A New Source for Eicosapentaenoic Acid-Rich Oil and Biomass

Quinn Zhu, Bjorn Tyreus, Boonchai Boonyaratanakornkit, Clementina Dellomonaco, Xiaochun Fan, Raymond Hong, Pamela Sharpe, David Short, Dongming Xie, Zhixiong Xue, Narendra Yadav and Ethel Jackson

Biochemical Sciences and Engineering, Central Research and Development, E.I. du Pont de Nemours and Company, Wilmington, DE 19880

The oleaginous yeast *Yarrowia lipolyticia* has been used as host for the production of carotenoids, resveratrol, omega-3 and omega-6 fatty acids via engineering of metabolic pathways and global regulators at DuPont. We report here the development of clean and renewable commercial products of eicosapentaenoic acid (EPA, C20:5, omega-3 fatty acid) oil and EPA-rich biomass by fermentation. The EPA oil has been used as human nutritional supplement; and the EPA-rich biomass has been used as salmon feed to raise brand salmon, VerlassoTM (www.verlasso.com). The yeast triacylglyceride oil has a unique fatty acid profile with less than 5% as saturated fatty acids and more than 55% as EPA that has great health benefits for human and animals. The EPA-rich biomass for feed reduced >75% fish oil consumption and produced premium salmon. We will discuss in detail the approaches such as regulation of global regulators, engineering of metabolic pathways and developing fermentation process for production of these two commercial products. The bioengineering of *Yarrowia* generates a platform technology to produce high value oil and biomass with tailored omega-3 or omega-6 fatty acid compositions. Our land-based production of EPA, DHA, ARA or GLA provides a superior source for these essential molecules for applications in nutritional supplements, functional foods, infant foods, medical foods, pharmaceuticals, and animal feeds.