GUEST EDITORIAL

Genetics and animal welfare, what is the connection?

Not everyone will make the same associations when the terms 'genetics' and 'animal welfare' are placed in the same context.

Some might think of genetic disorders that compromise the welfare of individual animals, eg dogs which suffer from hip dysplasia (a condition where the head of the femur tends to slip out of the acetabulum), or broiler chickens that suffer from leg problems. These diseases are caused by the interaction of genetic and environmental factors. Only if its heritability is sufficiently high, or if sufficient genetic markers are available, will a trait readily respond to selection – allowing the disorder which is threatening the welfare of the animals to be eliminated from the population. In other instances, genetic disorders are being preserved, rather than eliminated, by human actions. This may be the case among certain dog breeds where the aberrant phenotype is part of the breeding standard; or in laboratory animals, where genetic disorders are maintained as models for human diseases.

Others might think of the impact of genetic modifications on the welfare of animals. The gain and loss of function in transgenic animals can severely disturb their normal physiology or behaviour. After micro-injection of a DNA construct into the zygote, the welfare of the resulting animals may also be compromised as a consequence of insertional mutations. There are already several examples in the literature describing how the health and well-being of transgenic animals have been seriously impaired due to side-effects provoked by the newly introduced gene. On the other hand, transgenesis can also be used for the production of animals that are resistant to diseases or have characteristics which improve their coping strategies and thus contribute in a positive way to their well-being.

When animals are kept in captivity they are usually unable to fully execute their species-specific behaviours. One way of dealing with this problem is to change the environmental conditions in such a way that the animals' basic physiological and behavioural needs can be fulfilled. If this is not feasible, one might consider submitting the animal population to a genetic selection scheme – and thus adapt the animal to the environment. In the past, this process has been the basis for domestication. At present, the tools for selection and genetic modification have drastically changed. From an ethical point of view it is questionable whether these new techniques can be used for creating animals which, eventually, will be deprived of their present natural physiological and/or behavioural needs (and changed into creatures that can be kept under impoverished environmental conditions), without compromising their well-being.

These, and probably several other associations, may be provoked by combining the terms 'genetics' and 'animal welfare' (see also the following *Editorial Comment*). The aim of this Special Issue is to explore some of the welfare implications of genetic changes in farm, companion and laboratory animals, as well as the potential of genetics to improve the well-being of these animals while preserving their integrity.

In their opening contribution, Sandøe *et al* have taken some of the negative side-effects of breeding farm animals as the starting point for a reflection on the ethical values that should underlie future breeding schemes. McGreevy and Nicholas illustrate that, in the dog, some of the formulated breed standards have a detrimental effect on the health and welfare of the individual animal. They point out, for example, that the stated breed standard of the British Bulldog, requiring a large head – the larger the better – is a cause of the birth problems that have become a common phenomenon in this breed. In some breeds welfare is also jeopardized by inbreeding, due to small population sizes. McGreevy and Nicholas suggest

several possible solutions to current welfare problems in dog breeding. The contribution by Jones and Hocking, elaborates upon some of the practical and ethical aspects of selective breeding, taking some evident welfare problems in poultry (fear, feather pecking and social stress) as examples. The following paper of Nevison *et al* emphasizes the need to consider differences in the genetic background when implementing welfare-improving measures. They describe some marked strain-specific differences for environmental requirements that have been found in the mouse. Scobie *et al* describe changing some of the phenotypic characteristics of sheep (by non-genetic means) in order to study the effects of these changes on welfare and economics. This approach provides information that is useful in formulating rational breeding goals for this species.

Four papers in this Special Issue deal specifically with aspects of biotechnology. Biotechnological procedures are discussed both because of their impact on the welfare of animals but also because of their ethical implications. Appleby discusses the different points of view that often exist between people when discussing animal biotechnology issues. He argues that communication can be substantially improved if the participants in the discussion make more effort in understanding one another's 'language' of ethics. Varner examines the moral aspects of cloning, taking the dog 'Missy' as an example. He reaches the conclusion that, when certain stringent conditions are met, much of the research on animal cloning can be endorsed from an animal rights perspective. Jenkins and Combes apply the ethical scoring system of Porter to a transgenic mouse model for the diagnosis of BSE and conclude that this approach can contribute to the identification of potential targets for refinement. Finally, Mertens and Rülicke describe the development of a score sheet for the collection of data that may be relevant for the assessment of welfare problems in transgenic animals.

Overall, the papers presented in this Special Issue contain viewpoints and practical information, which will certainly stimulate further discussion and, I hope, act as a trigger for new research on this important topic.

L F M van Zutphen
Utrecht University
The Netherlands

November 1999