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A Search for the Elusive Zymophage

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Antimicrobial resistance is slowly becoming one of the greatest threats to human health as many antimicrobials are becoming obsolete when overused against bacterial and fungal “superbugs”. Bacteriophages (or phages), viruses which infect and kill bacteria, hold promise as a new anti-microbial by targeting specific bacteria. However, very few viruses that infect unicellular eukaryotic organisms are known, and none have been found that infect Saccharomyces cerevisae, or budding yeast, which serves as a model fungal system, crucial in the understanding of fundamental mechanisms of cell biology and genome-wide approaches in biomedical sciences. When genetic research in budding yeast began in the 1960s, researchers looked for viruses that infect yeast, named “zymophages”, to use in genetic engineering. None were found. However, by adapting modern methods used for bacteriophage discovery for use in yeast and testing both laboratory strains and wild isolates from bark, we hope to finally resolve this 60-year mystery. This discovery work also tests whether the endogenous 2-micron plasmid, a 6kb selfish DNA element, may function as a host defence system. By curing this plasmid from any host strain used for zymophage hunting, we can test if it serves as a restriction system to protect yeast from zymophage infection. Any discovered zymophage will be amplified, its genome purified and sequenced, and its morphology determined by transmission electron miscroscopy. This project holds the potential to not only uncover a new class of viruses of unknown size, genomic organization, and morphology, but could open the door to combatting resistant fungal pathogens.