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BACTERIOPHAGE THERAPY TO COMBAT ANTIBIOTIC-RESISTANT INFECTIONS

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Antimicrobial resistance (AMR) is one of the most significant issues of 21st century. The inappropriate and overuse of antibiotics in medicine, animals and agriculture have led to extreme emergence of multidrug-resistant (MDR) bacterial strains. If the current trends continue AMR could lead to 10 million deaths annually by 2050 according to WHO warnings.

Given the rising threat of antimicrobial resistance (AMR) especially after COVID-19, integrating bacteriophage therapy into clinical settings offers a promising alternative to traditional antibiotics. Phages are viruses that target specific bacteria have shown effectiveness against MDR pathogens like *Pseudomonas aeruginosa, Klebsiella pneumoniae and Acinetobacter baumanii.* Having good ties with countries like Georgia, Poland and Russia puts Belarus in good position to adopt phage therapy. Being a cost-effective and adaptable treatment it could reduce the burden of hospital acquired infections as well.

Bacteriophages are viruses which infect and lyse bacterial cell wall, they are highly specific and operate via 2 lifecycles namely lytic (virulent) and lysogenic (temperate). Whereas only lytic phages are suitable for therapeutic use as they destroy their host bacteria.

Phages attach to specific receptors on bacterial surface, inject their genetic makeup and hijack the host's machinery to replicate. Their self-amplifying nature leading to bacterial lysis and release of new phage particles makes them particularly effective against infection.

CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) is a powerful tool which uses phages to target and destroy antibiotic resistant bacteria in ways like precision targeting, overcoming bacteria resistance against phages, targeted and selective killing and it can also be combined with the conventional page therapy to develop smart phages to make them more effective and specific, potentially turning a lytic phage into a gene-delivering tool.

Numerous case studies and clinical trials done In Georgia and Poland especially at Eliava Institute have been used successfully for decades. Although there are limitations like narrow host range, phage resistance and early human immune response, yet it offers benefits like high specificity, self-limiting replication, biofilm penetration and co-evolution with bacteria.

Advancements in synthetic biology like CRISPR technology for precise genome editing where phages are tailored to patient's infection is a growing area research yet.

In conclusion, bacteriophage therapy is an innovative and effective solution to AMR crisis globally. Although challenges still revolve around its specificity, adaptability and safety is what makes them adjunct to traditional antibiotics which demands for further research and regulations for broader application.