Session 3.6
Establishing the 3Rs Principle in Japan

Education in Alternatives to Animal Experimentation

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Summary
This article describes various aspects of 3Rs education. To be able to understand and discuss 3Rs education, a certain background knowledge of animal experimentation, in particular animal experimentation as an alternative to human experimentation, is essential. The realities of animal experimentation and medical and veterinary needs are discussed. The initiation and consequence of medical research is explained using examples of the author's research activities.

Keywords: alternatives to animals, animals in education, three Rs education

Introduction

Education in alternatives to animal experimentation has spread to all parts of the world including Asian countries (Kurosawa, 2004a). We should aim to educate all types of audience, from school children to professors and the general public, on the concepts and importance of the 3Rs (Kurosawa, 2004b; Cervinka and Kurosawa, 2004). Naturally, the approach must be specific to the target group: the approach to inform the general public must differ from the approach to postgraduate biomedical students.

The first step of 3Rs education should be education on the reality of animal experimentation. If there were no animal experiments, we would not be here to discuss them at the 5th World Congress. We need to understand why animal experiments are still being carried out. And we need to realise and express why we believe animal welfare and the 3Rs are important.

Animal experimentation

Animal experimentation is the alternative to human experimentation. Animal experiments are carried out when the same experiments on human beings cannot be ethically or morally justified. Particularly during the Second World War many such experiments were carried out on citizens and captured soldiers. As humans are the most relevant model for human physiology, biomedical progress was truly significant during that time. When this practice became public after the war ended, strict prohibitions were set on experiments on humans, particularly in the biomedical field. Still, the victorious countries secretly moved the records of human experiments carried out during the Second World War to their home countries.

Examples of medical progress achieved by animal experimentation

One of the most significant medical milestones was the first successful heart transplantation. The main function of the heart is to circulate the blood to various parts of the body. This fact was established some 300 years ago by pioneering biologists performing animal experiments. At that time, scientists and doctors tended to use the animals that were easily available and consequently they used many pet animals such as dogs and cats. The mechanics required for heart transplantation, i.e. sewing up the vessels, were already clear very early, but the most difficult challenge to successful heart transplantation was the immunological rejection of the donor heart. Thousands of mice and rats and other laboratory animals were required to solve the immunological rejection of organs, and we finally discovered drugs that introduce immunotolerance. After the discovery of these drugs, not only heart transplantation but also many other organ transplantations became possible and many patients have since then been permanently cured by organ transplantations. Unfortunately, donor hearts are in short supply and scientists are looking for novel ways to cure patients. Some scientists are try-

ing to produce human-like hearts in pigs with transgenic technology and they tend to test the safety of the transgenic pig hearts for humans on primates due to the similarity of immunological function in humans and primates.

Other examples of medical progress were achieved by chance discoveries. The very initial neurological studies using the seaslug might have been intended as a purely biological activity instead of medical research. However, the investigation of the neurological function of the seaslug led to the discovery of the scientific principle behind the cause of Parkinson's disease in human beings: the shortage of dopamine in certain neurons. The investigators were awarded the Nobel Prize in Physiology or Medicine in 2000.

Why do we continue to perform animal experiments?

Because there are still many incurable diseases in the world.

The number of kidney disease patients is increasing very rapidly and in the last year, the number of chronic renal failure patients was over 250,000 in Japan, but no cure-oriented therapeutics are available at present. Personal as well as scientific interests led the author to seek such treatment methods. An animal model of this disease appeared to be the most promising approach. The discovery of a strain of naturally occurring nephritic mice led to the establishment of a chronic renal failure mouse strain. Testing of various possible therapeutics in this model led to the chance finding that HGF (hepatocyte growth factor) could cure chronic renal failure. Application of HGF led to a dramatic recovery of the damaged kidneys (Mizuno et al., 1998). Further animal experiments are now necessary to find a way to apply HGF to chronic renal patients using gene-therapy. Neither line of investigation could have been followed without animal experiments.

Medical progress achieved with animal experiments not only benefits man, many discoveries can be translated to other animals and thus to veterinary medicine. Examples are the use of anaesthetics to enable surgery on animals and the use of medical devices such as X-ray machines for the diagnosis of disease in animals.

Understanding the importance of the 3Rs

Although medical discoveries resulting from animal experimentation contribute to human and animal health, these experiments require the use and often the death of animals. However, apart from having a natural empathy for animals, which should not be suppressed or ignored in the scientific communities, humans have the moral obligation to protect animals. These are the reasons why we are seeking the 3Rs to animal experiments. We need to balance human welfare and animal welfare. This concept is incorporated in the ISO 10993 standards.

ISO 10993 part 2 states, "The protection of humans is the primary goal of the ISO 10993 series of standards. A second equally important goal is to ensure animal welfare and to minimise the number and exposure of the laboratory animals" and that the standard was "developed to ensure the welfare of animals used in biological evaluation testing."

How can we transfer this information to different target groups?

School children should be taught both about the value of animal experiments and the medical progress achieved with them as well as about animal welfare and the 3Rs. These subjects should teach children ethical considerations.

University students must be made aware that many alternatives to animal experimentation are available and that they can contribute to their implementation. A list of some of these can be found on the web site of InterNICHE (http://www.interniche.org/). Apart from the theory, these alternative methods should be integrated into the practical courses as alternatives the traditional animals experiments, e.g. models and simulators, film and video, multimedia computer simulation, student self-experimentation, ethically-sourced animal cadavers, clinical practice, *in vitro* labs.

Of course, both the education of school children and university students on alternative methods can only be achieved by educating medical, veterinary and biology post-graduates, researchers and professors, who are or will become their teachers. This can be achieved by exposing them to the progress of alternative methods, e.g. by inviting professional alternative scientists for lectures, by providing alternative scientific journals and other reference materials, by exposing them to fair public opinion on animal welfare and by organising alternative academic meetings such as WC5.

However, the most important party to be educated is the public citizen as a tax payer. The average citizen neither knows of the reality of animal experimentation nor of our efforts for the 3Rs, although these are generally paid for with tax money. Therefore, we have an obligation to inform the citizen on our progress and our goals.

References

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