

**Educational Program at Bachelor Level on  
Replacement, Reduction and Refinement (3Rs principle)**

3RCC Recommendations – 17<sup>th</sup> of May 2019

The Swiss 3RCC recommends that a first course dedicated to the replacement, reduction and refinement of animal experimentation (the 3Rs principle) should be part of the core courses at the Bachelor level in the following degrees: life sciences, bioengineering, medical, veterinary, environment, agricultural sciences and pharmacy and any other potential degree of relevance.

A 3Rs principle dedicated course shall help students to e.g.:

- i) Gain an overview of the concept and examples of implementation of the 3Rs in animal experimentation.
- ii) Get awareness of the Swiss animal welfare legislation.

The recommended course duration should consist of a minimum of 5-10 hours, including preferentially both a theoretical part, and a practical part based e.g., on case-studies and/or articles to be discussed.

Below is a list of the recommended learning objectives to be achieved with the course. A learning catalogue with a list of topics and teaching means will be developed.

## **Learning outcomes**

### **1. Introduction**

Students should be able to:

- Be aware of the Helsinki Declaration regarding human research and explain restrictions for performing research in humans.
- Understand why and when animal experimentation is required.
- Know the history of animal experimentation leading to the 3Rs principle.
- Associate the principle of the 3Rs within the context of ethical responsibility and scientific rigour.

### **2. 3Rs Principle**

Students should be able to:

- Define the replacement, reduction and refinement principles based on examples.
- Know the connection between the 3Rs principle and good science & animal welfare.

### **3. Ethical principles and legislation**

Students should be able to:

- Understand different ethical concepts related to animal welfare (i.e. anthropocentrism, pathocentrism, biocentrism, speciesism, utilitarianism, animal rights).
- Describe what is the legal definition of an animal (object or person)
- Identify which animals and which aspects are protected (e.g. their dignity and their welfare).
- Describe how animals are protected and the legal framework.
- Describe what is considered to be an animal experimentation by the Swiss law.
- Summarize how researchers obtain the right to use animals in animal experimentation (administrative frame and authorization process (researcher-> AWO-> cantonal authorities-> cantonal commission-> OSAV/BLV and maybe Federal commission)).
- Assess what justifies an animal experimentation (indispensability, balance of interest: animal constraint versus benefits for health of human beings or animal/fundamental research/environmental protection) -> harm benefit assessment.
- Know the severity classification system.

### **4. Animal experimentation**

Students should be able to:

- Describe standards of animal welfare in research and in the animal facilities for different animal species such as rodents and zebrafish (i.e., culture of care, handling, habituation, environment (enrichment), pair-grouped specie-dependent, pain recognition, anaesthesia, pain management, euthanasia, etc.).
- Describe the work of the personal committed to the welfare of the animals and its importance/contribution to research.
- Respect the contribution animals make to research.
- Give examples where animal experimentation has benefited to humans, as well as examples where animal experimentation didn't reach objectives and poorly served human benefit.
- Describe the limitations of an animal model.

### **5. Experimental design and statistics:**

Students should be able to:

- Understand the concept of variability, its causes and methods of reducing it.
- Describe possible causes of bias and ways of alleviating it (e.g. formal randomization, blinding (in measurement and/or assessment), trials and possible actions when randomization and blinding are not possible)\*
- Describe the factors affecting significance, including the meaning of statistical power and "p-values".\*

- Identify/recognize the different types of formal experimental designs (e.g. independent, paired, mixed-design, completely randomized, randomized block, repeated measures, Latin square and factorial experimental designs).\*
- Read the methods and results section of a typical manuscript and distinguish between hypothesis driven and exploratory analyses and provide a brief (but accurate) summary of the main results.
- Read the methods and results section of a typical manuscript, and provide a brief critique of the biases (or even flaws) in the experimental design that could lead to erroneous results
- Interpret examples of experimental results

\* These learning outcomes may be acquired through already existing statistics-dedicated course.

## **6. Methods not entailing the use of living animals**

Students should be able to:

- Describe examples of alternative methods and/or strategies that can replace, reduce or complement the use of animal experimentation.
- Determine where and how *in vitro* methods can contribute to gaining scientific information as compared to animal experimentation (e.g., mechanistic information, relevance to the species of interest, e.g., humans).
- Describe the different existing steps needed to ensure relevance and reliability of methods (e.g., development, optimization, validation).
- Illustrate how methods not entailing the use of live animals can be used within integrated approaches taking into account other existing information.
- Describe the limitations of methods not entailing the use of live animals (e.g., current scientific gaps and technical limitations).
- Know how to find relevant sources of information related to the 3Rs and animal welfare.
- Be able to search 3R strategies in publications, websites (keywords, systematic reviews, etc.)
- Know about existing biobanks and procedures to obtain human samples for research projects.