Full day Courses

1. Statistical Methods in Ecotoxicology Using R

(Leading instructor: Christian Ritz, University of Copenhagen)

Abstract:

The open source statistical environment R (http://www.r-project.org) has become the lingua franca of data analysis among statisticians and is also in widespread use in many applied sciences. Many advanced or recent statistical and graphical/visualisation techniques are only available in R. Therefore, it is an extremely powerful all-in-one alternative software to specialised commercial data analysis software currently used by many ecotoxicologists. Moreover, it encourages collaborative and reproducible research.

The focus will be on giving the participants practical experience with the software. The course material will be a blend of introductory lectures on R (before lunch) and case-studies based on real toxicological data, from recent publications in ET&C and elsewhere (after lunch).

ANOVA methods, linear, non-linear regression (including dose-response analysis), and logistic and Poisson regression models will be introduced. There will also be case-studies on more advanced topics such as automation/simulation, hormesis models, mixture modelling, random effects models, analysis of data with non-detects, and time-to-event methods. Expert teachers will provide guidance and assistance throughout the course.

The course is intended for PhD students, researchers, and scientists in toxicology and environmental sciences. An elementary understanding of statistical concepts (including ANOVA and regression) is a prerequisite. Participants are encouraged to bring their own data.

Course objectives:

1) Review state-of-the-art statistical methods for analysis of toxicological data
2) Demonstrate the power of open source statistical software
3) Provide hands-on experience for standard data analysis (cookbook)
4) Enable participants to use the software on their own problems (take-home software)

Course level:

Advanced

2. How to best conduct aquatic ecotoxicity tests according to the International Guidelines

(Leading instructor: Hans Rufli, ecotoxsolutions)

Abstract:

The course provides guidance on how to perform algae-, daphnia- and fish-tests taking into account the EU regulations, US-EPA and OECD-test Guidelines, and how to produce scientifically valid studies accepted by the authorities in the EU, US and Japan. Each test method is exemplified with reactions of the authorities to studies submitted showing why authorities declared that a particular study did not satisfy the guideline requirements.

The course further provides information on the philosophy of testing and its background beyond what is stated in the guidelines, on effect-concentration and time-concentration relationships, on extrapolations from results of acute to chronic tests and from laboratory test results to the environment.

Last but not least, guidance will be given on how to best interpret and report studies. A case study based on an acute fish test with a 'difficult to test substance' will illustrate reporting needs and deficiencies. Examples will be discussed on how to best report results of aquatic ecotoxicology studies.

Course objective:

The course provides guidance on testing methods and strategies in aquatic ecotoxicology. It provides the knowledge and skills to optimise the testing in order to avoid the production of invalid data and the repetition of studies

Course level:

Intermediate

3. Bayesian statistical methods in ecotoxicology

(Leading instructor: Elise Billoir, Plateforme de Recherche en Toxicologie Environnementale et Ecotoxicologie de Rovaltain)

Abstract:

This short course intends to introduce and equip participants with the basic skills necessary to analyse ecotoxicological data within a Bayesian framework. The course material will consist of introductory presentations covering issues such as (i) classical modes of inference in ecotoxicology and problematic concepts such as NOECs (No Observed Effect Concentration) and the SSD (Species Sensitivity Distribution), (ii) basics of Bayesian inference with distinguishing points with conventional (frequentist) statistics explained, (iii) introduction to parameter estimation and inference within a Bayesian framework and (iv) background to case-studies which will be analysed in 'hands-on' session in the afternoon. Participants will be shown how to set up dose-response models, define prior distributions for the model parameters, analyse and interpret the results within a Bayesian context and to incorporate the resulting uncertainty in the derivation (through SSD fitting) of hazardous concentrations (HCs).

Course objective:

On completion of this course, participants will:

- have been introduced to basic probabilistic concepts unerpinning Bayesian statistics;
- be able to set up and run programs using the combo JAGS/R/rjags
- be able to use Bayesian methods to fit and evaluate various models for concentration-response data
- be able to use posterior distributions for toxicity measures to investigate uncertainty in Hazardous Concentrations (HCs) values derived from a Species Sensitivity Distribution (SSD)

Course level:

Intermediate

4. Introduction to population models for ecological risk assessment and their documentation using TRACE

(Leading instructor: Volker Grimm, UFZ Leipzig)

Abstract:

Population and other mechanistic effect models hold great potential for supporting ecological risk assessment of chemicals, in particular pesticides. Generally, current modelling practice, however, is not transparent and documentations of model assumptions, data, tests, and analyses are usually incomplete or incomprehensive for non-specialists. Modellers often do not understand the requirements of models in specific decision contexts, and decision makers often have no training in modelling. To overcome these challenges, the joint European project CREAM (http://cream-itn.eu) is applying and testing a general framework for TRAnsparent and Comprehensive documentation of Ecological models (TRACE) covering the entire modelling process. Modellers can use this framework to improve the documentation of their model structure, testing, assumptions, including organizing their "modelling notebook"; decision makers can use it as a checklist and for a systematic evaluation of models and their results. In order to evaluate a TRACE documentation, no expertise in modelling is necessary. The course will: introduce the scope and methods of modelling; demonstrate the role of model documentation; introduce the TRACE documentation framework; explain the need for Good Modelling Practice; explain how a general documentation framework can foster the establishment of Good Modelling Practice; provide examples; include short exercises in model analysis and modelling documentation, and in using TRACE documents.

Course objective:

Introduce into the scope and methods of population models

- Demonstrate structure and analysis of example models in exercises
- Introduce the rationale of the TRACE documentation framework
- Demonstrate how TRACE documents are compiled
- Introduce into elements of Good Modelling Pratice
- Demonstrate how to read and evaluate TRACE documents

Course level:

Introductory

5. Advanced course in toxinology for ER professionals

(Leading instructor: Amna Beshir Medani, Alemam Alhadi College)

Abstract:

ER professionals due to the lack of organized knowelege in toxinology ,often misdiagnose the symptoms of toxicity with the patological symptoms.This course is an enlightment for the basic information of an important part of toxicology, which is toxinology, for the easy geographical distribution, diagnosis, laboratory identification of natural toxins treatment and the needed further fellow up and handling of toxicity due to natural sources like those from animals, plants or other microbes.

Course objective:

1. Elevation of the standard of knowledge of toxinology among the medical and paramedical staff who are concerned with the treatment of ER patients poisoned by natural sources of toxins.
2. Classification of natural toxins and relating this classes to certain geographical area and history of poisoningμto ease diagnosis in case of suspicion.
3. Facilitate the availability of antidotes in the appropriate geographical districts in relation to toxin back ground.
4. Enhance easy, toxin-specified and economic models of research .
5. Net-working of personnel interested in this field, training them and lead an open access for contact between them.
6. Communication between companies investing in therapy and the medical staff.

Course level:

Advanced

6. Statistical issues in the design and analysis of ecotox experiments

(Leading instructor: John W. Green, DuPont Statistics Group)

Abstract:

This course covers statistical considerations of experimental design and statistical analysis used to evaluate toxicity of chemicals in the environment. Both hypothesis testing to determine a NOEC and regression modeling to determine an ECx will be developed in detail. The discussion will include advantages and disadvantages of both approaches and their use in risk assessment. The lead instructor works closely with OECD and USEPA, is an active member of the OECD Validation Management Group for Ecotoxicity and was instrumental in developing several new OECD Test Guidelines and new methodology and these will be discussed. Both instructors have worked on several other multi-displanary teams developing regulatory statistical guidance. Continuous, quantal, and severity score (histopath) data will be explored. The instructors have decades of practical experience designing and analyzing ecotoxicity experiments, performing risk assessments, and dealing with related regulatory issues and drew on that experience in developing this class. Underlying principles will be discussed, but the focus will be on practical issues. All topics will include illustration by real laboratory ecotoxicity data examples illustrating the relevant points and techniques. Logical flow-charts for NOEC determination and for regression model fitting will be presented, as well as some discussion of software to conduct analyses.

Course objective:

The course is intended to identify and explore techniques both statistically sound and acceptable to the regulatory communities for analyzing laboratory ecotoxicity experiments to meet current or near-term future guidelines. The course will identify problematic data that may call for specialized approaches. It is intended to provide practical advice and make specific recommendations, as well as alternatives and when they might be appropriate. It will also introduce statistical methods in recently adopted OECD Test Guidelines.

Course level:

Intermediate

7. In vitro methods for the determination of test chemicals metabolism utilizing fish liver subcellular fractions and hepatocytes

(Leading instructor: Karla Johanning, KJohanning Consultancy)

Abstract:

The main goal of this short course is to provide the basic tools and knowledge in the laboratory to perform in vitro metabolism assays utilizing fish liver subcellular fractions and hepatocytes. There is increasing interest in utilizing alternative methods to evaluate the bioaccumulation potential of chemicals. Bioaccumulation is the biological sequestering of xenobiotics and is the result of absorption, distribution, metabolism and excretion (ADME) processes. The in vitro metabolism assay utilizing fish liver subcellular fractions (i.e. S9, microsomes) and hepatocytes (freshly isolated or cryopreserved) provide a powerful tool to determine metabolism of a vast variety of chemicals. In vitro methods to measure the metabolism of chemicals are available, and have been used for decades in drug development. These in vitro methods offer alternative methods that are less costly, decreases the number of animals utilized, and can be performed in significantly less time than in vivo methods. In vitro methods provide the initial steps to test the overall metabolism of chemicals that will be under REACH regulation in the upcoming years. The purpose of this short course is to show visually and have the participants perform incubations with the appropriate materials and reagents to test metabolism of chemicals using fish liver subcellular fractions and hepatocytes.

Course objective:

The main objective of this course is for the participant to acquire the knowledge of testing chemicals utilizing the growing trend of the in vitro metabolism assay utilizing fish liver subcellular fractions and hepatocytes. The participant will learn the theory behind these assays and will actively participate ("hands on") in the in vitro incubations of a test chemical (using fish liver subcellular fractions and cryopreserved hepatocytes) interacting with the instructors. Dr. Helmut Segner has identified and has arranged already with a local laboratory at the Leibniz Institute of Freshwater Ecology and Fisheries which is the outkirsts of Berlin. This laboratory has the facilities we can use to teach this course.

Course level:

Introductory

8. The fish embryo alternative – introduction into LC50 and sublethal endpoints analysis (with practical training)

(Leading instructor: Carola Kussatz, UBA)

Abstract:

Animal (vertebrate) experiments are an integral part of the environmental and human risk assessment in the registration of industrial chemicals, pesticides, biocides and pharmaceuticals. Due to the high costs of animal test and the strong societal demand to reduce these experiments alternative approaches – non-testing and testing – are urgently needed.

Among the alternative test systems, fish embryos are increasingly used and represent a promising model in toxicology both for research and regulatory testing. The application of the model ranges from simple acute toxicity tests to the detection of highly specific, mechanism-of-action related endpoints. The latter is of great interest in order to predict long-term and subacute effects. In the short course we will focus on the zebrafish as one of the most widely used species for conducting fish embryo tests. We will cover basic aspects of husbandry, toxicity testing, including for instance the testing of difficult (volatile, lipophilic) compounds. Hands-on training will be provided for egg production and acute toxicity testing. Furthermore, different experts in the field will give a detailed overview on subacute endpoint analyses including gene expression, toxicogenomics (transcriptome and proteom analysis), bioconcentration, behavioural assays and endocrine disruption.

Course objectives:

The main objective is to introduce into the zebrafish embryo model and practical implementation of the test in a research or testing laboratory. For scientists that already have some basic knowledge, introduction into subacute endpoint analysis given by experts in the field are of great interest.

Course level:

Introductory

9. Modelling human and ecosystems exposures and impacts for life-cycle assessment: the USEtox model

(Leading instructor: Thomas McKone, University of Calfornia)

Abstract:

To address the increasing need for methods to assess the impacts of toxic chemical emissions on human health and ecosystems, this course provides a practical overview of multimedia chemical fate modelling, multi-pathway human exposure modelling, and comparative indicators for human health and ecotoxicological impacts. We begin by explaining basic concepts for environmental mass balance modeling—including partitioning coefficients, first order rate coefficients, cross-media transport, persistence, and long-range transport. We next present the fundamentals of multi-pathway models for human intake via inhalation, drinking water and food. We will review hazard-based and risk-based effects modeling approaches that are used to assess damage factors and illustrate how fate, exposure, effects and damage factors can be combined to construct characterization factors. We then guide the participants through a series examples in which they will develop characterization factors for human health and ecological impacts using the USEtox model developed by SETAC/UNEP Life Cycle Initiative. Students will explore USEtox as a tool for the comparative assessment of chemical fate, human exposure, and ecological impacts. We will conclude with a demonstration of how the model can be used in various applications, including the prioritization and ranking of chemicals for agencies such as the US-EPA.

Course objectives:

The aim of this workshop is to introduce participants to the exposure science methods used in life-cycle and comparative risk assessment. The participants will learn to use and evaluate basic tools for mass-balance, fate modeling, and intake fraction estimation. Participants will review underlying model assumptions and evaluate data needs along with data and knowledge gaps in these assessments.

The course is intended for environmental science practitioners interested in the scientific fundamentals of chemical impact assessment for a broad range of environmental emissions. Only a basic background knowledge of environmental modeling, risk assessment or LCA is considered necessary.

Participants will come away with a knowledge of basic concepts of exposure science for chemical impact assessment and be able to perform their own assessment using the USEtox model and interpret results

Course level:

Intermediate

10. Ecological Risk Assessment and Management

(Leading instructor: Tim Iannuzzi, ARCADIS)

Abstract:

This course will provide a broad introduction into the science and practice of Ecological Risk Assessment (ERA), and will utilize case study examples to generate participant-instructor discussion on the practice of weight-of-evidence ERA, and the principles of risk management. While the focus will be primarily on chemical contaminants, a broad array of multi-stressor issues will also be covered. This course is suitable for participants with little or no experience in ERA, as well as those with a moderate level of understanding.

The course will be broken down into two modules. The first will cover a broad overview of the ERA process/frameworks and a concise introduction to several scientific principles and disciplines that are key to practicioners, including basic systems ecology, toxicology, population biology, fate and transport, empirical and applied modeling, data collection (design and data quality objectives), and regulatory policy and guidelines (Europe and United States). Materials will be provided to the course participants for suggested follow-up study in each of these technical area. These will include lists of suggested readings(including a focused list of SETAC publications on the subject matter) and internet sites, terminology/definition sheets, and a computer "thumb drive" that contains electronic versions of key ERA regulations, guidance documents, and related materials.

The second module will focus on application of the ERA process to current environmental issues around the world. Case studies will be used to frame discussion on the broad application of the ERA framework to environmental issues, and risk management decision-making, the overall goal being to demonstrate how the ERA process/framework can be used to evaluate a broad array of environmental issues from localized contaminated sites to large-scale issues such as climate change.

Course objectives:

1. Provide an introduction to the Ecological Risk Assessment (ERA) process and frameworks.
2. Provide a broad overview of key technical topics that are important to ERA practitioners.
3. Generate discussion between the participants and instructors on case examples and issues related to ERA process and its application to present environmental issues.
4. Provide handouts and resource lists for participants to continue learning about the key technical and regulatory topics that are covered in the course.

Course level:

Intermediate

11. Dioxins & PCBs: Data Interpretation, Review & Validation

(Leading instructor: Yves Tondeur, Analytical Perspectives)

Abstract:

The short course covers a variety of topics associated with the interpretation and validation of "dioxins" and PCBs as separated by high-resolution gas chromatography and measured by isotope-dilution high-resolution mass spectrometry (ID HRGC/HRMS). The course is intended for people responsible for designing, directing, monitoring, and evaluating measurement programs involving target analytes measured by isotope-dilution mass spectrometry (i.e., can be applied to ID LC/MS/MS). For the ever-changing regulatory implementation, high profile topics of interest include Performance Based Measurement System (PBMS) and "dioxins" fingerprinting.

Course objectives:

Provide regulators, inspectors, permit writers, enforcement staff, risk-assessors, toxicologists, process engineers, researchers, and project managers with the necessary tools to improve communications between the end users and the data generators, as well as to comprehensively evaluate the quality and reliability of the data received from laboratories. The attendee will learn basic concepts, critical and key aspects of the ID-MS analytical methods, the sample analysis process, data review and interpretation, and quality assurance/quality control validation. In esssence, the course addresses "everything you need to know and were afraid to ask" including specifics on detection limit and analyte concentration calculations, measurement of uncertainty and how to realistically assess laboratory's performance so that the data produced is fit for purpose.

Course level:

Intermediate