

# ISVEE 16 Post-Conference Workshop

## INTRODUCTION TO MOLECULAR EPIDEMIOLOGY OF INFECTIOUS DISEASES

### GENERAL INFORMATION:

This three-day workshop balances theoretical and hands-on activities to teach students on the application of bioinformatics tools, for the analysis of molecular data (genotyping and sequencing), in the context of infectious diseases studies, on animal population health. Currently, the application of bioinformatics tools is a powerful complement to epidemiological studies, helping to understand in a greater detail, relevant aspects of infectious diseases such as: origin, aetiology, reservoirs, transmission patterns, and pathogenicity. In this course, theoretical and practical aspects of the different bioinformatic and statistical analysis will be presented and discussed in the context of applied epidemiological problems. Special emphasis will be put on issues such as data format and coding to facilitate posterior replication of the analysis by the students using their own data sets.

The main objective of the workshop is to provide to participant theoretical and practical knowledge on the use of the main bioinformatics tools for the analysis of genotyped and sequenced molecular data.

The workshop is mainly focused to master and PhD students who have contemplated the use of genotyped or sequenced molecular data on their research. This is an introductory course (beginner level) but some previous knowledge on molecular biology and epidemiology is recommended. Similarly, some basic knowledge on the execution of R code command would help. Participants should bring their own personal laptops (preference with Windows as operative system). Links with the list of opensource software, codes, data sets, and supplementary material will be provided before the workshop.

Organizers have taught this workshop numerous times since 2016, as part of summer courses at different events and institutions (University of Concepcion 2016 & 2019, Iberoamerican Society of Preventive Medicine 2017 meeting, Chilean National Veterinary Service 2018, and Austral University 2018 & 2019). This workshop has been delivered to more than 120 participants, mostly professionals and graduate students related to different disciplines of animal and human health.

For further information please write to Dr Cristobal Verdugo ([cristobal.verdugo@uach.cl](mailto:cristobal.verdugo@uach.cl))

### WORKSHOP SPECIFICATIONS:

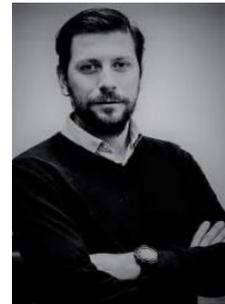
- Duration: 3 days post-conference workshop
- Minimum: 5 students and maximum: 20 students

- Non-ISVEE delegates will be allowed to participate in the workshop if the registration by ISVEE delegates does not reach the maximal enrolment.
- Language: English (questions and help could also be provided in Spanish).
- The workshop DOES NOT consider online participation

#### **INFORMATION ABOUT WORKSHOP ORGANIZERS:**

##### **Claudio Verdugo-Reyes**

Veterinarian from the Universidad Austral de Chile (UACH) and Ph.D. from the University of Florida, USA. Currently, Associated Professor at the Veterinary Pathology Department of the UACH, Valdivia, Chile. His area of interest is the application of evolutionary and epidemiological theories for the understanding of infectious diseases dynamics in wildlife populations.



He has focused his research on the ecological and evolutionary mechanisms that affect the natural hosts susceptibility to pathogens, especially those of zoonotic relevance. His research explores the way in which host-pathogen interactions modify the genetic variability of pathogens, as well as host-defence mechanisms, affecting pathogen transmission and persistence in natural populations.

Further information: <https://www.researchgate.net/profile/Claudio-Verdugo>

##### **Cristobal Verdugo-Vasquez**

Veterinarian from the University of Chile, Master in Preventive Veterinary Medicine from the University of California, USA, PhD from Massey University, New Zealand, and former Postdoctoral fellow at the International Livestock Research Institute, Kenya. Currently, Associated Professor at the Preventive Veterinary Medicine Department of the UACH, Valdivia, Chile.



His research has focused on the transmission dynamics of infectious pathogens in livestock and the assessment of diagnostic tests and surveillance systems for the detection of transmissible diseases. He also has performed research on factors that determine pathogenicity differences of infectious agents, and their association with different hosts.

Further information: <https://www.researchgate.net/profile/Cristobal-Verdugo>

## WORKSHOP SCHEDULE:

Day	Time	Activity/Contents	Details
1	8:30-10:00	Introduction (T:100%/P:0%) *	Presentation of the workshop objectives and methodologies, and introduction to the molecular epidemiology.
	10:00-10:30	bio break	
	10:30-12:00	Population genetics (T:100%/P:0%)	Lecture on key factors to understand pathogen selection and divergence
	12:00-13:00	lunch break	
	13:00-14:30	Typing vs. Sequencing (T:70%/P:30%)	A comparison between typing and sequencing techniques and their advantages and disadvantages in the context of molecular epidemiology studies.
	14:30-15:00	bio break	
	15:00-16:30	Genotyping data analysis (T0%/P:100%)	Practical exercises using genotyped data for diversity and similarity indexes, and haplotype network
2	8:30-10:00	Sequence data analysis (T:40%/P:60%)	Sequence data and sequence alignment
	10:00-10:30	bio break	
	10:30-12:00	Phylogenetic inference I (T:70%/P:30%)	Nucleotide substitution models
	12:00-13:00	lunch break	
	13:00-14:30	Phylogenetic inference II (T:40%/P:60%)	Maximum likelihood/Bayesian method for phylogenetic inferences
	14:30-15:00	bio break	
	15:00-16:30	Phylogenetic inference III (T:30%/P:70%)	Phylogenetic trees, interpretation, and inferences
3	8:30-10:00	Case study (T:0%/P:100%)	Group work: Using molecular data set provided to the students to solve a molecular epidemiology problem
	10:00-10:30	bio break	
	10:30-12:00	Case study continuation (T:0%/P:100%)	Group work: Using molecular data set provided to the students, to solve a molecular epidemiology problem
	12:00-13:00	lunch break	
	13:00-14:30	Student presentations	Presentations and discussion on the results of the case study assigned to each group
	14:30-15:00	bio break	
	15:00-16:30	Workshop closure	

\*In parentheses the percentage of theoretical (T) and practical/hands-on (P) work