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Expression of interest

of Advanced Environmental Research Laboratories, West University of Timisoara to join a Consortium on HORIZON EUROPE calls 2023-2024 CLUSTER 6 (CL6)

Topic ID for cooperation:

HORIZON-CL6-2024-ZERO POLLUTION-02-2: Innovative technologies for zero pollution, zero-waste biorefineries

Organization details:

Country: Romania

Name of the organization: Advanced Environmental Research Laboratories; West University of Timisoara.

Link webpage of the organization: <http://www.elearning-chemistry.ro/lcam1/>

Contact person short description and contact details: Lect. Dr. Gheorghita MENGHIU, Department of Biology-Chemistry, Faculty of Chemistry, Biology, Geography and Advanced Environmental Research Laboratories, West University of Timisoara, Oituz 4A, Timisoara 300086, Romania, Phone: +40724990916, E-mail: gheorghita.menghiu@e-uvt.ro

Lect. Dr. Gheorghita MENGHIU has vast experience in molecular biology techniques, DNA and protein engineering, biochemistry and biotechnology methods.

Short description of the organization

As a research center of West University of Timisoara, the main activity at Advanced Environmental Research Laboratories (AERL) was and is scientific research. The group of those carrying out research activities in AERL comprising researchers and professors. A number of 14 research projects have been implemented in the last few years. One of the main relevant research implemented projects is *ROmania Serbia NETWORK for assessing and disseminating the impact of copper mining activities on water quality in the cross-border area: Remediation solutions*. The implementation of these research projects led to the purchase of several state-of-the-art equipments, which are actively used in current researches. Within these projects, international collaborations were developed with universities and research institutes from Serbia, Switzerland, Estonia, Norway, Greece. Advanced Environmental Research Laboratories is involved in research experience exchanges, internships, Erasmus scholarships, academic visits with partner institutions from Germany, Spain, Portugal, Azerbaijan, Italy, Irak.

Incl. cooperation with other research, industry, business etc., profile of the main researchers, previous research projects related to the topic (last 3 years)

Possible main contributions of organization to the project proposal

- Work Packages leader: Lect. Dr. Gheorghita MENGHIU

Often, water in rivers is contaminated with heavy metals due to industrial, agricultural activities, and mining industries developed in certain areas of a country. Drinking or cooking water contaminated with various metals becomes a serious problem for the health of people and animals, especially in areas where industrial waste drains in surface water and underground water. The aim of this research is to use recombinant metalloproteins for bioremediation of heavy metal polluted waters, using protein engineering and molecular biology techniques. This research proposal is based on the development of recombinant metalloproteins and metallopeptides that can bind over 20 ions per protein/peptide of several heavy metals as copper, lead, cadmium, arsenic, and other heavy metals.

The first step in this research is bioinformatics analysis of the amino acids that are involved in binding a metal ion, and repetitive simulations of a peptide or protein site that can bind more than 20 metal ions. After the establishing of the proper amino acid sequences, based on these, compatible genetic sequences will be created. The DNA sequences will be integrated into different plasmids which will be further electrotransformed in several microbial strains, such that metallopeptides be produced by the cells. The next steps are extraction, purification, biochemical characterization of the metallopeptides obtained, and their metal ions binding capacity.

In line with the European Green Deal's zero pollution ambition, the development of new recombinant metallopeptides or metalloproteins involved in the binding of a high number of heavy metal ions could be a very important chance in bioremediation of heavy metals polluted waters as well as collecting of different metals from water in order to be reused.

Specific expertise relevant to the call topic

Expertise of the research team:

Each member of the research team has relevant experience in the field: development of recombinant proteins starting from DNA sequences, designing of proteins with improved properties using directed evolution of proteins, production of recombinant proteins in different microbial strains, protein purifications, biochemical characterization of enzymes, analysis of heavy metals in different water samples using inductively coupled plasma optical emission spectroscopy, microbial and ecotoxicological analyses, bioaccumulation analyzes of heavy metals in various microorganisms, molecular design.

Relevant publications to the call topic:

1. Constantina Bianca Vulpe, Mariana Adina Matica, Renata Kovačević, Daniela Dascalu, Zoran Stevanovic, Adriana Isvoran, Vasile Ostafe, Gheorghita Menghiu, *Copper accumulation efficiency in different recombinant microorganism strains available for bioremediation of heavy metal-polluted waters*, International Journal of Molecular Sciences, 2023, 24(8):7575.
2. Zoran Stevanovic, Renata Kovacevic, Radmila Markovic, Vojka Gardic, Bianca Constantina Vulpe, Bianca Boros, Gheorghita Menghiu, *State of the surface waters in cross border region of eastern Serbia and Caras Severin county – Moldova Noua in Romania*, Studia UBB Chemia, 2021, 66(4), pp 309-328.
3. Gheorghita Menghiu, Vasile Ostafe, Radivoje Prodanovic, Rainer Fischer, Raluca Ostafe, *A high-throughput screening system based on fluorescence-activated cell sorting for the directed evolution of chitinase A*, International Journal of Molecular Sciences, 2021,22(6): p. 3041.

4. Gheorghita Menghiu, Vasile Ostafe, Radivoje Prodanovic, Rainer Fischer, Raluca Ostafe, *Biochemical characterization of chitinase A from Bacillus licheniformis DSM8785 expressed in Pichia pastoris KM71H*, Protein Expression and Purification, 2019, 154, pp 25-32;

Relevant research projects implemented at AERL

1. RoS-NET2 Project *ROmania Serbia NETwork for assessing and disseminating the impact of copper mining activities on water quality in the cross-border area: Remediation solutions.*
2. ERA-NET Project *Biological tools implementation for new wound healing applications of by products from the crustacean sea food processing industry.*
3. ERA-NET Project *Polymeric NanoBioMaterials for drug delivery: developing and implementation of safe-by-design concept enabling safe health care solutions.*

Infrastructure of AERL

The research center Advanced Environmental Research Laboratories has molecular biology, microbiology, biochemistry and bioinformatics laboratories and is well equipped with state-of-the-art equipment as follows: electroporation equipment for DNA electrotransformation in microbial cells, nucleic acids and proteins electrophoresis systems, for their separation based on their molecular size, Biotek Lionheart automated microscope for analyze live microbial cell assays over time, bioreactors for continuous expression of proteins in microbial cells under controlled conditions, high and ultra-high performance liquid chromatographs for recombinant proteins and peptides purification, Biotek Synergy H1 multimode reader (ultraviolet-visible absorbance, fluorescent, and luminescent measurements) for biochemical characterization of new recombinant proteins (peptides and enzymes).

Please specify all points that you bring as a significant contribution / value to the topic. For example, team, expertise (publications, previous projects, patents, etc), infrastructure, networks, knowledge, data, technologies, etc.

Please contact Gheorghita MENGHIU (gheorghita.menghiu@e-uvv.ro), for more information.