

Teaching and training in substitutive approaches to animal testing: Commitment of the University of Genoa

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Abstract

The 21st century life science requires that scientists become aware of scientific and ethical issues of substitutive approaches to animal testing. For more than 20 years Dr Bassi Team at University of Genoa promotes several activities in Academia on the Replacement of Animal Testing: 2 days training course, lectures within teaching programs, work experience opportunities for graduated or graduating students, stages for Biology, Medicine and Surgery degrees and PhD courses on human *in vitro* model disease projects, This effort is now improved by Centro3R activities to increase the number of scientists aware of effective alternatives to classical *in vivo* approaches, and prevent needless suffering of animals.

Introduction

Up to now, increased clinic evidence has shown the difficult extrapolation of data from animals to humans. So new toxicity testing models based on human biology are required. To respond more effectively to the public's demand for the replacement of animal methods, the 3Rs concept highlights to foster innovative technologies and encourage approaches. To accelerate the process of replacement of animals in biomedical research, education, and regulatory testing, many countries have already established institutions dedicated to the development of alternatives to animal testing. For this aim academic degree programs in Animal Replacement Science have to be established for training the next generation of scientists, ethicists, and policy makers. Education and training are the fundamental commitment of Academia and so in this framework future scientists should be educated, giving them the means and impetus to develop new and

appropriate experimental methods. Every researcher should know about relevant alternatives, the scientific limitations of both animal approaches and non-animal ones. In this context the lectures and training are to perform by scientists, regulators.¹⁻⁵

Results

To address these issues, since 2008, I and my team at Laboratory Analysis and Research in Physiopathology (LARF), at the University of Genoa, have provide theoretical and training courses on the Replacement of Animal Testing. In 2013, the LARF team won the international Lush Prize for Training Category.

Thanks to over thirty years of experience in various fields of pathology and teaching, the LARF staff is able to offer their knowledge and expertise in all aspects of *in vitro* technology. To date, LARF have hosted 8 editions of Basic and 5 of Advanced courses. The courses are organized over 2-days and are opened to a maximum of 24 participants, including experts in *in vitro* methods, as well as undergraduates. Low registration fees to permit even young graduates to participate and participants come from all over Italy.

These Courses are not funded from Academia, but only voluntary donations by some animal protection associations. It is to emphasize that leading Companies in *in vitro* areas contribute as sponsor by sending their specialists for talks and supervising the training modules focused on their top technologies or methods, and this is done with their own free-will. Thanks to this relevant support, each edition is unique in providing regular updates on main relevant topics of innovative *in vitro* models and technologies, implementation of current regulatory issues, adverse outcome pathway analytical construct, and so on. The theoretical part is combined with intensive sessions of hands-on experience within practical training modules given by specialists from the academic world and leading technology companies. The topics of these courses are focused on supplying basic knowledge, update on innovative *in vitro* models and technologies, implementation of regulatory issues, adverse outcome pathway analytical construct, and so on. Furthermore, the experts offer hands-on experience to each participant in specific practical training modules. A panel discussion among experts and trainees during the hands-on sessions and in the final roundtable contributed to creating a scientific network on alternative methods.

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The evaluation questionnaires result in a high level of satisfaction by all participants, who appreciate the guarantee of being able to use *in vitro* models and of getting updates, and more than often, request the scheduling of new advanced courses to improve existing expertise on alternative methods confirming their very positive learning outcomes.

Moreover, we promote and organize several training activities in Academia. Within the core *curricula* of my teaching programs, I give lectures, offer "stages", work experience opportunities, for graduated or graduating students of several Courses. Several graduating and PhD students elaborate their degree thesis on *in vitro* models and every year 20h training modules on *in vitro* toxicology are performed for graduating students in Biology, Medicine and Surgery, as for graduates, as a voluntary stage. It is to underlined that within the Medicine and Surgery Degree, we offer 6 hours of lectures within an optional course, on "*in vitro* Alternative Models for Personalized Medicine", and recently 1 student/year has working an experimental thesis on a human *in vitro* model disease project, for a total of 2 years.

In addition, for each edition of 2nd level Master Courses on the REACH guidelines, I am engaged in 4-hour lessons on Innovative *in vitro* Models for Risk Prediction; plus 2 hours of practical activity on skin or eye reconstructed human tissues, as required for irritation tests according to respective OECD regulations.

Conclusions

Dissemination of 3R-knowledge ensures best possible practice for a predictive and reliable toxicology, by performing and optimizing 2D/3D *in vitro* models based on human cells to evaluate the health hazard. At present, there is a strong commitment of both researchers and companies to perform advanced human-specific models. Establishing training programs around the world makes a huge difference to progress.

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