



The Institute of Veterinary Medicine and Animal Sciences of the Estonian University of Life Sciences (Eesti Maaülikool) (emu.ee/en/studies/doctoral-school/) opens a **PhD position** in the field of

“Purification and characterisation of extracellular vesicles: a novel approach for valorisation of fruit and vegetable wastes”.

Project description

Extracellular vesicles (EV) are membrane bound nano-scale particles found in all biological fluids. EVs are used in inter-cellular, inter-species and even in inter-kingdom level communications. EVs exist in animals and plants. Plant based EVs can potentially be a good source of food additives or pharmaceuticals.

Huge volumes of food industrial wastes and/or by-products are generated (mainly from fruits and vegetables) every year around the world. The wastes not only creates safe disposal issues, but also contributes negatively for the environment, especially when they go as landfills, or if left untreated for long time or if burnt. These wastes have created a significant carbon and blue water hotspot footprints, specifically in the industrialized regions.

Majority of the fruits and vegetables wastes/by-products represents a potential source of valuable phytochemicals/bioactive compounds and bioactive ingredients, which can be tapped for use as a natural additive in food, cosmeceuticals and/or in pharmaceutical applications. In this regard, tapping the potential of agri-food wastes and by-products can be a cost-effective source for mass production of EVs.

COMBIVET (combivet.emu.ee) and VALORTECH (emu.ee/en/research/project-valortech/) are two prestigious ERA Chair programs awarded to Estonian University of Life Sciences (EMU) by the EU commission. The current PhD project will utilise expertise and knowledge in these two programs, and test the hypothesis that **food and vegetable wastes have functional EVs capable of affecting mammalian tissue and cells function.**

The main objectives of this PhD project are:

1. Develop and adapt current methodologies for purification and characterisation of plant based EVs to food and vegetable wastes.
2. Identify the best source of locally generated wastes for production of plant-based EVs.

3. To investigate, the effects of the plant-based EVs on mammalian cells that can make them beneficial as potential food additives, cosmetics or pharmaceutical applications.

Required qualification: Master's degree in Medical Biology or Physiology or Molecular Biology or a related field. Experience in working with extracellular vesicles, cell culture and molecular biology technologies will be advantageous.

Required language skills: Good level of English: Recent TOEFL Certificate (only internet-based test scores are accepted, with the minimum score being 61); Recent IELTS Certificate (minimum score: 5.0); Recent First Certificate in English of the University of Cambridge; Recent PTE academic (minimum score 51); or An official certificate from the higher educational establishment if the medium of instruction was English during the whole period of studies.

Application documents: CV (Curriculum Vitae), copy of the Master's degree certificate, and motivation letter in free format. See complete list at emu.ee/en/admissions/doctoral-studies/admission-requirements/

Funding Notes: The PhD position is for a 4-year period. The expenses will be paid from both COMBIVET (No 857418) and VALORTECH (No 810630) ERA Chair projects. State funding is foreseen for the student's stipend.

The PhD student will be part of COMBIVET ERA Chair (combivet.emu.ee) and VALORTECH ERA Chair team (emu.ee/en/research/project-valortech/).

Application deadline: 31.05.21

Application web page: <https://estonia.dreamapply.com/>

Enquiries email: combivet@emu.ee

Existing research resources

In the last few years, the main supervisor (Professor Alireza Fazeli) research group have developed and optimized different methodologies for EV isolation and their characterization in terms of size, colloidal stability, morphology, surface proteome and molecular cargo [1-4]. The Fazeli group are actively involved in science dissemination for general public. They have so far organised three research schools entitled "**Basics of working with EVs**", teaching over hundred young researchers and investigators from all over the globe.

The co-supervisor's (Professor Rajeev Bhat) research group focuses mainly on valorisation of food industrial wastes and by-products. The expertise lays in identifying bioactive compounds, their bioactivity and finding potential applications in food, cosmetics or pharmaceutical applications. The research and innovation activities of the group includes optimisation of processing technologies of various food industrial wastes and by-products and converting the wastes and by-products into high value added functional ingredients.

COMBIVET Research Group

Formed under the ERA Chair of Comparative Medicine, the COMBIVET Research Group is investigating the health challenges faced by both humans and animals. The research performed by the COMBIVET group aims to propel the Estonian University of Life Science as a leading European research organization in the field of comparative medicine.

COMBIVET ERA Chair project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857418.

VALORTECH Research Group

VALORTECH ERA Chair holds a broader vision related to develop into a leading centre of excellence in development of advanced technologies for minimum waste, maximum utilisation and valorisation of various raw materials and components used in food and non-food value chains.

VALORTECH ERA Chair has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 810630.

More information on the group can be checked here (emu.ee/en/research/project-valortech/team/).

Institute of Veterinary Medicine and Animal Science (vl.emu.ee/en)

The Institute of Veterinary Medicine and Animal Sciences performs high-level modern teaching and R&D activities in the field of veterinary medicine, aquaculture, animal nutrition and production. Research involves almost all aspects of the "from farm to fork" production and processing chain of animal products.

Estonian University of Life Sciences (www.emu.ee/en)

Estonian University of Life Sciences is the only university in Estonia whose priorities in academic and research activities provide the sustainable development of natural resources as well as the preservation of heritage and habitat. According to QS World University Rankings by subject, the Estonian University of Life Sciences is one of top 50 universities in the world in the field of agriculture and forestry.

City of Tartu (visittartu.com)

Tartu, the City of Good Thoughts, is preponderantly a city of students and intellectuals. Tartu is the second largest city in Estonia, with around 100,000 inhabitants. It is very open to creative work and scientific culture, and always interesting events take place in the city.

ESTONIA (visitestonia.com/en/)

Estonia is located on the Baltic Sea shore, at the crossroads of Northern, Western and Eastern Europe. Since 2004 Estonia belongs to the European Union. Estonia attracts the visitors with its clean environment, diverse culture and excellent food. The landscape is covered with mires and bogs, fields and forests, limestone barrens and coastlines. Estonia has the largest collection of folk songs in the world. Music festivals and sports events connect culture and sports lovers from all over the world. Although Estonia may be the smallest of all Baltic countries, it more than makes up for this in different attractions.

References:

- [1] Dissanayake K, Godakumara K, Fazeli A. Isolation of Extracellular Vesicles (EVs) Using Size-Exclusion High-Performance Liquid Chromatography (SE-HPLC). *Methods Mol Biol* 2021; 2273:189–200.
- [2] Dissanayake K, Midekessa G, Lättekivi F, Fazeli A. Measurement of the Size and Concentration and Zeta Potential of Extracellular Vesicles Using Nanoparticle Tracking Analyzer. *Methods Mol Biol* 2021; 2273:207–218.
- [3] Reshi QUA, Hasan MM, Dissanayake K, Fazeli A. Isolation of Extracellular Vesicles (EVs) Using Benchtop Size Exclusion Chromatography (SEC) Columns. *Methods Mol Biol* 2021; 2273:201–206.
- [4] Midekessa G, Godakumara K, Ord J, Viil J, Lättekivi F, Dissanayake K, Kopanchuk S, Rincken A, Andronowska A, Bhattacharjee S, Rincken T, Fazeli A. Zeta Potential of Extracellular Vesicles: Toward Understanding the Attributes that Determine Colloidal Stability. *ACS Omega* 2020; 5:16701–1671

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