

# OVOCURA

Co-ordinator Professor Tadeusz Trziszka discusses the OVOCURA project; the complex studies on bioactive egg components that showed a possibility of production of nutraceuticals and biomedical preparations which help improve the quality of life

Food is the key factor guaranteeing human existence, health and quality of life. Research on the improvement of food products, including diet supplements, taking into account natural resources and searching for new innovative solutions, poses a challenge to science and technology.

The project 'Innovation Technologies of production of biopreparations based on new generation of eggs' (OVOCURA), worth €6m and, financed by the European Union within Innovation Economy Operational Programme (2007-2013), was meant to take up the challenge. It was carried out by a consortium of the Wrocław University of Environmental and Life Sciences and Wrocław Medical University in co-operation with Wrocław Technology Park and the NUTRIBIOMED Cluster. There were 233 persons involved in the project – 67 scientific staff members, 38 PhD students, 42 students and 32 technical staff members, with 54 people conducting the administrative tasks.

An attempt was made in the project to find a complex solution for the problem of the use of the biological potential of 'new generation' eggs produced, according to the project's own, special feeding and environmental programme and characterised by high pro-health qualities. Innovative technologies, such as extraction in supercritical fluids or enzymatic hydrolysis, make it possible to produce new diet supplements and biomedical preparations, which were developed in order to isolate bioactive substances from eggs.

Biomedical preparations obtained during the project, especially phospholipid preparations, biopeptides, inhibitors and mineral-organic preparations, are important nutrients, influence the process of regeneration of human body, and help in revitalisation and prevention. Preparations which may be used in the therapy of



Fig. 1 Technological line for the production of phospholipids and biopeptides



Fig. 2 The preparation of the mineral-organic from egg shells – OVOCALCIUM, in the prevention of osteoporosis

diseases of the central nervous system, including brain dementias (Alzheimer's disease), mood disorders (depression), circulatory system disorders (arteriosclerosis) and skeletal system diseases (osteoporosis) raise hopes.

**'The results obtained within the OVOCURA project give new perspectives for other projects and development of new nutraceuticals and biomedical preparations which may improve the quality of life and help in fighting civilisation diseases.'**

Substances which may be used in further clinical studies or for the production of medicines against cancer, paradontosis and dermatological disorders constitute a separate group. In this respect, research on ovocystatin and Yolkina, a newly discovered protein complex, was a significant achievement of the project.

### Examples of preparations obtained during the project Ovocystatin

Apart from the ability to inhibit sulfhydryl proteinases, ovocystatin is characterised by antimicrobiological and anti-cancer activities slows down the process of bone degradation and development of bacteria (*Porphyromonas gingivalis*) causing periodontal diseases. Cystatin, present mainly in egg white, plays a regulatory function during embryo development and, most of all, protects it from cysteine proteases of micro-organisms. Two types of cystatin, monomeric and dimeric, were separated within the research. An efficient method of stabilisation of the monomeric form of cystatin, as well as a method of its controlled dimerisation for research and for potentially therapeutical purposes, was



Fig. 3 Ovophospholipid

developed. The studies on cell lines showed that ovocystatin may be an effective factor in the fight against cancer diseases.

**Yolkina**

A new protein complex, called Yolkina, was obtained from IgY immunoglobulin of hen egg yolk for the first time. The complex is characterised by high immunostimulatory activity. Yolkina is a composition of peptides of from approximately four - 36kDa, which may be separated both in the process of highly efficient chromatography and electrophoretically as well. Their amino acid composition is characterised by a high content of acid residues and by low content of methionine. Based on the analysis of the N-terminal amino-acid sequence of seven peptides, it was observed that all of them are fragments of C-terminal of vitellogenin II.

It was proved in immunological studies that Yolkina shows an ability to induce the secretion of pro-inflammatory cytokines: TNF- $\alpha$  and IL-6, as well as anti-inflammatory cytokine IL-10 which plays a key role in inhibiting secretion of numerous mediators of inflammatory reaction, such as IFN, TNF- $\alpha$  or IL-6. The results show



Fig. 4 Egg white hydrolysate



Fig. 5 Egg yolk hydrolysate

that Yolkina is characterised by immunomodulatory activity and may play an important role in regulating immunological response. Thus, it may help in fighting brain dementias, particularly Alzheimer's disease. The method of preparation of

Yolkina is simple and may easily be adapted for large and semi-technological scales of production.

**Ovophospholipids**

It was possible to obtain 'super lecithin', rich in n-3 fatty acids, especially over 10% DHA. The preparation of super lecithin shows pro-health and nutritional qualities, is characterised by anti-stress, anti-fear and revitalisation activity, most commonly after cancer diseases and regulates blood pressure as well. A simple technology of semi-technological and semi-industrial production has been developed.

**Ovobiopeptides**

Several methods of enzymatic hydrolysis have been developed taking into account egg white and yolk proteins which make it possible to obtain bioactive peptides characterised by antimicrobial, antioxidative, chelating and ACE inhibitory activities, as well as by functional ones as food products additive.

**Ovocalcium**

A preparation characterised by highly concentrated, easily assimilated calcium obtained from egg shells. A simple method of obtaining ovocalcium has been developed. Experiments conducted on volunteers indicate a possibility to use this preparation as a diet supplement in particular in patients with osteoporosis.

**New perspectives**

The results obtained within the OVOCURA project give new perspectives for other projects and development of new nutraceuticals and biomedical preparations which may improve the quality of life and help in fighting civilisation diseases.

The team working on the project is ready to participate in new international co-operation activities.



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