TECHNOLOGY OFFER

NOVEL ANTIMICROBIAL, ANTIINFLAMMATORY AND ANTICANCER PEPTIDES

Bacterial infections (BI) and cancer are leading causes of death, exacerbated by limited treatment options and drug resistance. Both global health challenges involve immune system imbalances, with BI impacting various organs and becoming most severe when bacteria enter the bloodstream, causing sepsis—a rapid organ failure due to immune response to bacterial products. Sepsis is challenging to detect and treat, with each untreated hour reducing patient survival by 8%. Recent studies have unveiled bacteria's role in cancer, altering cancer research dogma. Bacteria can influence cancer development and metastasis by disrupting the immune system, promoting tumor growth, drug resistance, and preventing immune cells from killing cancer. To address these challenges, University of Graz has developed a novel peptide-based active ingredients within the NERA peptide platform. Unlike antibiotics, this novel Nera peptides offers a unique mechanism of action and holds significant therapeutic potential for both diseases (Fig. 1).

ADVANTAGES:

- Fast mechanism unlikely to develop resistance
- Wide therapeutic window
- Human origin, non-hemolytic, non-cytotoxic
- Broad antimicrobial spectrum
- Novel therapeutic approach for cancer
- Antiinflammatory

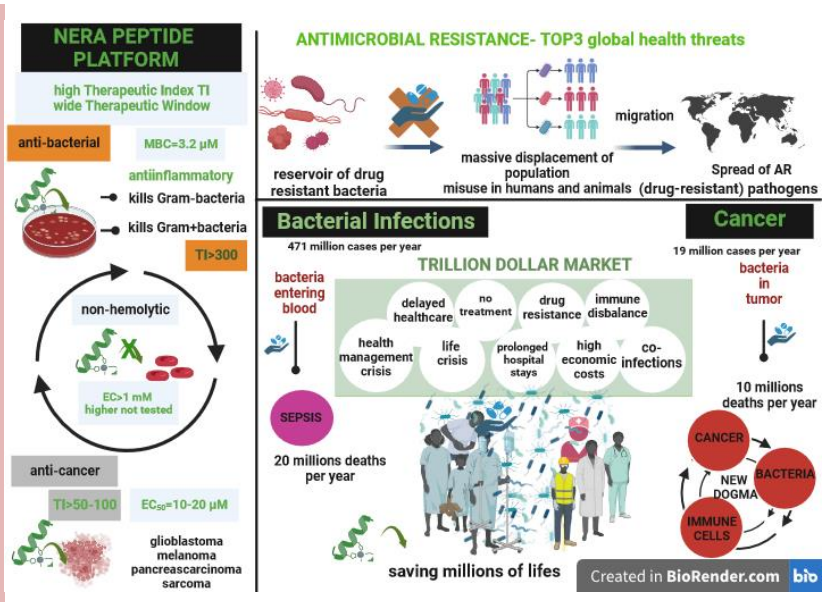

Fig.1 Overview of the peptide`s activities

FACTS Annually, BI result in over 471 million cases, including 48.9 million instances of sepsis and 26 million wound infections. BI leads to 8 million deaths per year, with sepsis alone claiming 20 million lives. Additionally, antimicrobial resistance (AR) causes 7 million deaths annually. The global migrant crisis and refugee movements have the potential to exacerbate AR. There is a pressing need for innovative drugs targeting Gram-negative bacteria, particularly the ESKAPE pathogens (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter species*) due to their clinical significance. Although cancer is less prevalent than BI, it still causes 11 million deaths annually, with breast and colon-rectal cancers being major contributors.

TECHNOLOGY Nera peptides, derived from the human antimicrobial peptide cathelicidine LL-37, exhibit impressive efficacy against both Gram-negative (*Escherichia coli*) and Gram-positive (*Bacillus subtilis, Enterococcus hirae*) bacteria. Remarkably, they do not harm human cells (erythrocytes, fibroblasts) and do not interact adversely with eukaryotic membranes. This substantial increase in therapeutic potential, from 25 to 300 compared to the parent peptide LL-37, represents an unprecedented achievement in peptide-based therapies. Moreover, Nera peptides display notable activity against various cancer cells such as melanoma, sarcoma, pancreas adenoma, and glioblastoma. Additionally, they demonstrate anti-inflammatory properties by promoting the release of anti-inflammatory cytokines in monocytes challenged with bacterial endotoxins. This groundbreaking approach to cancer treatment can be employed as a standalone therapy or as a complement to existing treatments.

KEYWORDS:
BACTERIAL INFECTIONS
SEPSIS
CANCER
ANTIMICROBIAL RESISTANCE
ANTIMICROBIAL PEPTIDES
MEMBRANE-ACTIVE AGENTS
ANTI-GRAM-NEGATIVE
ANTI-GRAM-POSITIVE
ADJUVANTS
ANTI-INFLAMMATORY
ANTI-CANCER

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COOPERATION OPTIONS:
LICENSING AGREEMENT
RESEARCH COOPERATION AGREEMENT

DEVELOPMENT STATUS:
EXPERIMENTAL PROOF OF CONCEPT IN *IN VITRO* MODELS (TRL 3A).

STATUS OF PATENTS:
A50312/2023
A50313/2023
PRIORITY DATE: 26.04.2023

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