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Exopolysaccharides from lactic acid bacteria and their antitumour activity

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As the recognition for natural compounds has increased over the last decades, diverse industries have also increased the implementation of research in order to develop these compounds into useful products. Microorganisms are known to synthesise compounds in response to different external pressures, and one of these is the microbial exopolysaccharides (EPS). Exopolysaccharides are compounds that are secreted by various organisms as a product of their metabolic pathways and as a response to different environmental stress. These are polymers of high molecular weight that are mainly composed of sugar residues and their derivatives, and are known to possess diverse biological functions.   Among all the microorganisms that are studied for the production of EPS, lactic-acid bacteria (LAB) have acquired a special acknowledgement in regard to their properties and potential for industrial application. LAB EPS possesses the ability to cause damage to cancer cells. They inhibit the proliferation of a variety of tumours through different mechanisms. Tumour cells, when treated with EPS, exhibit apoptotic changes in their morphology, such as vacuolation and chromatin condensation. EPS activates the transcription and translation factors of death receptors and their ligands, which stimulate caspases. Caspases then execute programmed cell death.   Moreover, EPS have the ability to bind to the surface receptors of cancer cells in the intestine, which in turn inhibits their proliferation. This ability is significant because various species of LAB that produce EPS are present in the intestine. Furthermore, EPS possess selective cytotoxicity, which means that they show less to no cytotoxic effect to normal cells, but are toxic to cancer cells. This makes the EPS a safe alternative to other antitumour synthetic compounds, which are known to be effective but possess negative health side effects are a great concern.   The other properties exhibited by LAB EPS include anti-mutagen, anti-oxidation, anti-angiogenesis, anti-inflammation and induction of cell cycle arrest and signal pathway modulation. These broad functionalities against tumour cells provide them with a promising potential in the anti-cancer therapeutic industry.

Keywords: Exopolysaccharide, Lactic-acid bacteria, Tumor, Cancer cells , Anti-tumor drugs, Therapeutics

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