How does the research on primates benefit humans?

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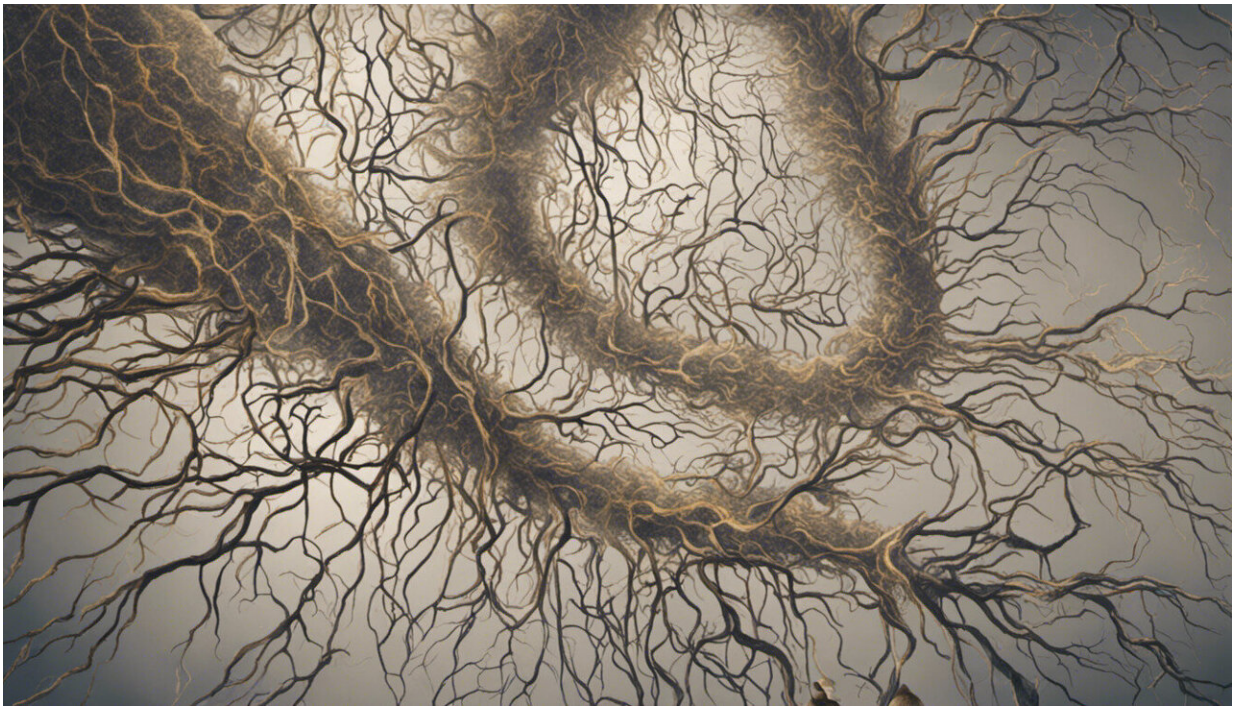

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The conflict centres on two irreconcilable ethical obligations: the obligation to seek ways of making diseases treatable and in this way reduce human suffering, on the one hand, and the obligation to protect the lives of animals, on the other. As long as animal testing remains the only way of accessing knowledge about the functions and complex

biological interactions in living organisms, there can be no satisfactory solution to this conflict.

A few figures to begin: As all experiments on animals are subject to both authorisation and approval, there are very accurate statistical records available on them. According to the statistics, the number of animals killed for the requirements of basic research in Germany is only 0.03 percent of the total number of animals sacrificed for human requirements (this only includes the animals killed to provide food and materials and does not include the extermination of so-called vermin etc.). Around three-quarters of all laboratory animals are rodents; the percentage of non-human primates (e.g. macaques, marmosets and vervet monkeys) is 0.05 and has remained constant for years.

Playing around with numbers like this is of little help when it comes to the ethical balancing of animal and human suffering. It is true that animals are killed to gain information. But it is not true that animals are tortured. It is clearly important to examine the harm and suffering inflicted on animals in basic research. However, the hope and assumption is that the knowledge gained from the experiments will serve in establishing a better understanding of the cause of diseases in animals and humans, and the development of effective treatments. The desire to forego the knowledge that can be gained from animal testing means deliberately foregoing the desire to help people who suffer from diseases for which no treatment currently exists. This is the moral dilemma.

It is often claimed that the knowledge gained from animals is not applicable to humans. This claim is simply false. On the contrary, the biological processes in the animal and human organism are extraordinarily similar, as both descend from common ancestors, and nature is extremely conservative when it comes to the development of biological mechanisms. This is demonstrated most clearly by the fact that almost all of the methods used in human medicine are the same as

those used in veterinary medicine. Anyone who claims that the insights gained from animals are meaningless when it comes to the understanding of normal and pathogenic processes in the human body is either badly informed or knowingly untruthful.

The aspects of brain research dealing with problems involving the restoration of brain functions following strokes, paraplegia, brain tumours and inflammatory diseases can seldom be researched using tissue cultures. In fact, it is completely pointless to aim to clarify the causes of the numerous diseases resulting in brain function disorders using tissue cultures. These disorders include, for example, epilepsy, multiple sclerosis, all degenerative diseases of the central nervous system, including Alzheimer's disease, and the clinical pictures leading to progressive paralysis, the numerous developmental disorders, which result in severe learning difficulties, and, last but not least, mental illnesses like depression and schizophrenia. Effective methods for the treatment of these diseases can only be developed if their causes are explained and the mechanisms through which the damage arises are understood.

To reach this understanding, it is essential that we identify which brain structures are responsible for which functions, how structures in the brain develop and how the learning processes – which must take place when functions that have been lost have to be replaced by other ones – unfold in the brain. The ape brain is particularly suited to this purpose because it is similarly complex in structure to that of humans. The development of new methods of treating brain diseases is often only possible with the use of apes. Examples of such diseases and treatments are presented below:

Experiments with rhesus monkeys have led to a new treatment for patients with Parkinson's disease

Known as deep brain stimulation, this treatment involves placing electrodes in the damaged brain areas and releasing electrical pulses which alleviate the disease symptoms; the device in question is also referred to colloquially as the "brain pacemaker" (see video). Deep brain stimulation can also be used to treat schizophrenia, obesity and forms of depression which do not respond to the drugs in common use. However, this treatment can cause serious side effects, such as wound infections and psychiatric complications. To reduce these serious side effects for patients in the future, scientists are investigating the exact way in which deep brain stimulation works on apes. Research has also been under way for some time on a new method which involves the stimulation of the spinal cord by electrodes and not the brain. These tests are currently being carried out on rats. Before the results obtained with rats can be applied to humans, however, they must be tested on apes.

Experiments with apes also make a crucial contribution to the study of different forms of dementia like Alzheimer's

Apes are among the few species which, like humans, can develop Alzheimer's disease. Tests on long-tailed macaques have shown that they also develop protein deposits in the brain, which are largely similar to those that arise in humans. In contrast, the corresponding protein in mice and rats is vastly different to the human one. Thus, researchers could investigate far more effectively how these protein deposits arise in the brain using long-tailed macaques, and possibly other ape species.

Huntingdon's disease is another serious disorder of the brain

Patients with this disease suffer from the progressive destruction of an area of the brain responsible for muscle control and fundamental mental

functions. The brain cells are destroyed by a faulty protein (huntingtin), which is formed due to a defect in the corresponding gene. The physical symptoms include the impairment of the emotions, muscle control including facial expression, and finally of brain function as a whole – the final stage of the disease involves dementia. It is also possible that this disease can be better explained using apes rather than mice or rats. Genetically modified macaques with a mutated form of the huntingtin protein in the brain form protein deposits like those that occur in human Huntington patients. The symptoms of the disease are also similar in both apes and humans. Further research on these animals could, therefore, lead to new ways of treating this disease, which has proved incurable thus far.

Findings from the research on apes should also benefit patients with locked-in syndrome

This disease causes the death of the neurons in the musculoskeletal system. Patients progressively lose their motor skills, for example the ability to lift a cup to their mouths, until they are ultimately unable to breath unaided. The only shimmer of hope for locked-in patients at present is the development of brain-computer interfaces. What is involved here is a direct communication channel between the brain and an external device which records the neuronal processes. Such brain-computer interfaces can be applied to a certain degree using non-invasive technologies. EEG recording is the potential interface that has been studied in most detail. Paralysed patients can be trained to control their brain waves so that they can use them to move a computer cursor. They can then communicate in a simple way by clicking on certain images on a monitor. Neuroprosthetic devices now exist which are implanted in patients. The further development of this approach should ultimately result in enabling the brain to control the complex movement of a prosthesis and thus enable patients to be able to guide a cup to their

mouths using thought-controlled robotic arms. To this end, neuroscientists are researching the signals in the motor centres of the brains of macaques.

The use of apes as experimental animals has already led to important medical insights. For example, rhesus-factor incompatibility between mothers and their unborn children was discovered through experiments on rhesus monkeys. The treatment of diabetes patients with insulin is also based on animal tests as is the treatment of polycystic ovarian syndrome, the most common hormonal disorder in European women which usually results in infertility. Finally, the development of stem cell technology, on which so many hopes are pinned today, was initially based on apes.

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