

präklinischen Entwicklungsphase Transplantationsversuche von einer Tierart auf eine andere befriedigende Ergebnisse gezeigt haben. Bei diesen Versuchen können - neben der Belastung durch den chirurgischen Eingriff der Transplantation - als Folge der Reaktionen auf das fremde Gewebe massive Gesundheitsstörungen entstehen, sodass die Empfängertiere sterben oder eingeschläfert werden müssen. Dies gilt zumindest, bis die Technik zu grösserer Reife gebracht worden ist.

Bei konsequenter Durchsetzung eines absoluten Respektes für alles Leben würde sich die Nutzung von Tieren als Organspenden verbieten. Allerdings müsste dann der Umgang mit Tieren in unserer Kultur in jeder Beziehung neu überdacht werden, nicht nur in Bezug auf die Nutzung in Tierversuchen und für die Xenotransplantation.

Eingriffe in das Wohl und das Leben von Tieren dürfen - um die Würde der Tiere zu wahren - nicht ohne überzeugende Gründe vorgenommen werden. Im heutigen Augenblick kann die zukünftige Bedeutung der Xenotransplantation noch nicht abgeschätzt werden. Noch sind die Risiken der Übertragung menschenpathogener Erreger nicht abschliessend beurteilbar, und manche technischen Bereiche müssen weiter entwickelt werden. Es lässt sich daher auch nicht mit Sicherheit sagen, ob das angestrebte Ziel erreicht werden kann und die Tierversuche somit ihren Zweck erfüllen. Dieser Schwachpunkt trifft jedoch für jede Art der Forschung zu.

Bei der Xenotransplantation tierischer Organe stehen sich die Interessen von Mensch und Tier diametral gegenüber und müssen in jedem einzelnen Fall sorgfältig

gegeneinander abgewogen werden. In der Phase der Entwicklung dieses Verfahrens ist eine generelle Beurteilung der Zulässigkeit des Einsatzes von Tieren nicht möglich. Die folgenden Hauptaspekte müssen im Sinne einer Güterabwägung besonders gewürdigt werden:

- der im besten Fall mögliche Nutzen (Lebensqualität, Überlebensdauer) für den Organempfänger
- die versuchsbedingte Belastung der Empfängertiere in der präklinischen Phase
- die Einführung einer Vielzahl menschlicher Gene ins Erbgut der Tiere und mögliche Folgen für deren Wohlbefinden
- die Lebensbedingungen der Spender-tiere unter dem für die Transplantation geforderten Gesundheitsstatus
- der Tod vieler Tiere an sich.

## Contribution to the ethical appraisal of xenotransplantation with respect to protection of the dignity of the animals

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The spectacular advances that have been made in the field of human organ transplantation have improved not only the life expectancy, but also the quality of life for a large number of patients. However, the increasing demand for donor organs can no longer be met. Xenotransplantation is one of many possibilities for closing the gap between the growing demand for organs and the limited supply from donors. Xenotransplantation is understood to mean the removal of live organs, tissues or cells from animals and their transplantation in human patients. From the animal-ethics point of view, appraisal of the transplantation of whole organs is of prime importance. The fundamental question, whether the implantation of animal or-

gans in humans is acceptable, has to be answered by society as a whole. The Swiss Academy of Medical Sciences has undertaken the task of drawing up guidelines on xenotransplantation for the physicians and surgeons involved in this field. The aim of this present statement is to address a further aspect, namely the ethical appraisal of xenotransplantation with respect to protection of the dignity of the animals.

The use of animals for the benefit and the good of humans has been practised for time immemorial, and since the beginning of philosophical and religious tradition it has again and again been put into question. In Europe, the use of animals for biomedical research in particular is accepted by the majority of the

population, but rejected by a minority. Both its proponents and its opponents put forward sincere, convincing arguments. In the knowledge that on the one hand, Man cannot do without scientific experiments in animals, while on the other the ethical principle of respect for life calls on him to protect animals, the Swiss Academy of Medical Sciences (SAMS) and the Swiss Academy of Natural Sciences (SANS) published ethical principles and guidelines (EPG) for scientific experiments in animals for the first time in 1983. These were revised and extended in 1995<sup>1</sup>. They provide aids to decision making in this controversial area. Further, the Ethical Committee for Experiments in Animals of the SAMS and the SANS gave its opinion concerning the term "dignity of the animal"<sup>2</sup>. Even with different basic attitudes, we all have the moral obliga-

<sup>1</sup> Ethical Principles and Guidelines for Scientific Experiments on Animals (latest version 1995).

<sup>2</sup> Statement to the term „dignity of the animal“ (1997).

(These publications can both be ordered at: Sekretariat SANW, Bärenplatz 2, CH-3011 Bern.)

tion to recognise the dignity of animals, to take proper account of the most important interests of both humans and animals and to come to decisions only after giving responsible and careful consideration to all the circumstances.

The use of animals as organ donors for humans (the animals from which the organs are taken are called "donor animals", "source animals" or also "xenogenic animals") opens up a new field in the use of animals and must therefore be considered very thoroughly. Unfavourable consequences for the animals can occur mainly in three areas:

*Introduction of heterogeneous genes:* In order to improve the tissular tolerance and thus to reduce the rejection reactions, human genes have to be introduced into the genome of the donor animals. Therefore the questions that arise with every transgenic animal have to be asked: Do the transferred gene or genes cause changes in appearance, the behaviour or other characteristics of the animal? Does it cause the animal pain and suffering? In comparison with the creation of transgenic animals for research purposes by the means used up until now, the amount of the foreign genetic material introduced for the xenotransplantation can play a role.

*Housing conditions:* Animals intended to be used as organ donors must be absolutely free not only from pathogenic germs but also from potentially pathogenic germs of all kinds. The breeding, care and housing of the animals are therefore possible only under strict conditions of isolation. This requires a closed, isolated unit where the feed and other materials are passed in through an isolation chamber, only after they have been sterilised. The animal keepers also have to pass through an isolation chamber. These conditions are already required today in breeding and housing units for experimental animals where breeding animals and laboratory animals have to be kept free from pathogenic germs. Under these restrictive conditions, however, the animals are deprived of all contact with a natural environment, which can cause them stress. The specific design of the cages or other forms of housing for the particular animal species and the provision of various suitable diversions are in-

tended to increase the quality of their environment and to make social contact possible for the animals.

*Preclinical development phase:* In this phase, major ethical problems can arise as far as the animals are concerned, especially with the xenotransplantation of organs. Before the transplantation of an animal organ in humans can be justified according to medical-ethical criteria, test transplantations of the organ from one animal species to another must have shown satisfactory results. In these tests, besides the effects on the animal due to the surgical intervention necessary for the transplantation, massive adverse effects on the health of the recipient animals as a result of the reaction to the foreign tissue can occur, so that they die or have to be put to sleep. This will be the case at least until the technology has been improved and perfected.

Consistent observance of absolute respect for all life would make the use of animals as organ donors impossible. However, this would also mean that in our society the handling and use of animals, in every respect, and not only in regard to their use in animal experiments and for xenotransplantation, would have to be considered anew.

In order to respect their dignity as living creatures, any intervention into the well-being and the life of animals must not be undertaken without convincing justification. At the present time it is still not possible to estimate the future importance of xenotransplantation. The risks of the transmission of germs pathogenic for humans cannot be assessed conclusively, and many fields of technology have to be developed further. It can therefore not be said with certainty whether the objective that is being aimed for can be achieved and whether these animal experiments can thus fulfil their purpose. However, this uncertainty is a weakness that applies in any type of research.

With the xenotransplantation of animal organs, the interests of Man and animals are diametrically opposed and have to be carefully weighed against each other in each individual case. In the development phase of this procedure it is not possible to make a general appraisal of the admissibility of the use

of animals. Special recognition must be given to the following principal aspects, in the sense of a weighing-up of the benefits and the disadvantages:

- the possible benefits (quality of life, life expectancy) for the organ recipient, in the best case;
- the suffering imposed on the recipient animal due to the experiment, in the preclinical phase;
- the introduction of a large number of human genes into the genome of the animals and the possible consequences for their well-being;
- the living conditions of the donor animals that are necessary to ensure their state of health as required for the transplantation;
- the death of many animals, in itself.

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