

## ADVANCED SEPARATION BY PERTRACTION (EXTRACTION THROUGH LIQUID MEMBRANES) OF BIOSYNTHETIC COMPOUNDS WITH MEDICAL, FOOD AND COSMETIC UTILIZATIONS - PRIORITY OF THE WHITE BIOTECHNOLOGY (PERBIO)

Research Grant no. 57/1.10.2007, Project ID\_317 ([www.idei-317.blogspot.com](http://www.idei-317.blogspot.com))

The proposed research project, namely the study on separation by original non-conventional techniques (reactive extraction and extraction through liquid membranes) of some valuable biosynthetic products, joins the top of the world-wide researches on separation of biosynthetic compounds with important applications in medicine, food and cosmetics, researches that are included in the current context of "the white biotechnology". The actual trend to implement "the white biotechnology" is considered to be "the third wave of the biotechnology", being directed to the identification and utilization of natural regenerable sources of raw materials for biosynthesizing valuable bioactive compounds, as well as to the design, optimization and application at macro-scale of new techniques for separation and purification.

The interest on the separation processes was major from the beginning of chemical industry development, their evolution controlling the profitability of a certain technology. Although the separation processes have been initially distinctly analyzed, today their development is completely included in the development of chemical or biochemical technologies. In the last years, due to the demand of high quality products, the high purification technologies are strongly required, even in the conditions of the graduated exhausting of traditional raw materials. The increase of the importance of separation stage is also indicated by its applications in the last century. In U.S.A., both Amundsen Report, and Energy Department Report underlined the special attention that must be accorded to the development of the modern separation techniques. In this country, the Committee for Engineering Processes of the S.E.R.C., presenting the priorities of the chemical and biochemical industry showed that the separation processes are placed on the top of the research directions. Thus, the Committee, together with the S.E.R.C Directorate for Biotechnology, proposed a research strategy which needed 13 - 15 billions USD/year at the beginning of this decade. In U.S.A. are annually unfurled about 70 major grants on these research domains. Because the use of biotechnology and the optimization of the high cost biotechnological stages represent a priority, the proposed project contributes to the development of the fundamental and applicative researches in the bioengineering and biotechnology domain in our country, all the more as the activity and the previous results of our team in this field are appreciated in the scientific media. New valences of the multidisciplinary research are promoted by means of this project, in the purpose of increasing the economically efficiency of the biotechnologies for production of *antibiotics, carboxylic acids, amino acids and vitamins* with pharmaceutical, food and cosmetic utilizations. Therefore, the main original **objectives** of the project are as follows:

1. to establish and optimize the conditions for selective separation of gentamicins from biosynthetic mixture by facilitated pertraction
2. to establish and optimize the conditions for separation of nistatine by free or facilitated pertraction
3. to establish and optimize the conditions for individual and selective separation of cinnamic, p-hydroxycinnamic and p-methoxycinnamic acids by facilitated pertraction
4. to establish and optimize the conditions for individual and selective separation of vitamin C and gluconic acid by facilitated pertraction
5. to establish and optimize the conditions for separation of vitamin B<sub>10</sub> by facilitated pertraction
6. to establish and optimize the conditions for individual and selective separation of amino acids (aspartic and glutamic acids, glycine, phenylalanine, tryptophan, cysteine, histidine, arginine, lysine) by facilitated pertraction
7. to study the possibilities for scaling-up the proposed separation processes.

The studied biosynthetic compounds are products of high economically value, as it was indicated in the studies for 2006 and previsions for the next years made by specialized companies (*Market News Service, In-Pharma Technologist, Nutra Ingredients Europe, Codex Alimentarius Commission*):

- gentamicins: production cost varies between 300 USD/Kg (Fujian Fukang China) and 1215 USD/Kg (Sandoz Austria)
- nistatine: overall world production in 2006 was of 2.2 billions USD, among them 27.5% in our contry (SC Antibiotice SA Iasi, second place in the world producers)
- cinnamic acids (cinnamic acid): overall production in 2006 of 12,000 tonnes
- vitamin C: estimated world production in 2007 of 2.7 billions USD
- vitamin B<sub>10</sub>: overall production in 2006: 22,000 tonnes
- amino acids: biosynthetic amino acids production in 2006 was of 3.43 billions USD, estimated in 2009 at 4.9 billions USD (the most important being glutamic acid, tryptophan and lysine).

Besides the above mentioned objectives, another major objective of the project is to reach top-results in the field of bioseparations, for increasing the visibility of the Romanian research activities, and for translating the obtained results to the industrial practice.

**Project director: Professor Dan Cașcaval, Ph.D.**

Department of Organic and Biochemical Engineering  
Technical University "Gheorghe Asachi" of Iasi  
[dancasca@ch.tuiasi.ro](mailto:dancasca@ch.tuiasi.ro), [dancasca@from.ro](mailto:dancasca@from.ro)