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Antimicrobial Peptides: Mechanisms of Ac ion and Therapeutic Applications

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C **:** AMPs possess immunomodulatory properties that may be bene cial in treating chronic in ammatory conditions. For example, certain AMPs can reduce the secretion of pro-in ammatory cytokines and promote tissue healing in conditions like rheumatoid arthritis, in ammatory bowel disease (IBD), and psoriasis [7]. By modulating the immune response, AMPs could help shi the immune system away from pathogenic in ammation towards a more balanced and restorative state.

C **:** AMPs are also being investigated for their potential anticancer activity. Some AMPs can selectively target and kill cancer cells while sparing normal cells, making them attractive candidates for cancer therapy. ey may act by disrupting the integrity of cancer cell membranes, inducing apoptosis, or stimulating immune cells to recognize and eliminate tumor cells. Furthermore, AMPs have been shown to enhance the e ectiveness of conventional chemotherapy and immunotherapy.

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Despite their promise, the clinical application of AMPs is hindered by several challenges:

: While AMPs are generally selective for microbial cells, their ability to interact with host cell membranes can lead to toxicity at higher concentrations [8]. is is especially true for peptides with broad-spectrum activity. To mitigate this risk, researchers are focusing on designing peptides that are more selective for pathogens and less toxic to host cells.

: AMPs are prone to degradation by proteolytic enzymes in the body, which can limit their therapeutic potential. Strategies to improve their stability include modi cations to their amino acid sequences, incorporation of non-natural amino acids, and the use of peptide mimetics or synthetic analogs.

C **:** e production of AMPs on a large scale remains challenging due to their high cost and the di culty of synthesizing large peptides e ciently. Advances in peptide synthesis techniques, such as recombinant DNA technology and solid-phase peptide synthesis, are helping to address these issues.

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Antimicrobial peptides represent a promising alternative to conventional antibiotics and hold potential for treating a variety of infectious, in ammatory, and even cancerous conditions. eir broad-spectrum antimicrobial activity, immunomodulatory e ects, and ability to target multidrug-resistant pathogens make them attractive candidates for therapeutic development. However, challenges such as toxicity, stability, and production remain to be overcome. Ongoing research into optimizing AMP design, delivery methods, and stability will be critical for realizing their full clinical potential.

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