ARTIFICIAL LIGNINOLYTIC SECRETOME BY *S. cerevisiae*: BUILDING A WHITE-ROT YEAST

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The ligninolytic enzyme consortium secreted by white-rot fungi constitutes a rich source of oxidoreductases with potential applications in different areas of biotechnology. The last decade has witnessed the birth of several engineering strategies to meet ligninases with industrial needs, in many cases surpassing the boundaries of nature, by using Saccharomyces cerevisiae as heterologous host in directed evolution enterprises. By harnessing the efficient homologous DNA recombination device of yeast, the natural vanguard of ligninases formed by high redox potential peroxidases and laccases, unspecific peroxygenases and aryl–alcohol oxidases have been improved to work in a range of processes ranging from organic synthesis to biomedical applications. To meet all these oxidative activities within the same heterologous host is a milestone in synthetic biology of great value. In this work, a full set of ligninases was successfully co-secreted by S. cerevisiae. Expression cassettes were constructed to harbor laboratory evolved versions of versatile peroxidase, laccase, unspecific peroxygenase and aryl alcohol oxidase while a panel of different promoters/terminator pairs was used to circumvent metabolic burdens and expression constraints. As such, this artificial secretome produced by S. cerevisiae (white-rot yeast, WRY) could be used as laboratory model to help answer key questions in the deconstruction of lignin in nature at the time that could work like workhorse for the production of biofuels and biomaterials.

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