COMPLETE BIOSYNTHESIS OF ADIPIC ACID IN SACCHAROMYCES CEREVISIAE

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Adipic acid is an important industrial chemical that is produced in significant quantities every year. However, conventional processes for its production are not sustainable due to a heavy dependence on petroleum derived feedstocks and emission of greenhouse gases. Biotechnological production of adipic acid in a yeast host is a sustainable alternative that can overcome these issues. While many heterologous pathways have been proposed to achieve this, significant progress has been made only using the muconic acid pathway which has been implemented by many research groups in both *E. coli* and *S. cerevisiae*. However, the *in vivo* conversion of muconic acid to adipic acid has not been reported. In this work, we describe the isolation of a novel enzyme: 2-enoate reductase that is capable of reducing the pi bond of an alpha unsaturated carboxylic acid such as muconic acid. We have characterized the substrate profile of these novel enzymes and have identified an oxygen tolerant enoate reductase that has significant potential for adipic acid production. This enzyme was tested for muconic acid activity in *S. cerevisiae* and was then expressed in a muconic acid producing yeast strain to construct a yeast host that is capable of complete biosynthesis of adipic acid using glucose as the only feedstock. To our knowledge, this is the first reported yeast strain that is capable of adipic acid biosynthesis using glucose as the only feedstock. We anticipate that adipic acid production can be improved further through metabolic engineering.

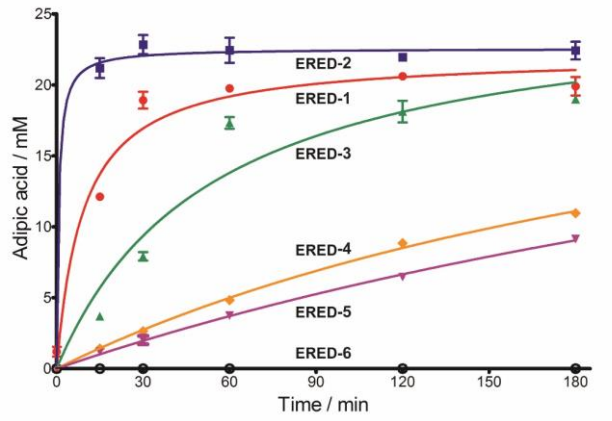

Figure 1- Activity of Enoate Reductases from 6 different organisms on 2-Hexenoic acid to produce adipic acid (in vivo – E. coli)