

## **Human reproductive cloning: a statement by the Royal Society**

Public anxiety is being raised by recent hype and speculation surrounding claims about human reproductive cloning. To help the public evaluate news about human cloning, the Royal Society has published the following statement of its position, together with a checklist against which to assess the claims. This statement has been prepared by Lord May of Oxford, President of the Royal Society, Professor Richard Gardner, chair of the Royal Society's recent studies into stem cell research and Henry Dale Research Professor of the Royal Society at the Department of Zoology, University of Oxford, and Sir Alec Jeffreys, inventor of DNA fingerprinting and Wolfson Research Professor of the Royal Society at the Department of Genetics, University of Leicester.

Human reproductive cloning is illegal in the United Kingdom. The Royal Society urges all other nations, particularly the United States, to introduce and support appropriate regulations that would create a worldwide moratorium on human reproductive cloning, regardless of whether it is funded publicly or privately. It is vitally important, however, that such a moratorium does not extend to research involving the cloning of very early human embryos for investigations into the therapeutic potential of stem cells.

Very early human embryos cloned for legitimate research into harnessing stem cells could help to improve or save the lives of millions of patients worldwide. A recent opinion poll shows that the majority of the public in the United States supports research on human embryonic stem cells, and the UK Parliament recently voted, by large majorities in both Houses and after extensive public debate, to allow such work to go ahead under licence.

The Royal Society is concerned about claims that human reproductive cloning has been achieved, despite a lack of evidence that it is medically safe, scientifically sound, or socially acceptable. Such claims, when made through the media and without proper assessment by credible scientific and medical authorities, tend to create public anxiety that may prove unwarranted.

We urge all individuals and organisations that claim to be engaged in human reproductive cloning immediately to release the full details of their work for proper assessment by the scientific and medical community. This information must provide answers to at least 10 key questions, which we are publishing to help the public decide whether current and future claims about the cloning of humans are credible and ethically acceptable.

The checklist of questions is:

1. Have the health risks that such experiments pose, for both cloned offspring and the women in whom cloned embryos are implanted, been recognised and properly evaluated, and how do these compare with the known and substantial risks involved in the cloning of other species?
2. What research, including tests involving non-human species, was carried out to justify an extension of such experiments to humans?

3. Was the research that led to the alleged human reproductive cloning subjected to independent analysis and review by experts from the scientific and medical community?
4. What safeguards were introduced to minimise risks to human test patients, including both cloned offspring and the women who bore them?
5. To what extent did human test patients understand the risks and consequences associated with the experiments, and what evidence is there that they gave fully informed consent?
6. Where were the experiments carried out, and did they comply with local, national and international ethical standards and regulations for such work?
7. What were the methods used and the results obtained, including failure rates in experiments involving human test patients, and when will this information be submitted for review and assessment by independent experts?
8. Have arrangements been made to undertake regular and detailed health monitoring of the cloned offspring during their lifetimes, and of the women who bore them during an appropriate post-natal period?
9. Have any measures been put in place to monitor the psychological well-being of both the individuals that have been cloned and the offspring?
10. Have independent tests by properly qualified people been used to confirm that the offspring are indeed clones?

The Royal Society draws particular attention to the importance of using independent accurate tests to establish that an individual that has been cloned and an offspring are genetically identical, which require the following:

- I. samples for DNA analysis should be obtained directly, from both the individual that has been cloned and the resulting offspring, by an independent expert, and witnessed and verified by representatives from a reputable organisation (such as the American Association of Blood Banks or equivalent organisation, which oversees DNA paternity or forensic tests in the United States);
- II. samples should be tested in two independent accredited laboratories using different DNA markers (such as a laboratory of the Federal Bureau of Investigations and a reputable paternity testing laboratory);
- III. samples should be subjected to simple tandem repeat (STR) locus profiling, testing 10 to 15 different loci per laboratory to establish the degree of mismatch between the individual that has been cloned and the offspring;
- IV. results should be subjected to rigorous statistical analyses by the laboratories involved and published in full so that they can be properly evaluated by the scientific and medical community.