantly growing.

A conceivable group under examination contains bacteriocins or antimicrobial peptides (AMPs) that have cytotoxic activity against several types of tumor cells (4). In this regard, Nisin is one of the natural AMPs produced by *Lactococcus lactis* (4). Some documents are presented regarding the cytotoxic properties of Nisin on numerous cancer cells (5, 6).

In the research by Ahmadi et al., Nisin has induced apoptosis and cell cycle arrest, tested for colon cancer cell growth suppression. The dose-dependent reduction of colon cancer cells (SW480) viability after Nisin treatment has been demonstrated using MTT assay (7).

Additionally, the effect on the mitochondrial apoptosis pathway was evaluated via the study of the expression level of two vital genes, from the *Bcl-2 family* (7). Nisin can elevate the apoptotic index through alteration in the expression of *bax/bcl-2* ratio, both at the mRNA and protein levels in a dose-dependent manner.

On the other hand, given the apoptotic impacts of Nisin and its interactions with other drugs, a combination of Nisin and Doxorubicin and their effect on the expression level of these genes warrant future investigations. Also, *p53* can stimulate the intrinsic pathway of apoptosis by inducing the transcription of particularly apoptotic *Bcl-2* family genes (8), so the effect of Nisin on the expression of the p53 gene can also be investigated.

Conclusions

Finally, considering that Nisin can induce apoptosis through intrinsic pathways and cause cancer cell death (7), it was suggested that at appropriate doses it might be efficient and safe for cancer treatment, room for future studies.

Authors' contributions

SK is the principal investigator and wrote the editorial, and LOR edited the manuscript. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

All authors claim that there is no competing interest.

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Ethical statement

Not Applicable

Abbreviations

AMP	Antimicrobial peptides
MDR	Multidrug-resistant
MTT	3-(4,5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide
WHO	World Health Organization

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Author (s) biosketches

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