Curso intensivo de Espectroscopía de Masas (MS) y Metabolómica aplicada

Advanced Techniques in Systems Biology and OMICS Research

Profesor invitado: Vladimir Shulaev, North Texas University

https://biology.unt.edu/people/vladimir-shulaev.html

https://scholar.google.es/citations?user=Tk2k_5UAAAAJ&hl=es

https://research.com/u/vladimir-shulaev

Las clases/sesiones con el Prof. Shulaev serán en inglés.

Curso realizado en conjunto entre:

- University of North Texas
- Universidad de Talca
- Universidad de Magallanes
- CHIC (Cape Horn International Center)
- Dirección de Relaciones Internacionales / American Academy UTalca
- Dirección de Postgrado; Universidad de Talca

Advanced Techniques in Systems Biology and OMICS Research

Instructor: Dr. Vladimir Shulaev (shulaev@unt.edu)

Course Description: This course is designed to teach the basic principles and techniques of OMICS (transcriptomics, proteomics, metabolomics, and bioinformatics) research, system biology, and functional genetics, as well as grant writing. Subjects covered will include different microarray and GeneChip platforms, proteomics, metabolomics (LC- and GC-MS), transcriptomics (RNAseq), NextGen whole genome shotgun sequencing, mutant analysis, bioinformatics, and systems biology. In addition to the lectures, each student (or a team of 2-4 students, depending on class size) will be required to present a talk about a selected project and write a proposal (project) on a given subject. For this purpose, the student(s) will choose a subject and upon approval by the instructor will write the project proposal (5 pages minimum) and present the subject to the class. The subject will then be discussed by the entire class with respect to its importance, the validity of the scientific questions presented, the best experimental design(s) to be used, and the strategy of writing the grant. The student(s) project will be graded on its quality. There will be no written exam.

Required Text: There is no required textbook for this course. Each week the students will be given one or more research papers to read. PDF of these, as well as PowerPoint and PDF files of the lectures.

Course Objectives and Goals: The goal of this course is to prepare the student for the advanced and complex landscape of today's cutting-edge research in biology. Understanding the principles, methods and uses of the newest OMICS techniques and systems biology will contribute greatly to the student's future in academy and industry.

Tentative Lecture Schedule and Course Requirements: The tentative lecture schedule is given below. If and when there are changes, announcements will be made in class. Attendance is necessary to gain the understanding and knowledge to do well on the course assignment. Students should read the appropriate material provided on BEFORE the lecture.

Grading: Grading in the course will be based on the final version of the proposal written by the student(s). The student(s) are encouraged to consult the instructors at different stages of the proposal writing process. The proposal should include abstract, objectives, research strategy, rational, and expected outcome.

Notes: Students interrupting class by talking, being disruptive or using cell phones or ipods will be asked to leave the classroom.

Attendance: Students must attend all classes. Classes can only be missed with prior approval or documented emergency/illness (Doctor or ER note).

Descripción de contenidos y cronograma del curso

Inicio: 10 de Marzo de 2025

Finalización: 2 de Abril de 2025

Inscripciones: Hasta el jueves 06 de marzo de 2025

Se entregará constancias de participación a los inscritos que cumplan l os requisitos del Curso Electivo, según Syllabus.

Conferencias y Talleres invitados:

- **Prof. Andy Pérez, Facultad de Farmacia, Universidad de Concepción**
  Department of Instrumental Analysis, Faculty of Pharmacy, University of Concepcion, Chile aperezd@udec.cl / www.udec.cl
- **Dr. Felipe Jiménez-Aspee, Department of Food Biofunctionality, Institute of Nutritional Sciences, University of Hohenheim, D-70599, Stuttgart, Germany**
  Cómo trabajar con archivos de HPLC-DAD-MS/MS. Experiencias y recomendaciones de usuarios.
- **Dr. Alberto Burgos, Facultad de Ciencias Químicas, Universidad Nacional de Asunción, Paraguay.**

- **Dra. Nélida Nina, Universidad Mayor de San Andrés, Bolivia**

  Monday/Lunes, March 10
  09:00-10:00
  Sesión de apertura y palabras de bienvenida a los participantes

- **Dr. Joel Alderete, Director, Instituto de Química de Recursos Naturales, UTalca**
- **Dra. Margarita Gutiérrez, Director, Programa de Doctorado en Ciencias, mención IDPB, UTalca**
- **Dr. Ricardo Rozzi, Director, Centro Internacional Cabo de Hornos / CHIC.**
- **Dr. Vladimir Shulaev, North Texas University, USA**
- **Dr. Lee Meisel, INTA, Universidad de Chile**
- **Dr. Guillermo Schmeda H., Laboratorio de Química de Productos Naturales, UTalca**
- **Lisbet Yáñez, Coordinadora de Cooperación InternacionaL. Dirección de Relaciones Internacionales. Universidad de Talca.**

Starting lecture (Prof. V. Shulaev).
10:30 – 12:30 Introduction and rules for mass spectra interpretation. Main fragmentation patterns. Using programs for HPLC-MS/MS

Tuesday/Martes, March 11 (V. Shulaev).
09:00-11:00 Using programs for HPLC-MS/MS

Wednesday/Miércoles, March 12
09:00-11:00 Cómo trabajar con archivos de HPLC-DAD-MS/MS. Experiencias y reco mendaciones de usuarios.

- **Dr. Alberto Burgos**.

  14:30-17:00 Taller y práctica de uso de programas
  Dr. V. Shulaev, Dr. A. Burgos

  Thursday/Jueves, March 13
  09:00-11:00 Aplicaciones de fingerprinting en diferentes matrices de interés agro alimentario (Nélida Nina)

  Friday/Viernes 14. Trabajo autónomo. Actualización en principios de la espectrometría de masas y principales tipos de rupturas. Aprendizaje autónomo del uso de programas. Calibrantes, toma de datos y fórmulas moleculares posibles basadas en patrones de ruptura.

Monday/Lunes 17 (V. Shulaev).
09:00-11:00 Module 1. Introduction to Systems Biology

Tuesday/Martes 18 (V. Shulaev).
09:00-11:00 Module 2. Grant writing
14:30-17:00 Writing the grant. Taller. Escritura de proyecto (V. Shulaev, G. Schmeda)

Wednesday/Miércoles 19 (V. Shulaev).
09:00-11:00 Modulo 3. Parte 1. Functional genomics; Genetics approaches; Reverse and forward genetics

Thursday/Jueves 20 (V. Shulaev).
09:00-11:00 Modulo 3. Parte 2. Functional genomics; Genetics approaches; Reverse and forward genetics
15:00-17:00 How to use high-field NMR for chemical profiling Dr. G. Schmeda.

Friday/Viernes 21 (V. Shulaev).
09:00-11:00 Modulo 4. Parte 1. Structural genomics; Whole genome sequencing; Transcriptomics technologies; Custom microarrays; Affy microarrays; NexGen sequencing; RNA sequencing.

Monday/Lunes 24 (V. Shulaev).
09:00-11:00 Modulo 4. Parte 2. Structural genomics; Whole genome sequencing; Transcriptomics technologies; Custom microarrays; Affy microarrays; NexGen sequencing; RNA sequencing.

14:30-16:30 (Prof. Andy Pérez, Universidad de Concepción, Facultad de Farmacia). Metabolómica aplicada a matrices agroforestales.

Tuesday/Martes 25. (V. Shulaev and invited speakers)
09:00-11:00 Modulo 5. (V. Shulaev). Metabolomics approaches targeted analysis, global metabolomics, and metabolic fingerprinting.

Wednesday/Miércoles 26. (V. Shulaev).
09:00-11:00 Metabolomics approaches, targeted analysis, global metabolomics, and metabolic fingerprinting.

11:20-13:20 (Felipe Jiménez-Aspee). Metabolómica aplicada a biodisponibilidad, bioaccesibilidad y modificación de metabolitos en alimentos/productos agrícolas.

Thursday/Jueves 27. (V. Shulaev).
09:00-11.00 Metabolomics approaches, targeted analysis, global metabolomics, and metabolic fingerprinting

- **Charlas abiertas a la comunidad**

Monday/Lunes March 31
"Biodiversity International Seminar"

-Biodiversidad, conservación y desarrollo en la perspectiva CHIC: Un enfoque multidisciplinario e interdisciplinario en el extremo sur del continente.

-Soberanía alimentaria en el bordemar subantártico: desafíos y oportunidades

Tuesday/Martes April 01
How to use innovative approaches for biodiversity and bioactivity studies

- Prof. Ricardo Rozzi – Director Centro Internacional Cabo de Hornos (https://capehorncenter.com/ o el video https://youtu.be/Ao_biZD-kpQ)
- Prof. Vladimir Shulaev
- Prof. Guillermo Schmeda