Development of a sustainable bioprocess for the production of Vitamin B9

Mastella L.[1], Bertacchi S.[1], Senatore V. G.[1], Labra M.[1], Beltrani T.[2], Branduardi P. [1]

E-mail: l.mastella@campus.unimib.it

[1]*University of Milano Bicocca, Department of Biotechnology and Biosciences, Piazza della Scienza,2, 20126, Milan, Italy*
[2]*Laboratory for Resources Valorization (RISE), Department for Sustainability, ENEA- Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy*

Keywords: *Saccharomyces cerevisiae*, *Scheffersomyces stipitis*, folate, metabolic engineering, residual biomasses, industrial symbiosis

Abstract: Vitamin B_9, commonly known as folate, is an essential micronutrient that acts as cofactor in one-carbon transfer reactions, therefore involved in many reactions, among which the synthesis of nucleotides and amino acids. Folate deficiency is associated with important illnesses such as anemia and cardiovascular diseases.

All the vitamin B_9 commercially available is produced by chemical synthesis mainly in the form of folic acid, suboptimal in terms of bioactivity. The main goal of this study is the biotechnological production of bioactive folates by the use of tailored microbial cell factories.

The glucophilic yeast *Saccharomyces cerevisiae* was engineered in the anabolic pathways of the two main building blocks of folate, para-aminobenzoic acid (*p*ABA) and dihydropteridine, to identify the impact on the production of intra- and extracellular levels of free and poly-glutamate folates. In parallel, *Scheffersomyces stipitis,* a yeast naturally able to metabolize the different sugars deriving from lignocellulosic biomasses, is under evaluation as alternative cell factory.

We aim at creating a synthetic consortium for the complete biotransformation of the main nutrients released from the pre-treatment of residual biomasses to produce bioactive Vitamin B_9 forms, following the logic of industrial symbiosis.