International Conference on
Bioprocess-2013
Fermentation Technology, Bioprocess and Cell Culture
October 28-30, 2013 Kansas City, USA

Microbiologically produced organic acids as new building blocks in organic synthesis

Ulrich Stottmeister

University of Leipzig, Germany

Abstract

This review by a group of microbiologists, biotechnologists and chemists is focussed on the biotechnological production of selected oxo- and hydroxycarboxylic acids. The use of these acids as new building blocks can fulfil an impressive range of tasks in organic synthesis. In the first part, the biotechnological aim describes the development of process fundamentals with regard to:The use of different strains and mutants of the non-conventional yeast *Yarrowia lipolytica* as a "producer on demand" of metabolites in the TCA cycle (e.g. (2R,3S)-isocitric, 2-oxoglutaric acid).The variable use of renewable raw materials (plant oils, carbohydrates, industrial by-products such as glycerol).The development of a "multi-purpose" bioreactor and the application of pilot plant "standard equipment" for organic acid production to minimize the engineering work required.The development of new product isolation procedures, with the aim of direct product recovery and direct capture of products.In case of 2-oxo-gluconic acid formation from glucose, effective transformation reactions based on the bacteria *Gluconobacter sp.* were carried out using the same equipment.

In the second part, the chemical aim describes the impressive synthetic potential of 2-oxo-glutaric acid and 2-oxo-gluconic acid as new building blocks.

Our group has introduced and described for the first time new tools for the synthesis of a variety of:

- Hydrophilic triazines

- Spiro-connected heterocycles

- Benzotriazines

- Pyranoic amino acids

Many of these substances are of great interest for technical and pharmaceutical applications. The basic structure of the compounds is described in further detail.Our recent work has focussed on the chiral (2R,3S)-isocitric acid, another intermediate of the TCA cycle. We have developed a new isolation/purification procedure based on a mutant strain of *Y. lipolytica* and plant oils as sole carbon source. For the first time, this process provides large quantities of enantiopure trimethyl (2R,3S)-isocitrate, which can then be used in subsequent chemical transformations for promising, completely new chiral entities in the active fields of total synthesis and pharmaceutical research.

Biography

Ulrich Stottmeister studied chemistry at the University of Leipzig-Germany (since 1959, PhD:1968, Dr. sc. nat .: 1986, Dr. habil.: 1991). He was lecturer at the University of Leipzig for biotechnology and working as assistant professor at the University of Waterloo, Canada in 1991. Since 1992 he has built up the research group for "Remediation Research" in the new founded UFZ Centre for Environmental Research in Leipzig as department head. In 1995 he was appointed to the rank of a full professor for biotechnology and technical chemistry of the University of Leipzig. Ulrich Stottmeister is full member of the Saxony Academy of Sciences since 1996 and full member of acatech, the National German Academy of Technical Sciences since 2002. He was Vice-president and president of ISEB International Society of Environmental Biotechnology from 2004 to 2008.His general fields are Environmental Biotechnology and "White" Biotechnology. He is author, co-author and editor of a wide number of publications, contribution to monographs and books and holds several patents.
Ulrich Stottmeister is retired and in guest-status of the Helmholtz-Centre for Environmental Research UFZ.