

Exploring Genetic and Phenotypic Variation in Yeast Hybrids for Applications in Genetic Disease Research and Therapeutic Development

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ABSTRACT

For decades, yeast has been an invaluable model organism for studying fundamental biological processes, many of which are conserved across eukaryotes, including humans. Despite over a billion years of evolutionary divergence, yeast and humans share a substantial number of genes that encode critical cellular functions, the malfunction of which in humans often leads to diseases. Yeast's genetic tractability has allowed it to serve as a powerful tool for exploring human gene function, disease variants, and therapeutic interventions. Hybridization among yeast species, in particular, offers a unique opportunity to exploit interspecies genetic diversity to study phenotypic outcomes relevant to both food and medical biotechnology, and opens new pathways for understanding complex human diseases and emerging infections.

In our study, we overcame sterility in yeast hybrids by engineering hybrid tetraploids, generating diverse progeny with unique traits. These hybrids can serve as models for investigating the genetic basis of human diseases, emerging infections, and the development of natural therapeutics. This system provides a promising platform for studying human gene function, disease mechanisms, and therapeutic interventions.