

A GENETIC SWITCH FOR STABLE, LONG-TERM FERMENTATIVE PRODUCTION OF ANABOLIC PRODUCTS IN YEAST

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Amyris is the integrated renewable products company that is enabling the world's leading brands to achieve sustainable growth. Amyris applies its innovative bioscience solutions to convert plant sugars into hydrocarbon molecules and produce specialty ingredients and consumer products. Production and marketing of the molecule farnesene (Biofene®) has already been commercialized with production scale in some markets. Farnesene has many applications as a renewable feedstock for polymers, nutraceuticals and cosmetics. To reduce the production cost of farnesene, at Amyris we engineer strains using a state-of-the art industrial synthetic biology platform to have high titer, yield, and productivity, and we perform fermentations in 200 m³ vessels over the course of many days or weeks. The challenge is that high-producer cells grow more slowly than spontaneous mutant low- or non-producer cells, especially in the nutrient-unlimited conditions of the seed train expansion, and yet must comprise the vast majority of the population. We have successfully addressed this challenge by developing an industrially-scalable genetic switch to successfully maintain high performance throughout lengthy fermentations. This genetic switch uses maltose (a cheap, non-toxic and metabolizable molecule) to control transcription such that when maltose is added in the seed train, product formation is shut off. This increased the growth of high-producer cells, resulting in higher inoculum purity and improved performance in bioreactors.