UNIVERSITY OF PRESOV IN PRESOV

Completion of the Excellence Centre of Animal and Human Ecology with Emphasis on Improving the Quality of Scientific Research – Stage II

Európska únia
Európsky fond regionálneho rozvoja

Agentúra
Ministerstva školstva, vedy, výskumu a športu SR
pre štrukturálne fondy EÚ

Operačný program
VÝSKUM a VÝVOJ

„Podporujeme výskumné aktivity na Slovensku/Projekt je spolufinancovaný zo zdrojov EÚ".

Centrum excelentnosti
ekológie živočíchov a človeka

General information about the project

Project name: Completion of the Excellence Centre of Animal and Human Ecology with Emphasis on Improving the Scientific Research - Stage II

ITMS Project Code: 26220120041
Operational Programme: Research and Development
Co-financing: European Regional Development Fund (ERDF) and the State budget of the Slovak Republic
Priority axis: 2 Support to Research and Development
Measure: 2.1 Support of networks of excellence in research and development as the pillars of regional development and support to international cooperation
Tender Code: OPVaV-2009/2.1/02-SORO

Location of the project implementation: University of Presov in Presov, Faculty of Humanities and Natural Sciences, Department of Biology, ul. 17. Novembra 1, 08001 Presov, Slovakia

Grant
Charge in full: 2 776 531, 49
Total eligible expenditure: 2 773 548, 52
Non-Refundable Financial Contribution from ERDF: 2 357 516, 24
Non-Refundable Financial Contribution from SR State budget: 277 354, 85
Co-financing by University of Presov: 138 677, 43 (5 % from total eligible expenditure)

Start of the project: 02/2010
End of the project: 01/2013

Aims of the project:

- To increase quality and potential of excellent research at University of Presov in the field of animal and human ecology.
- To retrofit laboratories by top quality technology.
- To support and to further improve the conditions the realization of basic research within the Excellence Centre and to increase its contribution to society and practice.
- To increase socio-economic added value of the Excellence Centre.

Agency of the Ministry of Education, Science, Technology and Sports of Slovak republic for EU Structural Funds announced a tender with the code OPVaV/2009/2.1/02- SORO in the Operational Programme Research and Development in February 2009. Its priority is supporting the research and development, supporting the networks of excellence in research and development as pillars of regional development and promoting transregional cooperation. The aim of the Measure 2.1 is to create and support a network of excellent research, which are directly involved in the educational process, or are focused on areas of strategic importance for the further development of economy and society.

University of Presov responded to the tender announcement by submitting a project proposal. In February 2010, the demand-oriented project "Completion of the Excellence Centre of Animal and Human Ecology with emphasis on improving the scientific research - Stage II" with ITMS: 26220120041 was launched. Funds raised through the project were used for the following purposes:

- **Construction works**

In 2010, reconstruction works started with the aim to create new laboratories of the Excellence Centre (EC). The premises were rebuilt and modernized to meet the strict hygiene and labour standards essential for proper laboratory practice, as well as strict environmental and safety criteria in individual laboratories.

- **Laboratory equipment and instrumentation**

Laboratories were equipped by modern experimental infrastructure to meet advanced international standards in technological scientific equipment.

- **Improvement of staffing**

Concentration of top laboratory equipment created space for scientists, teachers, PhD students, and also undergraduate students to perform research using the equipment at the level of European and world leading research institutions.

- **Promotion of the Excellence Centre**

Excellence Centre is promoted to public via a regularly updated web page (www.unipo.sk/ceezc), promotional materials (brochures, fliers) and by the yearly open day. Lectures and seminars are organized for students of University of Presov and excursions for students of secondary and high schools.

Time frame of project implementation

Name of activity	Start of activity	End of activity
Hlavné aktivity		
1.1 Retrofitting laboratories of EC in the area of sequence analysis	02/2010	01/2013
1.2 Retrofitting EC laboratories in the area of environmental biotechnology research	02/2010	01/2013
1.3 Retrofitting EC laboratories in the area of animal biodiversity research	02/2010	01/2013
1.4 Retrofitting ICT laboratories by necessary ICT infrastructure	02/2010	01/2012
1.5 Construction works necessary to retrofit laboratories	02/2010	09/2011
2.1 Effective management of the centre, its operation and regular updating of the Research Agenda	02/2010	01/2013
2.2 Personnel management of EC and improvement of its staffing	02/2010	01/2013
2.3 Preparation of proposals for new research projects in accordance with the substantive priorities	02/2010	01/2013
3.1 Utilisation of EC research results in education	02/2011	01/2013
3.2 Dissemination of research and development results of EC for professional public	02/2010	01/2013
3.3 Networking activities and presentation of EC	02/2012	01/2013
Supporting activities		
Project management	02/2010	01/2013
Information and Publicity	02/2010	01/2013

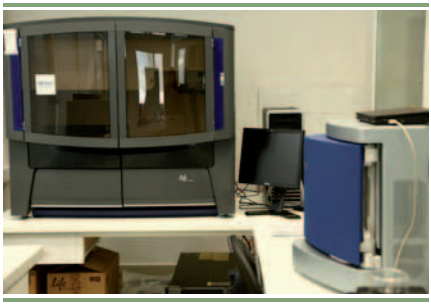
Workplaces created by the project

- Laboratory of Sequence Analyses I and II
- Laboratory of Animal Biodiversity Research
- Laboratory of Environmental Technologies I and II

Laboratory of Sequence Analyses I and II

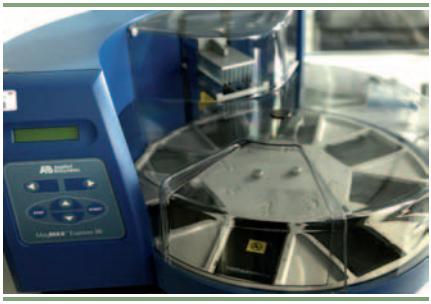
Laboratories of Sequence Analyses I and II serve for the high-throughput genetic analyses of different kinds of biological material at the world level. Above all, they enable extension of molecular-genetic and cytogenetic studies having the priority goals such as monitoring health status of inhabitants, screening of selected genetically conditioned diseases, and identification of interpopulation differences in mutation frequencies in a relationship with prevalence of congenital diseases and environmental load. The complex diseases such as obesity, diabetes mellitus, cardio-vascular, and autoimmune diseases are influenced by a lot of environmental and genetic factors. The modern methods of genetic analysis enable us to test a great amount of specific genes influencing pathophysiology of complex diseases. The whole genomic sequencing is the most modern strategy for revealing the predisposing genes. Laboratories of Sequence Analyses have one of the most progressive instruments in the field of DNA sequencing – the sequencer of next generation SOLID 5500xl at their disposal. This equipment is based on the principle of so-called "parallel massive sequencing", revolutionary technology that enables to sequence short parts of DNA in a huge number, and in comparison with the traditional method, it increases the capacity of sequencing from kb to Gb. Thanks to this technology it is possible to analyse large genomes (including human genome) in relatively short time and with high accuracy (99.99%). Besides identification and association analysis of candidate genes of complex and rare diseases, the apparatus enables e.g. determination of microorganisms on the basis of DNA sequence, detection of genetic diversity within the species and among genetically related species, whole transcriptome screening, or analysis of overall gene expression. Instruments improving the quality of analysis not only at the molecular level, but also at the cytogenetic one are also part of the instrumental portfolio of laboratories.

Regarding the fact that the laboratory has processed a great number of samples, it was inevitable to create reference bio-bank of anonymous DNA samples, and database of genetic data of populations of the Eastern Slovakia, including minorities. The bio-bank and its databases facilitate the higher degree of availability, suitability, and exchange of samples for scientific studies. They are necessary for the study and validation of the relationship of genes to specific diseases.

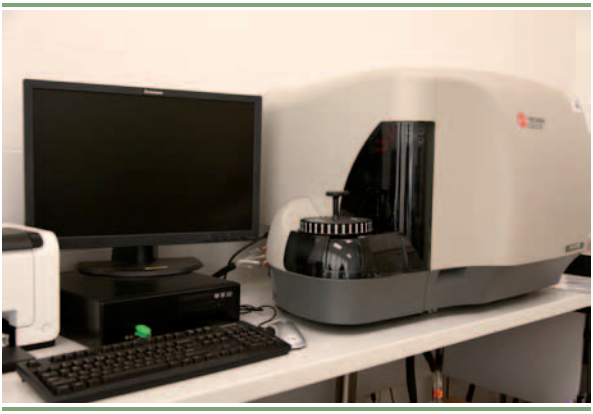


Solid 5500xl DNA sequencing system – a sequencer of new generation and its accessories. This technology enables carrying out the complete process of high-performance parallel massive sequencing that includes sample preparation, determination of the bases in individual fragments and subsequent arrangement of sequences obtained from these fragments using the modern software equipment.

OpenArray Real-Time PCR – the genotyping system for the high-throughput genotyping is used for SNP determination and expression analyses using technologies of nanoliter fluidic on the basis of real-time PCR.



MagMax Express RNA isolation station – fully automated high-throughput robotic system enabling extraction of RNA also from body fluids and non-cellular samples using the technologies of magnetic particles and sample preparation for subsequent molecular analyses.



Flow cytometer NAVIOS – the instrument for analysis of suspension of cells enables e.g. typing of cell sub-populations, analysis of cell cycle, or determination of immuno-phenotyping characteristics of cells.

Fluorescent microscope DM4000 – fully automated microscope with motorized parts for cytogenetic analysis, also suitable for FISH, mFISH, and CGH analyses. Device for evaluation of karyotypes and FISH analysis with digital camera.is a part of the instrument.

Laboratory of Animal Biodiversity Research

Activities of the laboratory have a direct relation to using laboratory instrumental eqiuipment from the first phase of creation of the EC, with emphasis on the determination of inter-species diversity of animals and determination of animals at the level of species. Evaluation of the relationship of ichthyocenoses to diversity of the environmental parameters, to diversity of main food components, and to the numerosity of predators as factors limiting population of species represents an important step to understanding the distribution of individual kinds of ichthyofauna.

River ecosystems create a mosaic of habitats that determine species and intraspecies diversity of biocenoses. The detail analysis of qualitative structure and quantitative representation of habitats is a starting point at cognition of ecological valence of individual species of aquatic organisms.

The top instrumental technique focused on molecular biology is used at realisation of the laboratory activities. In addition, the laboratory is equipped with technique aimed at analyses of the environmental factors, determination of aquatic animals, and other analyses relating to biodiversity and ecology of aquatic organisms. Turbidimeter, multiparameter analyser, spectrophotometer, pH meter, oximeter, hydrometric wing, and compact analyser provide detail information about the physical and chemical factors of the aquatic environment on the basis of colorimetric, titrating and, above all, the latest spectrophotometric methods. Trinocular microscope and stereomicroscope complete the laboratory equipment as the modern optical instruments, based upon the latest technologies with automation, high magnification in combination with maximal depth of sharpness and ultra-high resolving power. They are equipped with camera systems, visualisation and software for measurements and analyses serving for determination of organisms, biometric and eco-morphological analyses, food spectrum analyses, or determination of the growth and production of organisms.

Fully automated **stereomicroscope** with motor sharpening; smooth zoom; guaranteeing high resolving power and high depth of sharpness (details of structures from 476 nm) camera and application software.

Microscope DM4000B TL with accessories for light field, phase contrast and dark field, with super wide visual field (25 F.N.), fluorite lens (magnification 5x, 10x, 20x, 40x, 100x), FireWire camera and control software, possibility of function programming, automated light and contrast manager, automated motor head of condenser.

Analyser – UV-VIS spectrophotometer has the range to 110 nm. It can measure classical, time, kinetic and quantitative spectra, and at the same time, also fast and easy quantification of DNA, proteins, etc.

Microprocessor pH meter – enables the measurement of pH, temperature and voltage. It has resistant membrane keyboard, manual/automatic temperature compensation, multicalibration system for automatic or manual calibration and memory to store in the measured values

The given instruments and technique contribute also to the improvement of teaching, because they are used at the study, verifying and applying new methodological procedures by students, PhD students and research workers.

Laboratory of Environmental Technologies I and II

Contamination of air, soil and water by xenobiotics is a long-term, significant, and complex environmental problem. These substances are also known as foreign substances, risk substances, or pollutants. Their monitoring in the environment is the first precondition for prevention of their spreading and improvement of the present state.

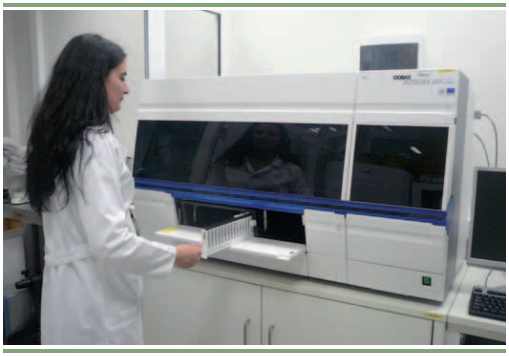
The wide spectrum of negative effects of foreign substances forces us to pursue possibilities of effective decontamination of the environment and revitalisation of polluted substrates. One of them is using plant capability to intake, cumulate and bio-transform toxic metallic ions, and so to vitalise and regenerate the contaminated environment. This situation stimulates us to develop the research of the given field.

The cellular organisation of live organisms enables various biochemical reactions that run in the specific space of individual cellular organelles and cytoplasm. Recently, there has been a rapid development of non-invasive techniques of measurement of biological material, along with the development of sensitive and specific biochemical markers. Concentrations of these markers can be observed in the body fluids (blood, urine, liquor) using invasive techniques.

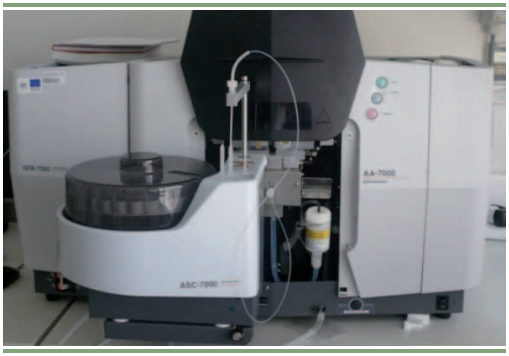
Biochemical markers are early-warning signals reflecting the response of the animal and human organisms to stressors (natural toxins, substances of anthropogenic origin, and physical changes). Laboratory examinations give information on the physiological processes and metabolic status of animal and human organisms.

Laboratory is equipped with the top instrumental technology. This equipment serves for monitoring and screening of the health of animals and humans, determination of xenobiotics contents (toxic metals, essential macro- and micro-elements) in soil, plant and animal material, and enables the use of phytoremedies as a way of using plants for decontamination of the polluted environment and improvement of human and animal health (method of environmental biotechnologies).

Fully Automatic Immunochemistry Analyzer COBAS e411 is an instrument designated for the in vitro qualitative and quantitative heterogeneous immunoanalysis of wide variety of tests (metabolic markers, cardiac markers, tumor markers, more than 60 parameters for the diagnosis of anemia, bone metabolism, hormones, and infectious diseases). This instrument is based on the technology of electrochemiluminescence (ECLIA).



Combined Clinical Biochemistry Analyzer COBAS INTEGRA 400 is a fully automated bio-clinical analyser with more than 150 applications. It allows determination of enzymes, proteins, electrolytes, substrates, active substances, and drugs in wide measuring ranges. Different kinds of materials such as serum, plasma or urine are measured by following measuring technologies: absorption photometry, turbidimetry, fluorescence polarization, and ion-selective potentiometry.



Atomic Absorption Spectrophometer (AAS) is a fully automated instrument used for analysing the contents, primarily of heavy metals /Cd, Pb, Cr, Ni, Hg, Cu, Fe/, as well as other elements/Al, As, Co, Mn, P, Sb, etc./ in soil, plants, livestock products and foodstuff. This instrument allows determination of maximum allowable values (Ministry of Health of the Slovak Republic, European Union regulations) of contaminants in listed organisms, soils and products. In phytoremediations, the techniques used for plant decontamination (recovery, regeneration) of the environmental pollution, this instrument is used for determination of the content of heavy metals as well as other elements (e.g. Au).

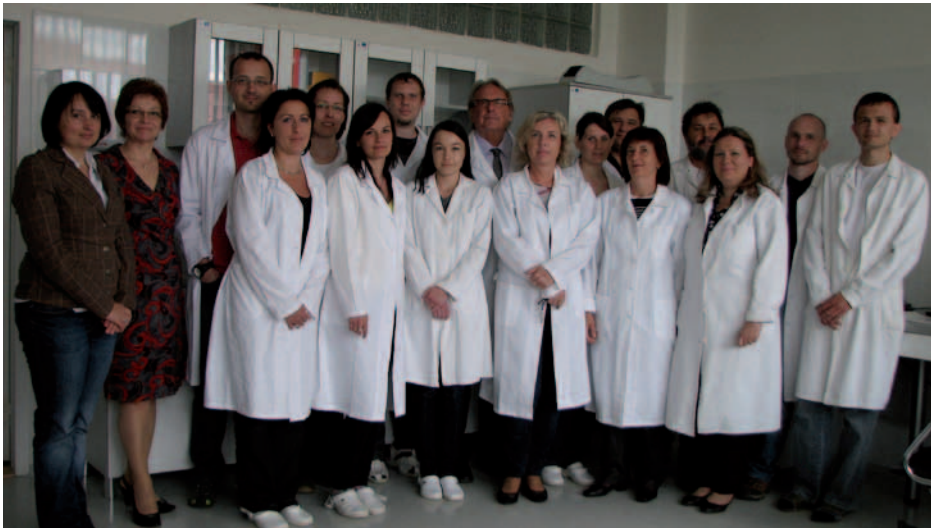
Phytochambers (phytotron for the growth of plants) is a cultivation appliance used for controlled plant cultivation, cultivation of callus cultures and microbiological cultures.

Research and implementation team

Director of the Excellence Centre:
prof. RNDr. Ivan Bernasovský, DrSc. (ivan.bernasovsky@unipo.sk)

Research team:
prof. RNDr. Jarmila Bernasovská, PhD. (jarmila.bernasovska@unipo.sk)
doc. RNDr. Iveta Boroňová, PhD. (iveta.boronova@unipo.sk)
doc. PaedDr. Ján Koščo, PhD. (jan.kosco@unipo.sk)
doc. MVDr. Janka Poráčová, PhD. (janka.poracova@unipo.sk)
doc. RNDr. Ivan Šalamon, CSc. (ivan.salamon@unipo.sk)
RNDr. Alexandra Bôžiková, PhD. (ivan.salamon@unipo.sk)
RNDr. Dana Gabriková, PhD. (dana.gabrikova@unipo.sk
RNDr. Martin Kello, PhD. (martin.kello@unipo.sk)
RNDr. Lucia Kuliková, PhD. (lucia.kulikova@unipo.sk)
MVDr. Soňa Mačeková, PhD. (sona.macekova@unipo.sk)
Mgr. Peter Manko, PhD. (peter.manko@unipo.sk)
Mgr. Marta Blaščáková, PhD. (marta.blascakova@unipo.sk)
Mgr. Jana Čarnogurská (jana.carnogurska@unipo.sk
RNDr. Pavol Labun, PhD. (pavol.labun@unipo.sk)
Mgr. Ján Ševc, PhD. (jansevc@gmail.com)

Implementation team:
Project manager and publicity manager: **Ing. Emília Martinková** (martinkova@unipo.sk)
Monitoring manager and Publicity and information manager:
PaedDr. Mária Berezovská (maria.berezovska@unipo.sk)
Financial manager: **Mgr. Jana Zábavová** (jana.zabavova@unipo.sk)
Accountant: **Mgr. Iveta Juneková** (iveta.junekova@unipo.sk)
Economist: **Ing. Anna Hanesová** (anna.hanesova@unipo.sk)
Worker for public procurement: **Ing. Jana Halajková** (jana.halajkova@unipo.sk)
Manager of construction works: **Ing. Karol Gabanyi** (karol.gabanyi@unipo.sk)
ICT manager: **Ing.Miroslav Ganaj** (miroslav.ganaj@unipo.sk)



Implementation team of the project Completion of the Excellence Centre of Animal and Human Ecology with Emphasis on Improving the Quality of Scientific Research – Stage II

Second row: (from left) PaedDr. M. Berezovská, Ing. E. Martinková, RNDr. P. Labun, RNDr. L. Kuliková, PhD., RNDr. M. Kello, PhD., prof. RNDr. I. Bernasovský, DrSc., RNDr. D. Gabriková, PhD., doc. RNDr. I. Šalamon, CSc., doc. PaedDr. J. Koščo, PhD., Mgr. P. Manko, PhD., Mgr. J. Ševc,

First row: MVDr. S. Mačeková, PhD., RNDr. J. Čarnogurská, RNDr. A. Bôžiková, PhD., prof. RNDr. J. Bernasovská, PhD., doc. MVDr. J. Poráčová, PhD., doc. RNDr. I. Boroňová, PhD.,

The most important publications of the Excellence Centre in years 2010-2012

Scientific papers in international scientific journals listed in Current Contents

Koščo J., Košuthová L., Košúth P., Pekárik L. (2010): Non-native fish species in Slovak waters: origins and present status. *Biologia.* 65(6):1057-1063

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Stancheva I., Geneva M., Hristozková M., Markovská Y., Šalamon I. (2010): Antioxidant capacity of sage grown on heavy metal-polluted soil. *Russian Journal of Plant Physiology.* 57(6):799-805

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Bôžiková A., Gabriková D., Sovičová A., Behulová R., Mačeková S., Boroňová I. Petrejčíková E., Soták M., Bernasovská J., Bernasovský I. (2012): The frequency of factor V Leiden and prothrombin G20210A mutations in Slovak and Roma (Gypsy) ethnic group of Eastern Slovakia. *Journal of Thrombosis and Thrombolysis.* 34(3):406-9

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Mačeková S., Bernasovský I., Gabriková D., Bôžiková A., Bernasovská J., Boroňová I., Behulová R., Švičková P., Petrejčíková E., Soták M., Sovičová A., Čarnogurská J. (2012): Association of the FTO rs9939609 polymorphism with obesity in Roma/Gypsy population. *American Journal of Physical Anthropology.* 147(1):30-34

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Bernasovská J., Boroňová I., Bernasovský I. (2011): A study of the Huntington`s disease associated trinucleotide repeat in Slovak population. *European Journal of Human Genetics.* 19(suppl.2):413

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Blaščaková M., Poráčová J., Smik R., Tomková Z., Franková L., Takacsová-Sopková M. (2011): The concentration of vitamin D3 in relationship to bone mineral density of postmenopausal women in the region of East Slovakia. *Clinical Chemistry and Laboratory Medicine.* 49(suppl.1):817

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Blaščaková M., Poráčová J. (2011): Interrelations between body weight, height, smoking, BMI and bone mineral density in postmenopausal osteoporotic Slovak women. *Osteophorosis Interanational.* 22(Suppl.1):399

Kachlik P., Poráčová J., Havelková M., Zahatňanská M., Kimáková T. (2011): A survey into basic school pupil lifestyle. *Epidemiology.* 22(suppl.1):229

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Labun P., Šalamon I., Mariychuk R., Fejér J. (2011): Isolation of antocyanins with identified qualitative-quantitative properties. *Planta Medica.* 77(12):1339

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Poráčová J., Kimáková T., Blaščáková M., Muchaničová A. (2011): The importance of Anthocyanins for human and animal health. *Planta Medica.* 77(12):1447

Poráčová J., Blaščáková M., Takacsová-Sopková M. (2011): The occurrence of thyroid dysfunction in the region of East Slovakia. *Clinical Chemistry and Laboratory Medicine.* 49(suppl.1):438.

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Mačeková S., Bernasovská J., Čarnogurská J., Boroňová I., Bôžiková A., Gabriková D. (2012): Association of the FTO variant with obesity in two ethnic groups in Slovakia. *European Journal of Human Genetics.* 20(suppl.1):238

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Excellence Centre of Animal and Human Ecology
Ul. 17 Novembra 1
081 16 Presov
Slovakia

Tel.: +421 51 7570 608, +421 51 7570 602

Web: www.unipo.sk/ceezc