



"BSUN Master Courses on Blue Growth: Microbiology and Genetic Engineering"

Date: April 7th and 8th, 2021

Venue: Online

April 7th, 2021 (10:00 - 12:00 CET / GMT +2)

Introduction to the BSUN Master Courses on Blue Growth – Prof. Eden Mamut, PhD, BSUN Secretary General

The EU Blue School initiative – Evy Copejans, Project Manager, EMSEA

Course on *"Marine Microbiology and Human Health"* – Dr. Anca Cristina Lepadatu, ``Ovidius`` University of Constanta

April 8th, 2021 (10:00 - 12:00 CET / GMT +2)

Course on *"CRISPR-Cas Technology - history, mechanism and applications in microalgae"* – Prof. John van der Oost, PhD and Mihris Naduthodi, Wageningen University & Research

Moderated discussion

Moderator – Prof. Carmen Chifiriuc, PhD, University of Bucharest

CRISPR (which is an acronym for **Clustered Regularly Interspaced Short Palindromic Repeats**) is a family of DNA sequences found in the genomes of prokaryotic organisms such as bacteria and archaea. These sequences are derived from DNA fragments of bacteriophages that had previously infected the prokaryote. They are used to detect and destroy DNA from similar bacteriophages during subsequent infections. Cas9 (or "CRISPR-associated protein 9") is an enzyme that uses CRISPR sequences as a guide to recognize and cleave specific strands of DNA that are complementary to the CRISPR sequence. Cas9 enzymes together with CRISPR sequences form the basis of a technology known as CRISPR-Cas9 that can be used to edit genes within organisms.

Microalgae are photoautotrophic organisms that are capable of fixing inorganic carbon from carbon dioxide present in the atmosphere or dissolved in the inland or ocean waters, using sunlight as the sole energy source to produce valuable compounds.

The development of efficient genome editing tools has tremendous potential in many areas related to blue growth including the further exploitation of algae as “solar powered cell factories”.

To this end, the team from the Wageningen University & Research developed various genome editing tools based on CRISPR-Cas9 and Cas12a to effectively generate precise-targeted mutants in microalgae *Nannochloropsis oceanica*.

Lecturers:

Prof. John van der Oost - Microbiologist, Ph.D., Professor at Wageningen University & Research, with a broad experience in scientific research at Helsinki University, European Molecular Biology Laboratory (Heidelberg, Germany), Free University of Amsterdam and in many other Universities. Prof. Van der Oost is considered the pioneer of the "CRISPR revolution" for his fundamental work on unraveling the

mechanism of CRISPR-based immunity in bacteria, paving the way for developing CRISPR mediated genome editing. The team led by Prof. Van der Oost demonstrated the first example of programmable gene editing, subsequently developed for the CRISPR-Cas 9 system that has been further used by many research groups for applications ranging from fundamental protein research to revolutionary treatments for diseases. The CRISPR-Cas research is considered one the most significant breakthroughs in the history of biology.

Anca Cristina Lepadatu - Biologist, Ph.D., Lecturer at “Ovidius” University of Constanța, Faculty of Natural and Agricultural Sciences, Department of Natural Sciences, Ph.D. thesis „Enterobacteriaceae strains with multiple antibiotic resistance isolated from Black Sea coast”; Main Fields of Interest: Microbiology, Microbial Genetics, Health. Research experience on various aspects of microbial genetics, from basic biology of bacteria and classical microbiology to recombinant DNA technology, regulation of gene action and genetic recombination of medically important bacteria.

Mihris Naduthodi – Biologist, PhD Student, he graduated his bachelor studies in Biotechnology and Biochemical Engineering from Sree Chitra Thirunal College of Engineering, Kerala University, India and MSc degree in Cellular and Molecular Biotechnology at Wageningen University. He worked on Metabolic engineering of thermophilic bacteria *bacillus smithii*. At present, he is a PhD student under the supervision of Prof. John van der Oost and Dr. Maria Barbosa. His present research focus on developing CRISPR-Cas based genome editing tools for microalgae.