



Theme III – 3Rs in Academia and Education

Coordinators

Gilly Griffin, CCAC, Ottawa, Canada

Monika Schäfer-Korting, FU Berlin, Germany

Session III-1: 3Rs in academic education, training programs and anticipated needs

Co-chairs

Gilly Griffin, CCAC, Canada

Monika Schäfer-Korting, FU Berlin, Germany

Session III-1: Oral presentations

III-1-190

Assessing current practice on the Three Rs literature search: analysis and key findings from the national survey

B. I. Choe¹, G. H. Lee¹, M. S. Yoon², L. A. Hart³, J. Richmond⁴ and P. Littlefair⁵

¹Nicholas Cardinal Cheong Graduate School for Life, The Catholic University of Korea, Seoul, South Korea; ²Animal Protection & Welfare Division, Animal and Plant Quarantine Agency, Gyeonggi-do, South Korea; ³School of Veterinary Medicine, University of California, Davis, CA, USA; ⁴Consultancy, Ethical Biomedical Research and Testing-Advice, Fife, UK; ⁵International, RSPCA, Horsham, UK

bichoe@catholic.ac.kr

Despite the tremendous amount of information on the Three Rs available online, it can be very difficult to obtain the specific information desired to replace, reduce and refine the use of animals for teaching and research, as required by legislation in Korea and elsewhere. The KNIC3Rs was established on August 2011 in collaboration with government, academia and national and international experts from animal welfare organizations, with the goal of exchanging knowledge and resources. One of its functions is to better prepare Korean scientists to identify and use relevant Three Rs techniques and strategies. In 2012, the KNIC3Rs conducted a survey of the Three Rs literature searching practices of Korean IACUCs and investigators. This paper presents key findings from the survey results and the progress made in Korea through practical workshops under the title of “Reducing the use of animals in research and education through better experimental design” and “The 3Rs Good Practice: Effective Search Strategies to comply with the 3Rs” conducted in 2012 and 2013. Educating scientists and IACUCs is key to giving them the skills to find useful information and is a good place to start in helping them embrace the use of alternatives.

III-1-315

Doerenkamp-Zbinden Foundation’s vision to reduce animal use in education and research in India through MGDC adequately realized

M. A. Akbarsha¹, S. Pereira² and F. P. Gruber³

¹Mahatma Gandhi-Doerenkamp Center, Bharathidasan University,

Tiruchirappalli, India; ²People for Animals (Chennai), People for Animals (Chennai), Chennai, India; ³Doerenkamp-Zbinden Foundation, Doerenkamp-Zbinden Foundation, Zurich, Switzerland
director@mgdccloud.org

MGDC was established in 2009 by Doerenkamp-Zbinden Foundation to promote adoption of 3Rs in India. MGDC adopted a pragmatic approach in which the academic fraternity was enlightened about and trained in ICT tools in education as alternatives to animal dissections and experiments in 40 seminar-cum-workshops across the country, in parallel with training to more than 200 researchers in *in vitro* and *in silico* toxicology in 15 workshops conducted at MGDC’s HQ. Sensitization was also achieved through popular lectures, talks in conferences, including Indian Science Congress, and meetings with regulatory authorities. High profile workshops were conducted in collaboration with The Hamner Institutes, USA; In Vitro AdMet Labs, USA; SkinEthic Academy, France; and ExCel Matrix, India. Original articles and reports were published in peer reviewed journals. A 4 credits elective course entitled “*Alternative Methods to Animal Experimentation*” is offered. MGDC’s relentless effort, supported by PfA, PeTA, and I-CARE, was rewarded with UGC, and Medical and Pharmacy Councils bringing up guidelines limiting use of animals in education to a bare minimum. Also, MGDC partnered with organizations in working out reforms in animal use in risk assessment. Highly satisfactory outcome indeed but achieved through persistence and perseverance.

III-1-396

Integrated 3Rs education

D. Fry¹ and M. Lloyd²

¹Faculty of Life Sciences, University of Manchester, Manchester, UK; ²Education and Training Group, Red Kite Veterinary Consultants Ltd, Wallingford, UK

derek.fry@manchester.ac.uk

Rather than the 3Rs being taught as an abstract concept, with information on each provided separately in different courses or defined subsections, we have incorporated all elements under an over-arching heading of experimental design. Replacement is considered through literature searching and setting the experimental aims, questioning not only whether non-animal alternatives might be used but also whether an alteration of the experimental aim might avoid animal use. Refinement is discussed with the decisions on what types of data to gather, the effect of animal discomfort or distress on the reliability and variability of the data gathered, the choice of procedures to be used, and the application of humane stopping points. Reduction is taken as minimising numbers overall by using an efficient and appropriate design and including in it proper controls, avoidance of bias, and sufficient



numbers to detect worthwhile effects. Along with a varied delivery which recognises both the range of ways people learn and the difference between adult and schoolchild learning, this provides a package that participants rate highly and for which responses to problem solving and pre and post testing indicate good acquisition of knowledge, understanding, and skill.

III-1-454

An integrated practical course on cell biology on *in vitro* cytotoxicity assays for Brazilian health/biology undergraduate students

D. Silva¹, J. Côrtes¹, R. Bachinski¹, C. Spiegel² and G. Alves^{1,2}

¹Clinical Research Unit, Antônio Pedro Hospital, Fluminense Federal University, Niterói, Brazil; ²Cell & Molecular Biology Department, Fluminense Federal University, Niterói, Brazil
gutemberg_alves@id.uff.br

Cell Biology (CB) is present on curricula of Health/Biology undergraduate courses. While practical CB classes are usually employed to review theoretical concepts discussed on expositive classes, sometimes undergraduate students miss the relevance of cell culture on *in vitro* assays, and, moreover, as alternative methods for animal use on their future career. This work presents the development of a practical CB 10-lessons course, applied to students from the Fluminense Federal University (Brazil), proposing that students participate in the whole process of drafting and performing a cytocompatibility assay, with production of a scientific report by each group of 5 students (n=80 groups). Students selected reference papers and presented a seminar on cytotoxicity tests and each class proposed a protocol, feasible with the available infrastructure. Students were trained in laboratory and cell handling. Students from all classes agreed upon the use of a colorimetric assay with murine pre-osteoblasts, using many replicates (3-5) and including adequate controls. Groups were able to produce sound, scientifically adequate reports, and students recognized, as stated on a qualitative assay, the relevance of practical lessons and CB on their professional development, as well as cell culture as alternative to animal testing, indicating the adequacy of this practical approach.

III-1-554

Use of animals for the purposes of education and training

M. Jennings and E. Lilley

Research Animals, Royal Society for the Prevention of Cruelty to Animals, Horsham, UK
elliott.lilley@rspca.org.uk

The use of living animals for education and training purposes which may cause the animals pain, suffering, distress or lasting harm will require project authorisation under Directive 2010/63/EU. Until recently, the extent to which such animal use is permitted has varied considerably among Member States – from routine use in acquisition of skills to use only under very specific circumstances.

There is still considerable debate regarding if and when animal use for education and training is justified. However, there is agreement that a considered and structured approach is needed. The learning outcomes need to be well defined and use of alternative strategies fully explored before any request is made to use living animals. Ideally,

within the EU, there should be a common understanding of the specific circumstances under which animal use is likely to be authorised, and agreed constraints, for example limiting the severity to mild and reducing numbers of animals to a minimum.

This presentation will discuss the ethical and practical factors to be taken into account when developing a harmonised approach.

III-1-624

The Berlin-Brandenburg research platform BB3R and integrated graduate school

M. Schäfer-Korting¹, G. Weindl¹, J. Plendl², H. Fink², A. Pries³, R. Preissner³, A. Luch⁴, G. Schönfelder⁵, R. Lauster⁶, M. Weber⁷ and B. Kleuser⁸

¹Institute of Pharmacy, Freie Universität Berlin, Berlin, Germany; ²Department of Veterinary Medicine, Freie Universität Berlin, Berlin, Germany; ³Institute of Physiology, Charité – Universitätsmedizin Berlin, Berlin, Germany; ⁴Department of Product Safety, German Federal Institute for Risk Assessment (BfR), Berlin, Germany; ⁵Department of Experimental Toxicology and ZEBET, German Federal Institute for Risk Assessment, Berlin, Germany; ⁶Institute of Biotechnology, Technische Universität Berlin, Berlin, Germany; ⁷Computational Molecular Design, Zuse-Institut Berlin, Berlin, Germany; ⁸Institute of Nutritional Science, University of Potsdam, Potsdam, Germany
monika.schaefer-korting@fu-berlin.de

Funded by the German Government the Berlin-Brandenburg Research Platform BB3R with integrated graduate education has started in April 2014. Joint research of scientists from FU Berlin, Potsdam University, Charité Berlin, TU Berlin, BfR, and Zuse-Institute Berlin will focus in gaining substantial progress in the fields of alternative and humane testing and in strengthening the national 3R expertise. BB3R aims to accomplish the following goals:

- Establishment of alternative methods for preclinical drug development and basic research; facilitation of research collaborations and sustainable research activities in the region Berlin-Brandenburg
 - Expansion of regional research activities by establishment of three junior research groups; successful candidates will be qualified for management positions in professional areas related to the 3Rs
 - Sustainable establishment of the BB3R graduate school for structured training of graduate students who complete a specific mandatory course program on alternative test methods to animal experimentation and related fields in addition to the research project
 - Creation of a pool of 3R experts for advice and assistance
- Increasing the awareness of the society for 3R-related issues
The research platform BB3R along with the associated graduate school will close substantial knowledge gaps in the fields of 3Rs and alternatives to animal experimentation in the years to come.

III-1-642

Training for the Three Rs – the CCAC research fellowships in animal policy training

G. Griffin¹ and E. Denovan-Wright²

¹Standards, Canadian Council on Animal Care, Ottawa, Canada; ²Pharmacology, Dalhousie University, Halifax, Canada
ggriffin@ccac.ca

Since 2003, the Canadian Council on Animal Care has offered 6 research fellowships in animal policy development. These fellow-



ships have been granted to young scientists to provide training in the implementation of the Three Rs. Each fellowship has addressed a different topic: genetically engineered animals; shellfish toxin testing; vaccine testing; public perception of animal based research; pain mitigation and the use of animals for teaching/training. Each research fellowship examined the challenges and opportunities to the implementation of the Three Rs, albeit in very different areas. The studies carried out resulted in at least one peer-reviewed publication authored by the research fellows. Currently, no CCAC research

fellowships are being offered, due to funding issues. However, the pause has provided an opportunity to analyse the effectiveness of the research fellowships, and to identify the necessary elements for their future stability. A survey was carried out to engage a wide range of individuals who had some interaction with at least one of the research fellows. The results of the survey will be discussed, as an opportunity to offer the concept of training fellowships as a way to encourage future implementation of the Three Rs.

Session III-1: Poster presentations

III-1-072

Survey of Canadian research and teaching institutions on strategies for implementation of the Three Rs

A. Plante and J. Alcorn

Research Ethics Office, University of Saskatchewan, Saskatoon, Canada

amanda.plante@usask.ca

The Canadian Council on Animal Care (CCAC) guidelines provide assistance in the implementation of best practices and achievement of Russell and Burch's Three Rs for animal use in science. Two CCAC guidance documents (Canadian Council on Animal Care, 1997, 2006) suggest animal use protocols include details on replacement, reduction and refinement, as one strategy for implementation of the Three Rs. To identify, more comprehensively, current and proposed strategies for Three Rs implementation, we conducted a survey of Canadian institutions to query how they encourage investigators to incorporate Three Rs principles in their research or teaching programs. The survey gathered information on the size and type of animal care program, challenges and the various strategies employed with respect to implementing the Three Rs. The survey also asked institutions to provide specific examples to illustrate how investigators purposefully address the Three Rs within their research or teaching programs. The data is collated and presented descriptively but clearly identifies the survey as a useful tool to collect information from the various institutions. We intend to share the information with Canadian institutions so that they may institute new ideas or procedures for Three Rs implementation into their institution's animal care and use program.

References

- Canadian Council on Animal Care (1997). Guidelines on: animal use protocol review. http://www.ccac.ca/Documents/Standards/Guidelines/Protocol_Review.pdf
- Canadian Council on Animal Care (2006). Terms of reference for animal care committees. http://www.ccac.ca/Documents/Standards/Policies/Terms_of_reference_for_ACC.pdf

III-1-165 *

Experience in the use of alternatives to animal experimentation in the learning capability of undergraduate students of human physiology at the Universidad de Guadalajara, Centro Universitario de la Costa 2008 to 2014

V. Rojas-Sahagún, S. Viruete-Cisneros, R. Preciado-González, M. Greig, K. Barrios-Pérez, L. Villaseñor-Loeza, J. Esparza-Barajas, A. Delgado-Romero, P. Santiago-Teodoro and N. Mera-Riofrio

Departamento de Ciencias Médica, Centro Universitario de la Costa, Puerto Vallarta, Mexico

vicleunam@me.com

The complexity of teaching is increasing with the advancement of scientific knowledge. The level of detail at which science needs to be explained in any field of knowledge makes observation and macroscopic experiments insufficient.

Health education is a challenge: imparting knowledge to explain life using all the resources available and implementing new strategies to facilitate this transfer of knowledge.

Animals have been used in scientific research in many ways, allowing the advancement of scientific knowledge in human and veterinary medicine as well as in the chemical industry (Nuffield Council on Bioethics, 2005).

New alternatives to the use of animal models can replace old models that injure and destroy lives of animals.

The methodology used in the world include the following: Models, mannequins and mechanical simulators; Simulation and virtual reality in computers (Dewhurst, 2006); Experimentation in humans and plants; Use of biological material from slaughterhouses; *In vitro* cell lines studies; Reuse of dead animals from donations (Vinardell, 2012).



Multiple studies have attempted to measure the level of effectiveness based on the use of these alternative learning methods based on computers (Dewhurst, 2004; Clarke, 1987).

Results: 65% of surveyed agreed that animals are not necessary in health education, 56% indicated learning better with autoexperimentation and 76% concluded that alternatives are better.

References

- Clarke, K. A. (1987). *Altern Lab Anim* 14, 134-140.
 Dewhurst, D. (2004). *Altern Lab Anim* 32, Suppl 1, 565-567.
 Dewhurst, D. (2006). *ALTEX* 23, 197-201.
 Nuffield Council on Bioethics (2005). The ethics of research involving animals.
 Vinardell, M. P. (2012). *ALTEX Proc* 1, 351-353.

* Supported by Young Scientists Travel Awards provided by ACT Germany and the German Foundation SET.

III-1-222

An Indian educational initiative to promote the use of alternatives to animal testing with special reference to 3D reconstructed human tissues

A. Riyasdeen¹, C. Pellevoisin², A. Alonso² and M. A. Akbarsha¹

¹Mahatma Gandhi-Doerenkamp Center for Alternatives to Use of Animals in Life Science Education, Bharathidasan University, Tiruchirappalli, India; ²SkinEthic Academy, SkinEthic, Lyon, France
 cpellevoisin@skinethic.com

In 2013, the Mahatma Gandhi Doerenkamp Center and SkinEthic Academy signed a partnership to organize a yearly national workshop on alternative methods to animal testing. The aim of this workshop is to increase awareness to 3R by illustrating how *in vitro* alternative methods have revolutionized modern toxicology and to train people to handle human reconstructed epidermis in the context of validated *in vitro* method for skin corrosion/irritation.

The workshop is an outcome of the effort of MGDC in propagating modern tools for risk assessment to the Indian community and the commitment of SkinEthic Academy to promote 3R and the use of alternative methods based on 3D reconstructed human tissues. The workshop is organized in a phased manner. The first leg of workshop is held for faculties and scientists from universities and research institutes. The second leg is for scientists from cosmetic, pharma and CROs. The workshop schedule is aptly distributed between lectures, hands-on and interactive sessions.

The decision in 2013 to ban animal testing for cosmetics in India reinforces the importance of such workshop to participate to the constitution of a community of scientists and toxicologist able to implement current alternative to animal tests and to develop new alternative strategies.

III-1-263

Continuous education and trainings promotes the 3Rs alternative methods development in China

C. Shujun

Toxicology, Guangdong Inspection & Quarantine Technology Center (GDCIQ), Guangzhou, China
 chengciq@gmail.com

Since 1990s, the 3Rs principles have begun to be known in China. Compared to Europe with a long tradition of animal warfare, 3Rs alternative technology in China is progressing slowly. In recent decade, China is undergoing significant changes. Several workshops and trainings hosted by GDCIQ have played a positive role in outspread of 3Rs, in which nearly 200 people from different industries attended. An alternative organisation, the Chinese Centre for Alternatives Research and Evaluation (CCARE), was established for sharing information and resources in 2007. The first Chinese alternative textbook, *Alternative Laboratory Animal Methods Principles and Applications*, was published in 2010 with the support from international contributors; another book, *Alternative Animal Testing Guideline*, will be published soon. With the support of EPAA, the Chinese version of *the three Rs and Humane Criterion* has been issued for the 55th anniversary of Russell and Burch's marvellous book *The Principles of Humane Experimental Technique*. Thousands of copies have been provided free of charge to Chinese public libraries and universities. With the cooperation of ECVAM, IIVS and other organizations, we are constantly making progress in this field. It is believed that continuous education and trainings will promote 3Rs alternative forward in China.

References

- Cheng, S. J. (2010). *Alternative Laboratory Animal Methods Principles and Applications*, China Science Press.
 Cheng, S. J. (2014). Chinese Version of *The three Rs and Humane Criterion* (Balls M., 2009), China Science Press.

III-1-324

Student perspectives on harmful animal use as a teaching method in the life sciences

M. Moreno

Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León, Monterrey, Mexico
 marianacasper@gmail.com

Practices involving harmful animal use are still employed as a teaching method in the life sciences at the Autonomous University of Nuevo Leon in Mexico. Several students have expressed their unwillingness to participate in these labs, which are an obligatory requirement. To address this problem, surveys were designed to assess the students' perception and attitude towards these practices. They were conducted upon 576 students from the following majors: Biology, Parasitology and Biotechnology. A Likert Scale was used, in which students were asked to express their degree of approval towards specific statements or questions. Simple yes or no questions were also included. The results overwhelmingly favored the use of alternatives. Fifty two percent expressed having felt an ethical conflict when performing these practices, yet only twenty percent voiced their concern to their teachers. Eighty five percent declared that they would prefer to use an alternative, and ninety four percent stated that they support the implementation of a conscientious objection policy. These positive results prompted the director of the Biology School to take an active interest in the issue and the School has now begun to take steps towards replacing harmful animal use with humane alternatives.



III-1-517

Conscientious objection to harmful animal use within veterinary and other biomedical education

A. Knight

Clinical Sciences Department, Ross University School of Veterinary Medicine, Basseterre, Saint Kitts and Nevis

aknight@rossvet.edu.kn

Laboratory classes in which animals are seriously harmed or killed, or which use cadavers or body parts from ethically debatable sources, are controversial within veterinary and other biomedical curricula. Along with the development of more humane teaching methods, this has increasingly led to objections to participation in harmful animal use. Such cases raise a host of issues of importance to universities, including those pertaining to curricular design and course accreditation, and compliance with applicable animal welfare and antidiscrimination legislation. Accordingly, after detailed investigation, some universities have implemented formal policies to guide faculty responses to such cases, and to ensure that decisions are consistent and defensible from legal and other policy perspectives. However, many other institutions have not yet done so, instead dealing with such cases on an ad hoc basis as they arise. Among other undesirable outcomes this can lead to insufficient student and faculty preparation, suboptimal and inconsistent responses, and greater likelihood of legal challenge. Accordingly, this paper provides pertinent information about the evolution of conscientious objection policies within Australian veterinary schools, and about the jurisprudential bases for conscientious objection within Australia and the USA. It concludes with recommendations for the development and implementation of policy within this arena.

III-1-566

An inspiring book telling the personal stories on the replacement, reduction and refinement of laboratory animal use

M. Schilders-van Boxel and I. Toussaint

Netherlands Knowledge Centre on Alternatives to animal use (NKCA), Utrecht University, Utrecht, The Netherlands

marjoleinschildersvanboxel@gmail.com

In 2012 and 2013, Inge Toussaint from the Netherlands Knowledge Centre on Alternatives to animal use (NKCA) interviewed 56 experts involved in the Replacement, Reduction and Refinement (3R's) of laboratory animal use, including Coenraad Hendriksen, Bert van Zutphen, Vera Rogiers, Herman Koëter, Marie-Jeanne Schiffelers and Erwin L. Roggen. The interviews nicely illustrate the dilemma's, opportunities and barriers that appear on the long road from development to implementation of 3R-alternatives. Their stories show that there is not a straightforward, easy way to implement 3R-methods. Some of these experts even claim that the 3R-principle has become outdated and that there is a need for a completely new approach. Initially these interviews were only published online. In December 2013 "De V van Verhalen" was published, in which all interviews were brought together in a beautifully designed hardcover book. Illustrations were done by NKCA employee Marjolein Schilders-van Boxel. The book was made available to schools, animal laboratories, researchers, policymakers, animal protection organizations, science journalists and individual persons, all free of charge, and it has been highly valued. Currently, the book is only available in Dutch, but the NKCA would be interested in publishing it in English as well.

III-1-576

EPA's toxicity forecaster research effort communications and outreach overview

M. Linnenbrink

Office of Research and Development, US Environmental Protection Agency, Research Triangle Park, North Carolina, USA

linnenbrink.monica@epa.gov

Recent scientific advances provide innovative solutions to persistent and pervasive issues facing risk assessments and policy decisions made about the safety of chemicals. USEPA has been using *in vitro* testing methods to accelerate the pace of chemical evaluations, reduce reliance on animals, and address the lack of data on the thousands of chemicals. In 2013, EPA's Toxicity Forecaster effort released high-throughput screening data on 1,800 chemicals. These chemicals were screened for potential health effects in ~800 HTS assays. All data is publicly available for stakeholders to analyze and use to help inform chemical safety decisions. Using ToxCast requires changing a regulatory paradigm that has been used for decades. EPA recognized early that an outreach strategy with the goal of helping increase usage and analysis of the data was needed. This presentation will describe EPA's strategy including an overview of:

- Communication and outreach goals and approach and how EPA is measuring effectiveness.
- Summaries of research collaborations and stakeholder groups.
- Strategies implemented (Communities of Practice, websites, videos, scientific media outreach, educational workshops, research collaborations worldwide, requesting stakeholder feedback) and information about which strategies were the most successful.
- Summary of stakeholder feedback.
- Future plans for outreach efforts.

For more information: <http://www.epa.gov/comptox>

III-1-609

4-year experience teaching alternative methods to animal use in toxicology

F. Caloni

Department of Health, Animal Science and Food Safety (VESPA), Università degli Studi di Milano, Milan, Italy

francesca.caloni@unimi.it

Since AY 2010/2011, a course for students with bachelor's degree in sciences has been offered at the University of Milan, Master of Veterinary Biotechnology Sciences titled "Alternative Methods to Animal Use in Toxicology" (Caloni et al., 2011). Several topics include contextual laboratory activities featuring the illustration and protocol of the main *in vitro* toxicological tests. An *ad hoc* lesson is reserved for the illustration of *in silico* models, provided by experts. An interactive approach adopted during the course, through video conferences and workshops with national and international speakers proved to be very effective for students. At the end of each lesson, the feedback of the students is requested through a questionnaire with 4/5 questions about the specific topic, in order to assess learning capacity. Finally the students are also asked to investigate an *ongoing* issue with a critical approach by providing ideas and possible improvements through presentations or display of posters, followed by a discussion. The result after 4 years is definitely positive, with high appreciation by students. For the next AY 2014/2015, a mandatory course in the first



year titled “Alternative Methods in Toxicology” is planned, in addition to the “*In vitro* toxicology” course within a specific curriculum in the second year.

Reference

Caloni, F. (2011). Course on alternative methods to animal use in toxicology in the veterinary faculty of Milan. *ALTEX* 28, 214.

III-1-627

Graduate training program BB3R

V. Kral¹, G. Weindl¹, J. Plendl², H. Fink², B. Kleuser³, A. Pries⁴, R. Preissner⁴, A. Luch⁵, G. Schönfelder⁶, R. Lauster⁷, M. Weber⁸ and M. Schäfer-Korting¹

¹Institute of Pharmacy, Freie Universität Berlin, Berlin, Germany;

²Department of Veterinary Medicine, Freie Universität Berlin, Berlin, Germany; ³Institute of Nutritional Science, University of Potsdam, Potsdam, Germany; ⁴Institute of Physiologie, Charité – Universitätsmedizin Berlin, Berlin, Germany; ⁵Department for Product Safety, German Federal Institute for Risk Assessment (BfR), Berlin, Germany; ⁶Department of Experimental Toxicology and ZEBET, German Federal Institute for Risk Assessment (BfR), Berlin, Germany; ⁷Institute of Biotechnology, Technische Universität Berlin, Berlin, Germany; ⁸Zuse Institut Berlin, Berlin, Germany

vivian.kral@fu-berlin.de

In April 2014, Berlin-Brandenburg research platform BB3R with integrated graduate program “Innovations in the 3R Research – Genetic engineering, tissue engineering and bioinformatics” has been established. The BB3R graduate program aims to prepare doctoral students and junior professors for later career in the field of life science or science administration.

The post-graduate qualification is based on the own research project of the PhD student and is supplemented by a broad, clearly structured training program in the wide field of 3R. Every PhD student is supervised by a team of three professors (research survey and personal mentoring).

The graduate program includes compulsory courses offered in spring schools (seminars and practical training) of alternative test methods and laboratory animal science and a forum for ethics and laws. The professional development program includes targeted training and workshops for transferable skills and provides mentoring, coaching and individual support in the career planning. Training of related methods in a lab of a research partner is recognized as elective course. In addition, the PhD students can attend seminars of the Dahlem Research School (DRS), established under the Excellence Competition of German universities, covering the fields of academic performance, managerial skills, information technology/languages and career development.

III-1-678

Experiments on animals: ideals of humane education & real practice

I. Merkulova¹, T. Mishatkina² and T. Hlinkina³

¹Department of Environmental Medicine, International Sakharov Environmental University, Minsk, Belarus; ²Department of Philosophy, International Sakharov Environmental University, Minsk, Belarus; ³Central Research Laboratory, International Sakharov Environmental University, Minsk, Belarus

inna_mer@mail.ru

In the frame of the UNESCO project 3-level system of bioethics education, including ethical issues of animal experimentation in life sci-

ence, has been formed in Belarus in the last decade. Training courses, curricula, textbooks and guidance manuals have been developed. Owing to co-operation with InterNICHE and Russian Animal Center Rights educational animal-free courses have been introduced in some Belarusian universities. The workshops on actual ethical issues of humane education and experimentation take place annually at International Scientific Conference “Sakharov Readings”.

Nevertheless, the practical application of 3Rs concept has local and sporadic character due to experience shortage of institutionalization process and ethics management by modern managerial techniques. So in Belarus there is no law on the protection of animals, alternatives are not included in the biomedical and veterinary educational standards. Obligatory ethical expertise of biomedical research on animals and GLP standards are not completely and widely applicable. Dissemination of alternatives to everyday practice is limited by high cost of modern models and small number of teaching materials in Russian.

III-1-708

Humane alternatives application on biology school lessons for the purposes of eco-ethical thinking formation among youth

L. M. Loginovskaya

Department of Pedagogy, Belarusian State Pedagogical University named after Maxim Tank, Minsk, Belarus

ouranimal@gmail.com

Formation of eco-ethical thinking among youth is a complex, multistage process. A school educational system plays a significant role in creating the preconditions for this type of thinking. Training and education of adolescents during biology school lessons provide large opportunities in this regard.

For many years in Belarus adolescents during of the course “Zoology” were forced to get acquainted with the animal world by using sacrificed and canned or dried animals. This led to the development of the younger generation utilitarian way of thinking.

Nowadays, thanks largely to the development of computer technologies, the application of humane alternatives (such as video and audio materials, multi-media presentations, etc.) during biology lessons has become possible.

Modern approach with application of humane alternatives has been introduced in course “Zoology” in secondary school 98, Minsk, Belarus. Furthermore, during studying the course “Human Anatomy” students become acquainted with the program “Virtual Physiology” and were informed about the existence of humane alternatives to experiments on animals, which they could use in the future in higher education.

III-1-824

Humanising and modernising medical education: change in the Ukraine

I. Strelchenko¹, D. Leporsky² and N. Jukes³

¹Department of Physiology, Donetsk National Medical University, Donetsk, Ukraine; ²InterNICHE Ukraine and Kharkiv Regional Society for the Protection of Animals, Kharkiv, Ukraine;

³InterNICHE, Leicester, UK

pero@hotmail.ru

An important element of enhancing the teaching process for future medical doctors is to make it humane. In 2012, following national and international media exposure of very poor conditions and severe animal experiments at Donetsk National Medical University, the De-



partment of Physiology signed an agreement with InterNICHE and Doctors Against Animal Experiments (DAAE) (Germany) to develop collaboration and to fully replace animal use in practical classes. In 2013, the Department of Pathological Physiology signed a similar agreement. InterNICHE and DAAE donated laptop computers, multimedia projectors, models, trainers, interactive multimedia software, and video films on DVD. Approximately 90% of the animal use was replaced over a period of several months, and the final 10% is being

replaced over one year. The annual use of over 700 animals in physiology and over 5000 animals in pathological physiology has been ended. The departments value the concept of humane education and the possibility to implement replacement alternatives. In addition, the impact of interactive learning approaches and computer literacy in helping to modernise medical education in the Ukraine is being recognised.

Session III-2: Funding agencies and funding programs

Co-chairs

Takashoi Omori, Doshisha University, Japan

Vicky Robinson, NC3Rs, UK

Session III-2: Oral presentations

III-2-024

The Danish 3R-Centre

C. L. Nellemann, L. B. Broenden and T. Bengtsen

The Danish 3R-Centre, Ministry of Food, Agriculture and Fisheries, Copenhagen, Denmark

clne@food.dtu.dk

Background: The new Danish 3R-Centre was established in 2013, as a unique collaboration between government, the pharmaceutical industry and animal welfare organizations. The centre works to promote alternatives to animal testing (replacement), increase awareness of methods that use fewer animals (reduction) and endorse improvements to scientific procedures and husbandry which minimise pain and suffering and improve animal welfare in situations where the use of animals is unavoidable (refinement).

Materials and methods / Who and how: The centre has a Board consisting of seven recognized experts within the field. They are actively involved in the development of alternatives and animal testing in practice. A Secretariat assists the board in their daily work. The role of the centre is to collect and disseminate knowledge as well as initiate and support research within the 3R's.

Mission: The 3R-Centre will:

- work to initiate useful activities that may lead to the immediate implementation of the 3Rs.
- provide a forum for collaboration, discussion, exchange and dissemination of information on the 3Rs.
- initiate research projects and recommend funds allocation of resources within the area.

Vision: It is the goal of the Danish 3R-Centre to generate a leading environment within the implementation and dissemination of the 3R'er.

III-2-296

Contribution from the European research framework programmes to the 3Rs

C. Desaintes, B. Mulligan and A. Hoeveler

DG Research & Innovation, European Commission, Brussels, Belgium

christian.desaintes@ec.europa.eu

The European Commission (EC) has contributed significantly to research into the 3Rs. Besides the scientific validation of alternative methods to animal testing by EURL ECVAM, the EC has been supporting research into the 3Rs through successive research Framework Programmes (FP). During FP7 (2007-2013), around €200 million have been dedicated to animal-free toxicology projects. As part of this effort, six large projects have been co-financed as public-private partnerships with either Cosmetics Europe (SEURAT-1), or the European Federation of Pharmaceutical Industries and Associations (5 projects from the Innovative Medicines Initiative: IMI). Indirect contributions to other areas of the 3Rs have also been provided by numerous FP7 research projects as part of the health programme. Horizon 2020, the new research & Innovation FP (2014-2020), will provide further opportunities to advance research into the 3Rs. In its 2015 call for proposals, €30 million will be allocated to non-animal approaches to predictive safety (<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2283-phc-33-2015.html>). Details of the call will be presented at this Congress. Projects contributing to the 3Rs might be further supported through subsequent Horizon 2020 calls, as well as by the renewed IMI-2 public-private partnership[4].

III-2-374

More than 20 "years" research funding by ZEBET – measures and impact

G. Schoenfelder^{1,2}, D. Butzke¹, B. Grune¹, C. Roehl¹, A. E. M. Seiler¹, M. Steinfath¹ and M. Oelgeschlaeger¹

¹Experimental Toxicology and ZEBET, Federal Institute for Risk Assessment (BfR), Berlin, Germany; ²Institute of Clinical Pharmacology and Toxicology, Charité-Universitaetsmedizin Berlin, Berlin, Germany

gilbert.schoenfelder@bfr.bund.de

Research funding is a general instrument trying to promote the advancement of science by providing financial and organizational resources. Particularly, research funding is an appropriate action for those research areas, which are currently underestimated, where data gaps exist, and where a vision needs to be pursued. In 1959 William Russell and Rex Burch published already the 3R principle. At a time, as science on reduction, refinement, and replacement was not the highest priority. ZEBET (The Centre for the Documentation and Evalu-



ation of Alternatives to Animal Experiments at the German Federal Institute for Risk Assessment (BfR) has therefore placed immediately after its establishment in 1989 a research program that over a reasonable period of time as part of a proof-of-concept study initiated science linked to the 3R principle. From this time on, a variety of experimental methods were developed, such as computer-based *in silico* methods, as well as cell-based models for toxicological studies on xenobiotic metabolism for the replacement and reduction of animal testing for toxicological purposes. In the future, the BfR will promote through its ZEBET funding program not only 3R research in the field of toxicology but especially in basic research. The focus of the research will be more and more based on translational research approaches.

III-2-647

Advancing safety science and health research under Horizon 2020 with modern, human biology-based tools

T. Seidle

Research & Toxicology Department, Humane Society International, Toronto, Canada

tseidle@hsi.org

The European Union has long been a world leader in funding “3Rs” research to replace, reduce or refine animal use in toxicity testing through its multiannual research framework programs. Funding priorities have historically been driven by policy demands of EU legislation (e.g., cosmetics and chemicals) for near-term replacement of specific animal tests, and have led to a series of large-scale integrated projects focused on particular toxicological endpoints. Although this approach has not been without its successes, the overall return on investment has been limited in terms of measurably reducing animal use. Moreover, these investments have tended to overlook the wider bioscience domain, which accounts for a substantially larger proportion of animal use than toxicology. This presentation will discuss an initiative by Humane Society International to influence the EU’s new research and innovation framework program, Horizon 2020, and entrench key directional language within the legal framework to prioritize funding for research and infrastructures needed to fully replace animal use in toxicity testing, and to deliver promising new tools for human health research (i.e., uncovering adverse outcome/disease pathways, development of human biology-based *in vitro* assays to detect pathway perturbations, next-generation *in silico* models and decision tools for risk assessment, etc.).

III-2-793

Experience from a UK 3Rs research funder

V. Robinson

NC3Rs, London, UK

vicky.robinson@nc3rs.org.uk

It is now ten years since the NC3Rs was launched. During this time we have introduced a number of funding schemes to support research, and early career training and development. This presentation will cover our experience as a 3Rs research funder including lessons learnt. It will focus on the impacts of the science we have supported.

III-2-208

Motivating synthesis of evidence part of more knowledge with fewer animals programme

E. van Oort, C. Schuttevaer, R. Diemel and U. Gangaram Panday

Team science and innovation, ZonMw, The Hague, The Netherlands
e.oort@zonmw.nl

The More Knowledge with Fewer Animals programme, is developed by the Netherlands Organisation for Health Research and Development (ZonMw). The programme aims to reduce the use of animal testing, without impairing the quality of scientific research and the safety of developed products. The programme is subdivided into modules with varying focus, aiming at developing 3R methods across a broad spectrum. Three modules are commissioned, one module promotes and develops 3R knowledge infrastructure. The focus of this module is divided into two parts: First part, by stimulating the performance of a synthesis of evidence by biomedical researchers. Second part, by stimulating the publication of solid negative results of animal experiments. Hands-on workshops “*From information to knowledge through systematic reviews*” are organised by SYRCLE in collaboration with ZonMw. Junior and senior researchers, involved in animal experiments, are invited to join the workshop. To stimulate publication of solid negative experimental results, researchers can apply for compensation of a one month salary in order to publish their negative results. Publications must be in peer reviewed, open access journals and researchers are required to use the “GSP Checklist” or “ARRIVE” in order to improve both the accessibility and the quality of the published results.



Session III-3: Innovative teaching and training tools

Co-chairs

Hans A. Braun, Philipps University, Marburg, Germany

Nick Jukes, InterNICHE, UK

Session III-3: Oral presentations

III-3-247

Evaluation of the multimediaroom/ training clinic at the Norwegian University of Life Sciences

K. Hansen¹, K. Smith² and A. Smith²

¹Section of Experimental Biomedicine, Norwegian University of Life Sciences, Oslo, Norway; ²Norecopa, Norwegian Veterinary Institute, Oslo, Norway

kristine.hansen@nmbu.no

At WC8 in 2011 we presented the Multimedia Room/Training Clinic at the Norwegian School of Veterinary Science (now part of the Norwegian University of Life Sciences). One of the conclusions at WC8 was the need for more research into the use of such facilities. In 2012 a simple questionnaire was used to assess the students' self-confidence in anatomy, physiology and basic clinical skills such as blood sampling from dogs.

There was a significant increase in the students' self-confidence in performing basic clinical skills after the Multimedia Room/Training Clinic was opened in 2009. While we cannot conclude categorically that this improvement was caused solely by use of the new facilities, the results agree closely with our subjective impressions, following discussions with the students. The results were published in the Norwegian Veterinary Journal in 2014 and will be presented here.

Other benefits include easier access to multimedia and training products for the students, and lower running costs after the initial investment. This is likely to become even more cost-efficient as the number of students enrolled on these courses increases, compared to traditional teaching methods.

Reference

Hansen, K., Smith, K. and Smith, A. (2014). *Norsk Veterinærtidsskrift*, 126, 13-16.

III-3-497

The potential of *Drosophila* in neurosciences – education of undergraduates and junior researchers

S. J. Sigrist

Neurogenetik, Freie Universität Berlin, Berlin, Germany

stephan.sigrist@fu-berlin.de

Many practical and ethical obstacles severely limit the scope for experiments using mammals in fundamental biology and biomedical science. Invertebrate models are an increasingly appealing alternative. Simplicity and economy of breeding and housing in combination with extremely powerful genetics have made the fruit fly *Drosophila* a predominant model to understand how genes direct the development of an embryo from a single cell to a mature multicellular organism. Many

of the genes that they defined as being important for fly development have since been shown to be critical for all animal development, including humans. Particularly, many of the underlying building blocks and engineering processes have been conserved through evolution and are strikingly similar. Over the last three decades, the use of *Drosophila* has been extended into areas as learning, behavior, and aging. I will present exemplary studies demonstrating the versatility of *Drosophila* for studying elementary mechanisms of cognitive aging (Gupta et al., 2013), and ways of protecting from it. Moreover, I will discuss and illustrate of how we use *Drosophila* in the education of undergraduates and junior researchers.

Reference

Gupta, V. K., Scheunemann, L., Eisenberg, T. et al. (2013). *Nat Neurosci* 16, 1453-1460.

III-3-516

The birth of “SimDonkey”: the develop of a high fidelity donkey patient simulator

A. Knight¹, R. Adams², D. Pederson² and E. Bauman²

¹Clinical Sciences Department, Ross University School of Veterinary Medicine, Basseterre, Saint Kitts and Nevis; ²Institute for Research and Clinical Strategy; Center for Excellence in Simulation Education, DeVry Education Group, Downers Grove, IL, USA

aknight@rossvet.edu.kn

High fidelity human patient simulators (HPSs) provide medical students with opportunities to develop important clinical competencies, including technical skills, clinical reasoning, teamwork and communication, within environments which are reasonably realistic, yet comparatively stress free. However, very few high fidelity animal patient simulators have been developed for use by veterinary students. Accordingly, we transferred working parts from “SimMan” – a high fidelity HPS – into an animal mannequin. We chose a donkey – subsequently “SimDonkey” – for several reasons. The size of the HPS circuitry and equipment precluded the use of a smaller mannequin. Additionally, we make significant use of donkeys in our clinical training program, and there remains a dearth of simulators for teaching equine clinical skills. Our SimDonkey has a range of cardiovascular and respiratory features derived from the HPS, including bilaterally palpable pulses in the regions of the carotid arteries and front legs, an airway that can be intubated, with or without a range of intubation problems, spontaneous chest excursions to simulate breathing, auscultable heart and breath sounds, with a range of pathologies available, and ECG and defibrillation connection points – although the internal structure of this mannequin, including its potentially inflammable components, currently preclude defibrillation.



III-3-537

Successful replacement of animals with a CAL software in pharmacology education

S. Manikandan and R. Raveendran

Department of Pharmacology, Jawaharlal Institute of Postgraduate Medical Education (JIPMER), Pondicherry, India

dr.ravee@gmail.com

Our department has been striving hard to replace animals with alternatives in education (Raveendran and Gitanjali, 2011) and was able to completely replace the animal experiments by incorporating the “ExPharm Pro” software (written by the last author) in undergraduate syllabus. ExPharm Pro (<http://www.animalsimulator.com>) is a new and online version of ExPharm and includes many new features such as pre-test, post-test, full experimental set up, data entry page, logs and admin features. It can simulate 5 animal experiments each of which includes a learning module and 2-3 examination modules. The software was introduced in the syllabus in 2012 for medical undergraduates doing a course in pharmacology in our institution after removing all the animal experiments. After demonstration of each simulated animal experiment in a regular practical class, the students were asked to perform the experiment individually in the department computer laboratory. One batch of students completed the course in December 2013 and took the final examination using the software. The new method worked well as indicated by the successful and smooth completion of the course and the examination. The general feedback was good and our experience demonstrates the successful replacement of animals using a CAL software without compromising the quality of education.

Reference

Raveendran, R. and Gitanjali, B. (2011). *ALTEX Proc 1*, 355-360.

III-3-600

The real and virtual laboratory: computer simulations in life science education and research

H. A. Braun¹, S. Postnova², K. Voigt¹ and A. Tchaptchet¹

¹Institute of Physiology, Philipps University of Marburg, Marburg, Germany; ²Complex Systems Group, School of Physics & CIRUS, University of Sydney, Sydney, Australia

braun@staff.uni-marburg.de

The Marburg Neurodynamics group combines the experience from experimental studies with profound knowledge of mathematical simulations to develop realistically appearing computer models for education and mechanism-based models for research.

The educational tools, the “Virtual Physiology” series (SimNerv, SimMuscle, SimHeart, etc.) are already used since many years at universities and schools all over the world in refinement and/or replacement of animal experiments (Bahar, 2001; Braun, 2003). They are

currently reprogrammed as platform independent versions with new features (demoversions at <http://www.virtual-physiology.com>).

Likewise, advanced mathematical simulations can significantly reduce the number of animal experiments and clinical studies. According to the goals of a huge EU Network of Excellence (BioSim, <http://en.wikipedia.org/wiki/BioSim>), the idea is to make use of computer simulations for the design of more goal directed experimental and clinical studies at universities as well as pharmaceutical companies thereby avoiding unnecessary suffering of animals as well as of patients – at lower costs.

Examples from own research (Postnova et al., 2010; Tchaptchet et al., 2013) shall illustrate how simplified, nevertheless realistic models of neurons and synapses can be designed that allow to consider all major drug effects and that can be connected to models of higher autonomic and mental functions for the examination of their disturbances and the evaluation of more effective treatment.

References

- Bahar, S. (2001). Newsletter of the division of biological physics of the american physical society (<http://www.aps.org/DBP/newsletter/jun01.pdf>), *Vol.1, Nr.1*, June 2001, 5-7
- Braun, H. A. (2003). Virtual versus real laboratories in life-science education: Concepts and experiences. In N. Jukes and M. Chiuiia (eds.), *From guinea pig to computer mouse* (81-87). Interniche.
- Postnova, S., Rosa, E. and Braun, H. A. (2010). *Pharmacopsychiatry* 43, S82-S91.
- Tchaptchet, A., Postnova, S., Finke, C. et al. (2013). *Brain Res* 1536, 159-167.

III-3-882

A review of alternative tools and approaches in education and training

N. Jukes

InterNICHE, Leicester, UK

coordinator@interniche.org

Replacement alternatives in medical, veterinary medical and biology education and training include non-animal tools and ethical animal-based approaches. The non-animal methods comprise the use of models, mannekins, video, simulators, multimedia software and virtual reality. Alternative approaches such as the use of ethically sourced animal cadavers, clinical learning opportunities with animal patients, *in vitro* laboratories, and ethical fieldwork do involve animals, but in ways that are ethically neutral or that benefit individual animals. According to the InterNICHE Policy they are considered replacement methods because they can replace harmful animal use. Student self-experimentation is another alternative, and involves consenting human animals. This presentation will review the different types of alternatives and the teaching objectives they can help meet. It will explore the pedagogical, ethical and economic advantages they have over dissections of purpose-killed animals, animal experiments and other instrumental animal use. Examples of specific products and case studies of implementation will illustrate how these humane and innovative methods are seen less as “alternatives” and increasingly as the norm.



Session III-3: Poster presentations

III-3-119

NORINA: information on animal alternatives in a changing world

K. Smith

Norecopa, c/o Norwegian Veterinary Institute, Oslo, Norway

karina.smith@vetinst.no

The introduction of the personal computer in the 1980's made it possible to produce simple computer simulations to replace the classical animal experiments performed in physiology and pharmacology classes. Increasing resistance to the use of animals in schools led to the production of dissection alternatives. The NORINA database (<http://oslovet.norecopa.no/NORINA>) was launched in 1991 to provide a source of global information, since many items were produced by small companies or university departments with little advertising. A supplementary database, TextBase, was produced to provide information on written material (e.g., anatomical illustrations) and textbooks within laboratory animal science.

Many of the technologies in use 20 years ago are, however, irrelevant to course providers today, and students expect to find material for the latest platforms. In addition, many suppliers have ceased to operate, changed address or placed their products on the web. Similar developments are occurring within human medicine, and some products are almost directly transferable for the replacement or reduction of animal use.

This presentation will describe the developments within the area of animal alternatives, highlight the ways in which educators can contribute to the process and describe how NORINA has evolved to meet today's needs.

III-3-188

Development of the new Korean teaching aids on the Three Rs principles: translation of "the Three Rs and the humanity criterion"

B. I. Choe¹, G. H. Lee^{1,2}, B. H. Lee³, S. Trigwell⁴ and M. Balls⁴

¹Nicholas Cardinal Cheong Graduate School for Life, The Catholic University of Korea, Seoul, South Korea; ²CITI-KOREA, Seoul, South Korea; ³Laboratory Animal Center, Osong Medical Innovation Foundation, Chungbuk, South Korea; ⁴FRAME, Russell & Burch House, Nottingham, UK

bichoe@catholic.ac.kr

The principles of the Three Rs of Russell and Burch (*Replacement, Reduction and Refinement*) have now been guiding animal use for more than 50 years. In 2008, this came into effect to Korean law and a number of activities toward promoting the Three Rs have been undertaken ever since. Despite such a ground-breaking publication of *The Principles of Humane Experimental Technique* over half a century ago, and an abridged version *The Three Rs and the Humanity Criterion*, which is written more simply and accessibly for non-English readers, it is still necessary to read certain sentences over and over again to access the meaning. We have finally been able to address the ongoing absence of Korean teaching aids relating to the general basic theory and concepts of the Three Rs. This paper details the development of the new Korean teaching aids on the Three Rs based on *The*

Three Rs and the Humanity Criterion. This book is designed for academic textbook and teaching aids in the field of bioscience. It provides user-friendly instructions and informative graphics including Korean legal requirements. It is designed as a loose-leaf publication which is suitable for regular updating.

III-3-194

Animal alternatives in veterinary teaching-status and scope in an Indian veterinary university

A. B. Jacob¹, C. Leena¹ and M. R. Saseendranath²

¹College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Kalpetta, India; ²Directorate of Academics and Research, Kerala Veterinary and Animal Sciences University, Kalpetta, India

anibencyjacob@gmail.com

In India, animal experimentation is restricted in veterinary curriculum due to intervention of Animal Welfare Board. Various alternative tools, i.e., histological/ histopathological slides, video demonstrations, preserved specimens, phantom box technique have been used in veterinary teaching since long back to address this issue. A survey with various faculty members revealed that many alternatives which are used in other countries have application in Indian veterinary curriculum. Ethically sourced cadavers, which provide real tissue feeling, can be a good educational aid in veterinary anatomy, pathology and surgery. Rumen Simulation technique and Hohenheim gas production Techniques are some *in vitro* tools to analyze feed degradability, volatile fatty acids and rumen microbes, which replace painful rumen fistulation and relevant in nutrition and physiology. Videos of well performed dissection, surgery and autopsy, animal models, surgical training models and mannequins (animal handling, blood collection and intubation) have good application in the field of veterinary surgery, anatomy, pathology and medicine. Mannequins can be well utilized in veterinary gynaecology to study foetal presentation. However, many of the faculty members remain unaware of the tremendous scope of the alternatives. Therefore, wide awareness on the use of animal alternatives should be given before its popularization.

III-3-409 *

Peer mentoring and alternatives to using animals as a strategy for education in the life sciences

A. Meneses-Parga, S. Viruete-Cisneros, Y. De La luz-Esparza, D. López-Grano, P. Gay-Hernández, I. Casillas-Martínez, O. López-Padilla, E. Díaz-Pelayo, M. Martínez-Toscano and R. Preciado-González

Ciencias Medicas, Centro Universitario de Guadalajara, Universidad de Guadalajara, Puerto Vallarta, Mexico

andro_id2@hotmail.com

The Centro Universitario de la Costa of the Universidad de Guadalajara, implemented since 2008 a program of alternatives to using animals in teaching physiology based on self-experimentation, a mixed



system of hardware and software, and a group of outstanding students known as physiology lab instructors, which support learning of physiology students from lower semesters studying medicine and nursing. Mentoring relationship is important in career advancement (Ragins and Scandura, 1997; Sands et al., 1991; Aagaard and Hauer, 2003; Barczyk, 2011; Buckenmeyer et al., 2011).

The training of the instructors includes the review of current scientific articles in the field, the introductory course management of the Biopac®, and a course of human development.

In this paper we try to detect the level of satisfaction among the instructors.

The results are: from 35 answered surveys the 52% responded that their expectations of the group were completely fulfilled, 48% said their expectations were partly met, 97% felt identified with the program practices without the use of animals, 3% not identified himself, 97% felt satisfied serving as peer tutor, only 3% reported feeling unsatisfied in this area, 94% agreed that belonging to the group improved their academic training and finally the 6% was partially agree.

References

- Aagaard, E. M. and Hauer, K. E. (2003). *J Gen Intern Med* 18, 298-301.
- Barczyk, C., Buckenmeyer, J., Feldman, L. and Hixon, E. (2011). *Mentoring & Tutoring: Partnership in Learning* 19, 5-24.
- Buckenmeyer, J., Hixon, E., Casimir, P. et al. (2011). *Education Research* 4, 1-6.
- Ragins, B. R. and Scandura, T. A. (1997). *J Appl Psychol* 82, 945-953.
- Sands, R. G., Parson, A. and Duane, J. (1991). *The Journal of Higher Education* 62, 174-193.

* Supported by Young Scientists Travel Awards provided by ACT Germany and the German Foundation SET.

III-3-433

Overview of the free virtual experiments – computer simulations for teaching pharmacology

D. Modun¹ and E. MacDonald²

¹Department of Pharmacology, University of Split School of Medicine, Split, Croatia; ²Pharmacology & Toxicology, School of Pharmacy, University of Eastern Finland, Kuopio, Finland

darko.modun@mefst.hr

Objectives: The scope of this investigation was to determine and promote the available free educational tools for teaching pharmacology, according to the 3R principle.

Methods: Using the databases for humane teaching alternatives, such as InterNICHE and NORINA and the Internet search engine Google, we have searched for appropriate educational tools for teaching experimental pharmacology that are: 1) stand-alone programs capable for off-line teaching; 2) interactive alternatives to animal experiments – capable of simulating real experiments and producing realistic data; and 3) completely free of charge. Therefore, the following programs were omitted from this overview: 1) web-based, internet-dependent; 2) available primarily from a commercial source, or 3) non-experimental-based forms of computer assisted learning (CAL) such as on-line textbooks or multiple-choice questions.

Results: We have identified only two, rather old programs that meet all the above-mentioned criteria: Microlabs for Pharmacologists and Strathclyde Pharmacology Simulations (Jukes and Chiuia, 2003). Microlabs for Pharmacologists represents a series of computer simulation; we have recently written a free-of-charge E-handbook to accompany this program (Modun and Bach-Rojecky, 2013). Strathclyde Pharmacology Simulations is a suite of programs simulating pharma-

logical experiments on isolated tissues or whole animals.

Conclusion: There is a need for new, free, interactive and stand-alone programs capable of simulating experiments for teaching pharmacology.

References

- Jukes, N. and Chiuia, M. (2003). *From Guinea Pig to Computer Mouse: Alternative methods for a progressive, humane education*. 2nd edition. InterNICHE.
- Modun, D. and Bach-Rojecky, L. (2013). Proceedings of the 6th European Congress of Pharmacology. *Medimond s.r.l.*, 193-197.

III-3-487

Emphasis on zoology curriculum based on non-invasive teaching methods of physiology and anatomy has significantly reduced the animals use in practical classrooms in India

K. K. Sharma¹, V. Sharma¹, N. Sharma² and M. A. Akbarsha³

¹Animal Alternative Division, Animal Alternative Division of Save Environment and Welfare of Animals Society, B-269 Hari Marg Malviya Nagar, Jaipur, India; ²Department of Microbiology, Maharshi Dayanand Saraswati University, Ajmer, India; ³Mahatma Gandhi – Doerenkamp Center (MGDC), Bharthidasan University, Trichurapalli, India

kksmds@gmail.com

The efforts and pursuance of some progressive academicians and organizations of India made possible that University Grants Commission issued circular to universities to discontinue dissection in a phased manner and use appropriate alternatives. The Save Environment and Welfare of Animals (SEWA), Rajasthan, and Mahatma Gandhi – Doerenkamp Center, Tiruchirapalli, organized several training programmes all over the country for effective implementation of alternatives. Anatomy and physiology of vertebrates are taught using non-invasive software-based methods. Digital Frog 2.5, Pro-Dissector Frog, Froguts, PhysioEx 9.2, Dogfish, etc., are the common digital tools. Feedback response were obtained from the participants, which indicated more than 95% acceptance of digital alternatives over the age-old obsolete wet lab practices involving extensive animal killing. Institutions that practice digital methods of anatomy and physiology have discontinued animal dissection with improvement in understanding and learning skills. Survey carried out in some parts of Western and Southern India has shown positive sign of improvement in the biodiversity status of many animal species which were over-exploited in dissection and vivisection. Although, many digital alternatives for anatomy and physiology have been introduced in the recent past, there is need to develop 3D virtual dissection and physiology experiments using the modern digital tools.

III-3-489 *

Digitization of zoology museums can reduce the number of wild animals sacrificed for teaching of biosystematics: another dimension to implementation of 3Rs principle in teaching

V. Sharma¹, K. K. Sharma¹, N. Sharma² and M. A. Akbarsha³

¹Animal Alternative Division, Save Environment and Welfare of



Animals Society, B-269 Hari Marg Malviya Nagar, Jaipur, India; ²Department of Microbiology, Maharshi Dayanand Saraswati University, Ajmer, India; ³Mahatma Gandhi – Doerenkamp Center (MGDC), Bharthidasan University, Tiruchirapalli, India
vivekherps@gmail.com

In conventional protocols formalin – or alcohol-preserved or stuffed museum specimens are used for teaching biosystematics and identification of animals. For this purpose thousands of animals are collected from the wild and sacrificed for making museum specimens. This method of teaching biosystematics not only causes loss to biodiversity but also poorly-effective because badly maintained specimens do not provide proper information for identification. Protected animals also not spared because often these specimens are supplied by illegal poachers and traders. *Hoplobatrachus tigerinus*, *Euphlyctis hexadactyla*, *Uperodon systoma*, *Saara hardwickii*, *Chemeleo zeylanicus*, *Spalerosophis diadema atriceps*, *Naja naja*, *Geochelone elegans*, etc., are some species which are facing serious threats in Western India because poachers are taking them from wild for supply of museum specimens. In order to circumvent this problem we have digitized the museum and histological slides using high resolution imaging systems to make 2D and 3D images using image processing and analysis software. These digital images are hyperlinked to live videos. Teaching of biosystematics using digitized specimens significantly improves the knowledge and skill. The students also like the digitized museums rather than look at the mutilated specimens. This concept of virtual museum can save millions of animals, particularly those that face threats.

* Supported by Young Scientists Travel Awards provided by ACT Germany and the German Foundation SET.

III-3-490

Prokaryotes can be used as an effective animal alternative in genotoxicity testing of antifertility and xenobiotic compounds in routine lab courses

*N. Sharma*¹, *V. Sharma*², *K. K. Sharma*² and *M. A. Akbarsha*³

¹Department of Microbiology, Maharshi Dayanand Saraswati University, Ajmer, India; ²Animal Alternative Division, Environment and Welfare of Animals Society, B-269 Hari Marg Malviya Nagar, Jaipur, India; ³Mahatma Gandhi – Doerenkamp Center (MGDC), Bharthidasan University, Tiruchirapalli, India
nehaniharmicro@gmail.com

Large numbers of animals are sacrificed to learn toxicology, teratology, and pharmacology. To conduct the very preliminary / pilot experiments large numbers of animals are sacrificed. In the recent past while studying genotoxicity of the male antifertility drug RISUG on *Salmonella typhimurium* TA 97A, TA 100 and TA 1537, it was found that these prokaryotes can be conveniently used as alternatives for animals in genotoxicity testing in preliminary screening. *Vibrio fischeri*, *E. coli* tester strain K12 and *E. coli* BMX 100, can be used in the environmental toxicity assay of xenobiotics. With these prokaryotes the results can be brought out within 24 hours with an efficacy ratio of 9.4% where as animal models require 5 weeks, with an efficacy ratio of only 7.2%. Another advantage is that F1 hybrid is obtained within one day as compared to mouse model which takes 35 days. Designing prokaryotic strain for testing molecules is more convenient than the animal model. The analysis of byproduct of breakdown pathway is also user-friendly. When prokaryotes were used as alternatives in routine laboratory demonstration of genotoxicity of antifertility mole-

cules and xenobiotic compounds, experience revealed to be highly efficacious, fast, cost-effective and subscribed to the principles of 3 R.

III-3-515

The development of a clinical skills laboratory at Ross University School of Veterinary Medicine

B. Grevemeyer and *A. Knight*

Clinical Sciences, Ross University School of Veterinary Medicine, Basseterre, Saint Kitts and Nevis

aknight@rossvet.edu.kn

Several trends have altered the teaching of clinical skills to veterinary and medical students, including increasing recognition of clinical errors as a cause of adverse patient outcomes, the evolution of clinical skills educational research and theory, increasing class sizes, budgetary constraints, and increased focus on alternatives to animal use, for humane and ethical reasons. Accordingly, medical and veterinary schools have established dedicated laboratories for teaching clinical skills, using models, mannequins and simulators. Although been established in medical schools for more than two decades, their incorporation within veterinary curricula has occurred more recently.

In 2007 we decided to establish a clinical skills laboratory (CSL) at Ross University School of Veterinary Medicine. We visited two established, successful CSLs elsewhere. We then considered the range of skills we wished to teach, the physical space, equipment and infrastructure required, including facilities to deliver PowerPoint presentations and case simulations, and others to handle cadaver specimens. We converted an appropriate campus building, hired teaching staff, and sourced models and mannequins for teaching veterinary clinical skills.

Our CSL currently offers instruction in a diverse array of surgical, medical and other clinical skills. We hope this description of our experiences may assist others establishing CSLs elsewhere.

III-3-564

“Live zoology” an effective, non-invasive replacement alternative to animal dissections in zoology curriculum

M. C. Sathyanarayana and *M. A. Akbarsha*

Mahatma Gandhi-Doerenkamp Center for Alternatives to Use of Animals in Life Science Education, Bharthidasan University, Tiruchirappalli, India

mcsathya@yahoo.com

The pedagogy in zoology laboratory in India involves dissections where in animals are purpose killed. The zoology teachers teach the importance of biodiversity/wildlife conservation in the theory courses, and it is paradoxical that the same teachers kill animals for purpose of dissections. Animal welfare groups, educationists and students protest animal kill for dissections. The University Grants Commission, has brought up a specific Guidelines, that animal dissections should be phased out. The Guidelines suggests that during field visits the students shall observe the animals and make record of the observations; the animals shall not be removed from the natural habitat. Conscientious zoology teachers consider learning through dissections as “dead zoology” where as studying them in their natural habitats as “live zoology”. The various factors such as pedagogical concern, ethical issues, environmental problems, biodiversity conservation, societal



accountability and legal issues are pressures on the educators to replace the present practice of animal kill for dissections to learning of live zoology.

III-3-601

Virtual physiology: computer laboratories for life science education

A. Tchaptchet^{1,2}, *J. R. dell'Oro-Friedl*^{3,4}, *D. Immer*⁴,
*H. Schneider*⁵, *T. Braun*⁶ and *H. A. Braun*^{1,2}

¹Institute of Physiology, Philipps University of Marburg, Marburg, Germany; ²BM&T, GbR, Marburg, Germany; ³Institute of Digital Media, University of Furtwangen, Furtwangen, Germany; ⁴Entertrain, GmbH, Mainz, Germany; ⁵DAQ, Solution, Nehren, Germany; ⁶Motion, Design, Berlin, Germany

tchaptch@students.uni-marburg.de

Computer laboratories of the Virtual Physiology series (SimNerv, SimMuscle, SimHeart, etc.) are used in lectures, seminars and practical courses at university institutes and schools all over the world and, in many cases, have replaced previous experiments with animal preparations, e.g., with the frog nerve and muscle or the rat heart.

The Virtual Physiology programs are particularly well accepted because of their realistic lab design. They offer completely equipped laboratories on the computer screen with all necessary stimulation and recording devices. All settings of the devices are freely adjustable to perform physiological and pharmacological experiments almost as in the real world. Mathematical algorithms guarantee for physiologically appropriate reactions of the virtual preparations.

Experimentation in the virtual laboratories has particular didactic advantages (Bahar, 2001; Braun, 2003). The students are doing the experiments without negative emotions due to the killing of animals and without the fear that another animal will be killed when they are making a mistake that destroys the preparation. The virtual labs allow free experimentation thereby promoting the most effective type of learning, namely "learning by doing".

The Virtual Physiology tools are currently reprogrammed with several new features as platform and resolution independent versions. Fully functioning demo-versions can be downloaded from <http://www.virtual-physiology.com>.

References

Bahar, S. (2001). *The Biological Physicist, Newsletter of the Division of Biological Physics of the American Physical Society 1*, 5-7.
Braun, H. A. (2003). Virtual versus real laboratories in life-science education: Concepts and experiences. In N. Jukes and M. Chiuiia (eds.) *From Guinea Pig to Computer Mouse* (81-87). Interniche.

III-3-626

3Ts teaching touching toxicology in veterinary medicine degree: a project

*F. Caloni*¹, *L. Müller*², *C. Cortinovis*¹ and *M. Balogh*²

¹Department of Health, Animal Science and Food Safety (VESPA), Università degli Studi di Milano, Milan, Italy; ²Department and Clinic of Internal Medicine, Faculty of Veterinary Medicine, Szent István University, Budapest, Hungary

francesca.caloni@unimi.it

The use of the touch screen technology has grown more and more popular with a new generation of students, leading to the need for an up-dated way of teaching, through a software easily accessible always and everywhere, with an interactive and stimulating approach, designed for the students. A collaboration has started between the

University of Milan and the University of Budapest, in order to create such educational tools in the Veterinary Medicine Degree, in the discipline of Veterinary Toxicology, following the 3Rs approach. The educational software, structured in accordance with the requirements of each institution, will contemplate 3 main areas: The General Principles of Toxicology, Systems Toxicology and Clinical Toxicology. Each main folder will be set up in order to contain specific topics, opened by the user. The clinical toxicology section will also be supported by virtual case-based learning (Balogh, 2014), giving students the possibility to have a tool in a practical discipline, avoiding the use of animals. Implementing technology in didactic program gives advantages for educators in relation to the dissemination of concepts and for the students increasing the interest through new manners.

Reference

Balogh, M. (2014). *Veterinary Record 174*, 63-64

III-3-631

Synthesis of evidence and systematic reviews of animal studies: urgently needed innovations in laboratory animal science education

M. Leenaars and *M. Ritskes-Hoitinga*

SYRCLE, Radboud university medical center, Nijmegen, The Netherlands

Marlies.Leeenaars@Radboudumc.nl

According to Lancet series 2014: "Methodology and reporting of animal studies is currently inadequate and improvements are urgently needed". Education is a first step to make scientists aware of this situation and to provide guidance on improvements. In health research, transparency on quality of methodology of clinical studies has shown to be an effective method to raise awareness and as a result major improvements have been made. Transparency has been achieved by analyzing clinical trials in a transparent, structured and thorough way using systematic reviews. Recently, systematic reviews of animal studies, as a methodological approach of synthesis of evidence, were introduced within laboratory animal science (Leenaars et al., 2012). Besides stimulating better science, the potential benefits of systematic reviews encompass: (1) leading to better informed ethical review, (2) helping to implement the Three Rs, and (3) improving translational transparency to inform clinical trials (Ritskes-Hoitinga et al., 2014). This innovative topic in education was introduced by SYRCLE in recent years and has been funded by the Dutch Ministry and Health Funding Organization. Content, progress, availability and future needs of education and training programs for systematic reviews of animal studies will be presented. Moreover, effects and results of the training programs will be discussed.

References

Lancet Series (2014). *The Lancet 383*, 156-185.
Leenaars, M., Ritskes-Hoitinga, M., Griffin, G. and Ormandy, E. (2012). *ALTEX Proc 1*, 35-38.
Ritskes-Hoitinga, M., Leenaars, M., Avey, M. T., et al. (2014). *Cochrane Database Syst Rev 3*, ED000078.



III-3-654

Humane education strategies for veterinary education and training in Colombia

M. Chaparro¹, A. Guerrero¹, V. Arcila¹ and V. Quintero²

¹Animal Science Research Group, Universidad Cooperativa de Colombia, Bucaramanga, Colombia; ²Evaluation and environmental control, Centre for Environmental Education and Wild Animal Rescue, Bucaramanga, Colombia

maria.torresc@campusucc.edu.co

Making the right decisions from an ethical and legal point of view within veterinary science is a complex issue, and learning how to do it should be one of the fundamental pillars of education in our work as teachers. One way to achieve this goal is to integrate into the learning process a theoretical approach to animal welfare and ethics. Another is to develop an assessment of the needs and concerns of students during the learning process. In the last years, research has been conducted in the Faculty of Veterinary Medicine and Zootechnics at the Universidad Cooperativa de Colombia on the need for adopting effective and humane strategies which contribute to the development of students' skills. The use of non-animal alternative models for anatomy, clinical skills and surgery has become an efficient resource for this purpose. Students have been trained using non-animal models for large animals, small animals and wildlife. Students and teachers are very open to the use of alternatives. It is recommended that curricular committees of each institution acknowledge and approve non-animal models with the aim of establishing the academic guidelines required for their implementation.

III-3-881

Three databases for alternatives in education and training

N. Jukes¹, V. Danko² and D. Leporsky³

¹InterNICHE, Leicester, UK; ²Consultant, Moscow, Russian Federation; ³InterNICHE Ukraine & Kharkiv Regional Society for the Protection of Animals, Kharkiv, Ukraine

coordinator@interniche.org

InterNICHE provides three online databases to support the implementation of replacement alternatives in education and training. Available at the multi-language website <http://www.interniche.org>, the free-access resources are continually updated with new information and functionality. The Alternatives Database provides information on over 1000 alternative tools, with descriptions, specifications, images and links to producers. It can help teachers and others identify products to enhance specific practical classes and replace harmful animal use. The resource can be linked into alternative search strategies for universities and training centres. The Studies Database is an academic database, providing references, abstracts and in some cases full papers of over 1000 published studies. Entries are included for their relevance to the pedagogical, ethical and economic issues presented by the use of animals, alternatives and technology. The Downloads Database is a new resource with a range of software alternatives, images, video clips, presentations, posters and banners being added for download. As the resources evolve, a degree of integration of the databases will be developed. Users will be able to search for a training tool, watch a demonstration clip, check availability for borrowing the item, read a related academic paper and contribute a review.

Session III-4: Implementing the "Montreal Declaration on the Synthesis of Evidence"

Co-chairs

Gilly Griffin, CCAC, Canada

Merel Ritskes-Hoitinga, Radboud University, The Netherlands

Session III-4: Oral presentations

III-4-073

Systematic reviews of animal studies; missing link in translational research?

J. van Luijk¹, B. Bakker¹, M. Rovers², M. Ritskes-Hoitinga¹, R. de Vries¹ and M. Leenaars¹

¹SYRCLE, Radboud University Medical Center, Nijmegen, The Netherlands; ²Departments for Health Evidence and Operating rooms, Radboud University Medical Center, Nijmegen, The Netherlands

Judith.vanluijk@radboudumc.nl

The methodological quality of animal studies is an important factor hampering the translation of results from animal studies to men. Systematic reviews of animal studies may provide a suitable method to assess and thereby improve their methodological quality.

In our research we investigated: 1) risk of bias assessment in animal-based systematic reviews, and 2) internal validity of the primary

animal studies included in systematic reviews of animal studies.

We systematically searched Pubmed and Embase for SRs of pre-clinical animal studies published between 2005 and 2012.

A total of 91 systematic reviews met our inclusion criteria. The risk of bias was assessed in 48 (52.7%) of these 91 systematic reviews. Thirty-three (36.3%) SRs provided sufficient information to evaluate the internal validity of the included studies. Of the evaluated primary studies, 24.6% was randomized, 14.6% reported blinding of the investigator/caretaker, 23.9% blinded the outcome assessment, and 23.1% reported drop-outs.

To improve the translation of animal data to clinical practice, systematic reviews of animal studies are worthwhile, but the internal validity of primary animal studies needs to be improved. Furthermore, risk of bias should be assessed by systematic reviews of animal studies to provide insight into the reliability of the available evidence.



III-4-541

Implementation of the Montreal Declaration on the synthesis of evidence

M. Ritskes-Hoitinga¹ and G. Griffin²

¹SYRCLE, Radboud University Medical Center, Nijmegen, The Netherlands; ²Standards, Canadian Council on Animal Care, Ottawa, Canada

Merel.Ritskes-Hoitinga@radboudumc.nl

The Montreal Declaration at WC8 resulted from discussions and research about the insufficient progress of 3R implementation (Leenaars, 2012). Systematic reviews (SR)s are used as a method for the synthesis of evidence, which should lead to better scientific quality, implementation of the 3Rs and better patient safety simultaneously (Hooijmans 2013). Since WC8, international symposia on SRs of animal studies have been held in Nijmegen (SYRCLE, 2012) and Edinburgh (CAMARADES, 2013); and SRs of animal studies were discussed

at the Cochrane Collaboration meeting in Quebec in 2013 (Ritskes-Hoitinga, 2014). SRs have demonstrated insufficiencies in reporting of animal studies, and several reporting guidelines and their harmonization will be presented in this session. Developments in toxicology supported by SRs will also be discussed. Finally, stimulation of SRs by the Dutch Parliament and by funding education and development of tools by government agencies will be presented. This session will ask what critical factors are needed to achieve further worldwide progress in synthesis of evidence for stimulating quality of animal studies and creating more transparency on translational evidence.

References

- Hooijmans, C. R. and Ritskes-Hoitinga, M. (2013). *PLoS Med* 10, e1001482.
- Leenaars, M., Ritskes-Hoitinga, M., Griffin, G. and Ormandy, E. (2012). *ALTEX Proc* 1, 35-38.
- Ritskes-Hoitinga, M., Leenaars, M., Avey, M. T. et al. (2014). *Cochrane Database Syst Rev* 3, ED000078.
- Tabula Rasa (2014). <http://tabularasa.nl/beta/wp-content/uploads/2014/04/Rapport-Systematic-reviews-in-het-proefdierdomein.pdf>

Session III-5: Sharing best practices in LAS education and training

Co-chairs

Tsutomu Miki Kurosawa, Animal Welfare Research Japan, Japan

Jan van der Valk, Utrecht University, The Netherlands

Session III-5: Oral presentations

III-5-081

The European Platform for LAS Education & Training

J. van der Valk¹, M. João Castelhanos Carlos², P. Gonin³, N. Linklater⁴, B. Marczycha⁵, D. Bratbo Sørensen⁶, B. Ulfhake⁷, P. Vergara⁸, H.-M. Voipio⁹ and D. Smith¹⁰

¹3Rs-Centre Utrecht Life Sciences, Utrecht University, Utrecht, The Netherlands; ²Life and Health Science Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal; ³Department of Research, Gustave Roussy, Villejuif, France; ⁴Faculty of Biology/Animal Physiology, Philipps-University Marburg, Marburg, Germany; ⁵Home Office Administrator & Liaison Officer, University of Leeds, Leeds, UK; ⁶Department of Veterinary Disease Biology, Experimental Animal Models, University of Copenhagen, Copenhagen, Denmark; ⁷Comparative Medicine, Karolinska Institutet, Stockholm, Sweden; ⁸Veterinary School, Autonomous University of Barcelona, Barcelona, Spain; ⁹Laboratory Animal Centre, University of Oulu, Oulu, Finland; ¹⁰VP Education & Training, FELASA, Manchester, UK
j.vandervalk@uu.nl

The EU Directive 2010/63/EU requires Member States (MS) to publish minimum requirements with regard to education and training (E&T) of persons involved in laboratory animal science (LAS). In order to facilitate harmonization and subsequent free movement of personnel, an EU Platform & Information Portal for LAS Education & Training (Platform) has been proposed to enable information sharing and communication between approval/accrediting bodies, course providers and MS authorities. One of the Platform's key activities will

be to establish a website to serve as an information portal and database to facilitate information exchange between stakeholders.

The Platform goals involve establishing criteria for mutual recognition of E&T in LAS within Europe and to identify and maintain lists of approval/accrediting bodies and courses. It will help facilitating the establishment of new courses if required, by exchange of information and experiences. Furthermore, the Platform aims to facilitate sharing of information on standards for supervision and assessment of competence. All (non-personal) information will be freely available to trainers, accrediting bodies, potential trainees and other interested parties.

The activities of the Platform are coordinated by a Steering Committee with representatives from course providers, MS and accreditation bodies.

III-5-485

Training in the Three Rs under Directive 2010/63/EU

S. Louhimies¹ and D. Anderson²

¹DG Environment, European Commission, Brussels, Belgium; ²Technical Advisor to DG Environment, Pentlands Management Systems, Ltd, Edinburgh, UK
susanna.louhimies@ec.europa.eu

The adoption of the principles of the Three Rs within the text of Directive 2010/63/EU requires that animals may only be used in procedures where there is no alternative and that the minimum numbers are used, and that all refinements are used to minimise pain suffering and distress in animals used or bred for use on procedures.



Education, training and, supervision (as appropriate) and competence assessment are essential requirements for all persons carrying out procedures, designing procedures, caring for and killing animals. Knowledge and implementation of Three Rs is an essential element in the training for such personnel.

In February 2014, a common education and training framework was agreed among Member States. Within this framework are a series of Modules, each of which contain a number of Learning Outcomes (LOs) which have to be achieved. There are a series of LOs relating to the Three Rs which all relevant staff have to achieve, and a separate series, requiring a more comprehensive understanding, which have to be attained by those involved in the design of procedures and projects. Working towards the agreed standards throughout the EU will also facilitate free movement of staff and scientists.

III-5-641

Animal user training in Canada

G. Griffin¹ and P. Belleau²

¹Standards, Canadian Council on Animal Care, Ottawa, Canada;

²Public Affairs and Communications, Canadian Council on Animal Care, Ottawa, Canada

ggriffin@ccac.ca

In 1999, the CCAC published *guidelines on: institutional animal user training*. This guidelines document defined the need for training all those who were going to be carrying out scientific studies with animals ie, principal investigators, research technicians, post-doctoral fellows, graduate students. The guidelines document provided a recommended syllabus for an institutional animal user program, but it was not prescriptive, recognizing that many institutions already had good training programs in place. For some institutions, however, implementing the recommended syllabus was a challenge, due to lack of resources. The CCAC responded by developing a series of training modules which are available on the CCAC website. The training modules support both the core and non-core topics included in the recommended syllabus. In general, they are developed by experts in the area, and are based on CCAC guidelines. The *guidelines on: institutional animal user training* is currently undergoing revision to place more emphasis on the attainment of competency, and to make CCAC's requirements clear for all categories of personnel (including animal care staff and undergraduate students).

III-5-703

Harmonization of education and training in laboratory animal science

G. Griffin¹, P. Vergara² and C. Pekow³

¹Standards, Canadian Council on Animal Care, Ottawa, Canada;

²Departament de Biologia Cel·lular, Fisiologia i Immunologia, Universitat Autònoma de Barcelona, Barcelona, Spain; ³Animal Care, University of Washington, Seattle, USA

ggriffin@ccac.ca

The International Council for Laboratory Animal Science is a scientific organization dedicated to advancing human and animal health by promoting the ethical care and use of laboratory animals in research worldwide. ICLAS fosters education and training in laboratory animal science, particularly in regions of the world where such opportunities are lacking or few, for veterinarians, animal health technicians, and researchers who are responsible for carrying out animal-based studies. In 2008, the ICLAS governing board published a document on *The International Harmonization of Guidance on the Ethical Review of Proposals for the Use of Animals, and on the Education and Training of Animal Users in Science*. This document described guiding prin-

ciples for the education and training for researchers, and pointed to suitable international references. The goal of this endeavor remains to encourage high quality science and animal welfare globally.

III-5-759

Practical training of basic laboratory animal handling technique

T. M. Kurosawa

Sapporo Office, Animal Welfare Research Japan, Sapporo, Japan

kurosawa@iexas.med.osaka-u.ac.jp

Since 2010, international and national regulations, standards and guidelines were newly implemented or revised. OIE sets international standard of animal welfare including "Use of animals in research and education" in 2010. EU Directive of protection of animals used for scientific purpose was adopted in 2010. ILAR in USA revised its "Guide for the care and use of laboratory animals in 2011. CIOMS revised "The International Guiding Principles For Biomedical Research Involving Animals" in 2012. ISO10993-2 Animal Welfare Requirement for biological evaluation of medical devices will be revised soon. These standards and regulations emphasized 3Rs and training and education of any people involved in animal experimentation for refinement. These should be reflected all over the world including Asian region where practical implementation of laboratory animal welfare used to be less stringent. The author developed "Koken Rat" for a training tool in this field and then remodeled this mannequin as NATSUME RAT" which is now available in the market. The practical training of basic laboratory animal handling technique can be achieved using this model. Using NATSUME RAT, the instructors can demonstrate students and researchers not only appropriate handling techniques but also inappropriate mishandlings which cause pain and distress on laboratory animals.

References

- CIOMS and ICLAS Guiding Principles for Biomedical Research Involving Animals. <http://www.cioms.ch/images/stories/CIOMS/IGP2012.pdf>
- EU Directive on the protection of animals used for scientific purposes <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:276:0033:0079:EN:PDF>
- ILAR Guide for the care and use of laboratory animals. <http://grants.nih.gov/grants/olaw/Guide-for-the-care-and-use-of-laboratory-animals.pdf>
- NATSUME RAT. http://www.nazme.co.jp/products/products_detail.php?no=KN-590&id=92
- OIE Terrestrial Animal Health Code, Chapter 7.8 Use of Animals in Research and Education. http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_1.7.8.htm



Session III-5: Poster presentation

III-5-662

Students' perception of e-learning in laboratory animal science training

A. Costa¹, A. Costa² and I.A. Olsson¹

¹Laboratory Animal Science Group, Institute for Molecular and Cell Biology – IBMC, Porto, Portugal; ²Psychology Center, Faculty of Psychology and Educational Sciences – FPCE-UP, Porto, Portugal
olsson@ibmc.up.pt

With an increasing need of training in Laboratory Animal Science, e-learning appears to be a promising solution to issues of limited time and resources. As e-learning is increasingly used, it is important to understand how students perceive this approach to learning. At IBMC

we have integrated e-learning in our advanced (FELASA Category C) training, as a complement to classroom lectures (blended learning) and in our introductory (FELASA Cat B) course (theoretical part exclusively delivered by e-learning). We assessed participants' acceptance of the e-learning platform and level of satisfaction of its use during the last 3 years with *E-learning Acceptance* (QELA), a concordance Likert-type scale. This study included 127 participants (60% from the C course), 21 to 50 years old (M=28.42; SD=6.22), of which 76% were women, mainly PhD students and postdocs.

Results revealed that participants from advanced and basic courses show, in general, a positive acceptance to this approach (94.4%), and a very positive perception of the platform usability (70.9%). In both courses participants strongly agreed that e-learning was useful for time management (71.4%). Moreover the majority of the participants recognized that e-learning had a positive influence in practical classes with animals (66.1%).

Session III-6: Discussion: The role of journals in implementing the 3Rs

Moderator

Iratxe Puebla, PLoS One, UK

Session III-6: Oral presentation

III-6-941

Journal publishers: who exactly do we serve?

S. Trigwell

Fund for the Replacement of Animals in Medical Experiments (FRAME), Nottingham, UK
susan@frame.org.uk

For 41 years, the journal, *Alternatives to Laboratory Animals* (ATLA), has played a significant role in the dissemination of Three Rs-related information, including research papers on the development of alternative methods, reports on validation studies, project findings and conference proceedings, and news and comments and opinions on relevant issues. The journal's editors have always been mindful of the need to help authors in any country in the world, regardless of their economic circumstances, to promote and further the implementation of alternatives.

Recently, two issues have been pushed to the forefront of the minds of journal publishers, both of which threaten to skew the emphasis away from the needs of authors and toward the interests of the journal itself. These issues are the popular concepts of "open access" and the oft-misused journal Impact Factor. Unfortunately, these two issues have the potential to impact on the already inherently slow progress of Three Rs implementation. With real-life examples of the issues involved, it is hoped that ways in which this impact can be mitigated can be positively discussed in the session.

III-6-952

ALTEX – documenting and disseminating visions and progress on alternatives to animal experiments

S. von Aulock

ALTEX, Konstanz, Germany
editor@altex.ch

The topic of alternatives to animal experiments is unique in that it combines basic and applied research, legal regulations, regulatory control mechanisms, activist groups, political decisions and ethical discussions. ALTEX – Alternatives to Animal Experimentation (www.altex-edition.org) provides a scientific platform for constructive communication for all interest groups in this area by publishing full articles and reviews, short communications, letters, comments, workshop reports, corners, news and a calendar of events. The Food for Thought column allows the development of visions for future strategies in the area of alternatives to animal experiments. Any party may submit contributions to the news or the calendar.

ALTEX, like ALTEX Proceedings, a journal for abstracts and proceedings of scientific conferences on alternatives to animal testing and TIERethik (www.tierethik.net), a German-language journal on the bioethics of the relationship between humans and animals, is issued by the Society ALTEX Edition, which is a non-profit organization financed by subscriptions, author publishing fees, member contributions and sponsorship.

The main interest of the Society ALTEX Edition is to promote the 3Rs, thus ALTEX is devoted to the publication of research on the de-

velopment and promotion of alternatives to animal experiments according to the 3R concept of Russell and Burch: Replace, Reduce, and Refine. Articles having no 3R relevance are rejected before entering the evaluation procedure and ALTEX requires that authors reporting on animal experiments adhere to the ARRIVE guidelines. Consequently, ALTEX chooses to rank the potential direct and indirect impact of an article on implementing the 3Rs over its citability.

ALTEX is an open access journal, which means that all content is freely available without charge and unedited versions of each accepted manuscript are published in the ALTEX Online first section to allow interested parties rapid access to new information. ALTEX articles were accessed on average 1400 times per month from PubMed in the last year and the website was visited by 3800 different users per month. Alerts on new issues of ALTEX are sent out via the Altweb Newsletter.

Taken together, ALTEX strives to promote the implementation of alternatives to animal experiments by informing all types of stakeholders, documenting progress and encouraging strategy-building and networking.

III-6-953

PloS ONE consideration of ethical aspects in publication of animal-based research

I. Puebla

Senior Editor, PLOS ONE, Cambridge, UK

ipuebla@plos.org

PLOS ONE receives a wide range of manuscripts reporting research from all biomedical fields and many of these involve animal experiments, which can range from experiments on primate models to research on amphibians and cephalopods. PLOS ONE considers that the ethical aspects of experimentation are a critical part of the design and completion of research and we apply strict scrutiny to the aspects of the research related to the handling and care of animals.

We consider it our responsibility as editors to maintain internationally acceptable standards for research involving animals. We see the editors' duty as going beyond the application of specific journal policies, and consider that as editors we can and should facilitate progress in standards and the implementation of the 3Rs in research by raising awareness in different settings, PLOS ONE does this regularly by following up with institutions and ethics committees when we encounter situations that present ethical challenges.

Open Access publications allow the re-use of published research, increasing its use and reproducibility. These goals are in line with those behind the 3Rs and the PLOS journals support a broader implementation of these principles. Journals play an important role in maintaining standards of research involving animals and we would welcome a discussion on how journals and publishers can raise awareness about best practice in animal research and facilitate progress in this area.

III-6-954

Supporting RRRs through "Special Issues" and the role of journals in "big data"

T. B. Knudsen

Editor-in-Chief, Reproductive Toxicology, Elsevier B.V., The Netherlands

knudsen.thomas@epa.gov

Testing for embryo-fetal developmental toxicity and fertility measures is among the largest consumer of animal resources. Obvious concern exists for the appropriateness of animal models for predictivity of teratogenicity in embryo-fetal developmental testing and the RRRs especially in light of the increased requirements from REACH legislation in the EU. The current status of *in vitro* alternatives is directed at integrative testing strategies focused on promising results from stem cell-based assays, free-living zebrafish embryos, and high-throughput screening (HTS) methods. The integration of *in vitro* data with *in silico* models has not, however been accepted for regulatory purposes. This is an area of active investigation and scientific publications and reviews. Questions remain as to how to best define and assemble test batteries into predictive models that cover essential steps of fertility and prenatal/postnatal development across different lifestages of the reproductive cycle, including maternal-filial interactions during pregnancy and lactation and the impact on children's health and well-being to puberty and beyond. One way a scientific journal can support the RRRs is 'Special Issues'. Since 2009, RTX has published 11 special issues (<http://www.journals.elsevier.com/reproductive-toxicology/special-issues/>). Several have focused explicitly on the 21st century toxicity testing paradigm: the EU's ReProTect project (vol 30:1, 2010); one devoted to zebrafish embryogenesis (vol 33:2, 2012); and one devoted to the EU ChemScreen project (2014, in progress). Other special issues centered on the annual meeting of the affiliated society (European Teratology Society) have included novel solicitations for manuscripts and review articles addressing symposium themes for the annual meeting. In general, these special issues have been well-cited, generally above the normal for regular submissions to the journal, and have also stimulated subsequent regular submissions in those areas. Journals can adopt guidance statements for validation of *in vitro* manuscript submissions, targeted testing strategies, and inanimate (virtual) models for embryo-fetal developmental testing strategies. Approaches that use fewer animals but deliver scientifically valid information are highly desired but constrained by the lack of understanding of mechanisms by which drugs and chemicals interact with biological systems and the relevant pathways of developmental toxicity. Journals can encourage harmonization of discovery-based or hypothesis-driven approaches to toward standard Adverse Outcome Pathway (AOP) databases for which quantitative mechanistic relationships can be made, as well as building novel resources for Virtual Tissue Models (VTMs) for spatiotemporal predictive modeling across lifestages. Finally, publishers can play a role in the article of the future that posits large and complex 'big-data' (from terabytes and exabytes to zettabytes and yottabytes) difficult to process using conventional data management tools or traditional data processing applications. The trend to big-data enables mining for hidden correlations that are difficult to extract from smaller individual studies, and can address the interplay of complex biological pathways, exposure considerations, and lifestyle considerations (nonchemical stressors) for predictive toxicology. As such, the publishers need to address the issue of data format and availability and novel search strategies to make this happen as big-data unfolds.