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Recombinant *Lactococcus lactis* for efficient conversion of cello-oligosaccharides into L-lactic acid

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One of the possible applications of synthetic biology is the "creation" of recombinant bacteria able of producing building blocks. The latter have great potential since they can be used for the production of bio-based polymers possibly replacing oil-derived plastics. Lactic acid (LA) is among the most requested compounds by the chemical industry and is already largely employed for the production of its polyesters (i.e., polylactides), which are general purpose biodegradable and biocompatible plastic materials. Most LA produced worldwide is obtained by lactic acid bacteria (LAB)-based fermentation. However, current processes depend on expensive feedstocks (e.g., glucose) or compete for food crops (e.g., corn). Cellulose, instead, is an inexpensive substrate found in plant material-derived waste. Our aim is to construct a strain of *Lactococcus lactis* able to produce LA directly from cellulose (that is without prior enzymatic saccharification by commercial cellulases) by metabolic engineering. Only relatively few natural bacteria are able to grow with only cellulose as the substrate. *Clostridium cellulovorans* is one of them. To achieve our goal, we've introduced components of *C. cellulovorans* cellulose depolymerizing machinery into *Lactococcus lactis*. In particular, in this work we have shown that, by introducing only *two C. cellulovorans* glycosyl hydrolases, we were able to develop a recombinant *L. lactis* able of metabolizing short chains of cellulose (i.e., cellooligosaccharides with degree of polymerization up to 10) into L-LA with a yield close to 100%.

Biography

Denis Kalemasi has completed his MSc in Industrial Biotechnology at the University of Turin in 2015. He has been working since 2014 on the construction of a recombinant *L. lactis* for the direct conversion of cellulose into L-lactic acid.

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