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Project: Development of a *Talaromyces emersonii* 'Molecular Toolkit', enabling the efficient expression of designer enzymes/enzyme cocktails for industrial applications.

Talaromyces emersonii (*T. emersonii*) is a thermophilic fungus primarily isolated from composting biomatter. The thermostability and pH range of the enzymes produced by *T. emersonii* is remarkable, far out-performing similar enzymes from other fungal species, with activity found up to and including 100°C. These features suggest that this thermophile will have far reaching biotechnological applications in the energy, pharmaceutical and food industries. In order to create commercially viable strains of this fungus, a 'molecular toolkit' must be created to enable efficient expression of various genes of interest. This involves the isolation of DNA sequences that control the expression of genes, the creation of gene vectors and transformation methods to deliver these vectors efficiently into the cells.

- **Task 1: Development of an efficient transformation method for *T. emersonii*.**
 - Phase 1: Identification of selectable markers for *T. emersonii*
 - Phase 2: Development of plasmids for *T. emersonii* transformation.
 - Phase 3: Establishment of an efficient transformation system for *T. emersonii*.
- **Task 2: Construction of a *T. emersonii* 'molecular toolkit'.**
 - Phase 1: Identification of *T. emersonii* regulatory elements.
 - Phase 2: Construction of toolkit plasmids that will enable the transfer of genes between them
 - Phase 3: Testing of the molecular toolkit

