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Novel, Synthetic, Antimicrobial Peptides

-Owing to an increasing number of drug resistant bacteria, as well as similarity in the activity spectrum of current antibiotics, there is high demand for developing effective and specific antimicrobial therapies. Nontuberculous mycobacteria, specifically Mycobacterium abscessus (M. abscessus), have become an increasing public health concern in the US with pulmonary infection being the most common clinical presentation. One major threat from M. abscessus is their intrinsic resistance to classical anti-tuberculosis drugs, such as isoniazid and rifampin, as well as many common antibiotics, leading to a lack of therapeutic options.

Antimicrobial peptides (AMPs) have gained prominence due to their specificity towards anionic bacterial membranes, rapid action, and inability for the bacteria to develop resistance by acting against the cell membrane. AMPs also have immunomodulatory properties, making them attractive potential therapeutic candidates.

Researchers at the Biodesign Institute of Arizona State University have identified novel, synthetic AMPs with activity against M. abscessus. By screening an array of 125,000 random synthetic peptides, 6 AMPs were identified, and demonstrated significant inhibitory effect against M. abscessus. These 6 peptides were further evaluated and shown to have low toxicity to human red blood cells. In addition, higher peptide inhibitory activity was seen against Pseudomonas aeruginosa, Staphylococcus aureus, including MRSA, and Escherichia coli in the presence of EDTA indicating a synergistic antimicrobial effect.

These AMPs represent novel potential therapeutics to help combat the rise in drug resistant bacteria, including M. abscessus.

Potential Applications

- Small synthetic peptides with antimicrobial activity
- AMP therapeutics
- Anti-mycobacteria activity

Benefits and Advantages

- AMPs are more potent and have fewer side effects than orally and intravenously administered antibiotics and can be delivered as an inhaled therapeutic
- AMPs demonstrate selectivity towards anionic bacterial cell membranes, rapid action, and lack of development of resistance
- Efficient screening of random peptides using a high throughput synthetic peptide microarray
- Low toxicity (<10%) against human red blood cells
- Broad-spectrum and narrow-spectrum antimicrobial activity

For more information about the inventor(s) and their research, please see

Dr. Haydel's departmental webpage