World first: Japanese scientists create transgenic monkeys

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In a controversial achievement, Japanese scientists announced on Wednesday they had created the world's first transgenic primates, breeding monkeys with a gene that made the animals' skin glow a fluorescent green.

The exploit opens up exciting prospects for medical researchers, they said.

It could eventually lead to lab monkeys that replicate some of humanity's most devastating diseases, providing a new model for exploring how these disorders are caused and how they may be cured.

"Great advances in pre-clinical research can be expected using these models," the team said.

But other voices warned of a potential ethics storm, brewed by fears that technology used on our closest animal relatives could be turned to create genetically-engineered humans.

In a study published in the British journal Nature, a team led by Erika Sasaki of the Central Institute for Experimental Animals at Keio University reported on experiments on common marmosets (Callithrix jacchus), a small monkey native to Brazil.

They introduced a foreign gene, tucked inside a virus, into marmoset embryos that were then nurtured in a bath of sucrose.

The gene codes for green fluorescent protein (GFP), a substance that was originally isolated from a jellyfish and is now commonly used as a biotech marker. An animal tagged with GFP glows green when exposed to ultraviolet light, proving that a key gene sequence has been switched on.

The transgenic embryos were then implanted in the uterus of seven surrogate mother marmosets.

Three of recipients miscarried. The other four gave birth to five offspring, all of which carried the GFP gene.

In two of these five, the GFP gene had been incorporated into the reproductive cells. A second generation of marmosets was then derived from one of the two.

The work is important, because medical researchers have hankered for an animal model that is closer to the human anatomy than rodents.

Mice and rats, genetically engineered to have the symptoms of certain human diseases, are the mainstay of pre-clinical lab work, in which scientists test their theories before trying out any outcome on human volunteers.

But many disorders, especially neurological diseases such as Alzheimer's and Parkinson's, are so complex that they cannot be reproduced meaningfully in rodents because their biology is different.

Hopes for a non-human primate model have until now been dashed by the failure to insert a gene into a monkey's sperm and eggs -- the "germline" that ensures that the inserted DNA is passed on to future generations rather than lost.

The first genetically-modified monkey was born in 2000. Known as ANDi (the initials of "Inserted DNA," spelt backwards), the rhesus carried the GFP gene but not in its reproductive cells.

The latest exploit thus opens up hopes of eventually breeding colonies of transgenic primates with inherited traits that closely replicate human disease.

"This is the first case ever established in the world that an introduced gene was successfully inherited (by) the next generation in primates," the researchers said in a press relase.

Future plans include creating transgenic marmosets that replicate human diseases such as Parkinson's and amyotrophic lateral sclerosis.

In a commentary also published by Nature, Gerald Schatten and Shoukhrat Mitalipov, primate research specialists in the US, praised the achievement as "undoubtedly a milestone" but sounded caution.

They said marmosets were not as useful as baboons or rhesus monkeys in replicating some diseases, notably HIV and tuberculosis.

Another question was the random insertion of a foreign gene in the monkey's genetic code. This may have caused some of the miscarriages and, if previous research is a guide, could unleash cancer.

Scientists also have to address legitimate public concern about animal welfare and the need for "realistic policies" to prevent genetically-engineered babies, they warned.

"There are many unanswered questions," Helen Wallace, of GeneWatch UK, a British NGO that monitors the ethics of gene research, told AFP.

"It's a big step from making a fluorescent green marmoset to making a marmoset that replicates a human disease, it's a much more complicated thing to do.

"There's also a very important ethical debate, firstly about the animals themselves and secondly about what this might lead to in the future, whether it might be ethically justified to genetically engineer humans."