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NOBEL PRIZE IN MEDICINE

AWARDS: Trio shares prize for 'knockout' mouse development

THE 2007 NOBEL Prize in Physiology or Medicine has been awarded to three researchers for discoveries associated with the use of embryonic stem cells to introduce specific gene modifications into mice. The modifications, which can inactivate—or knock out—particular genes, reveal the function of the original genes and can also replicate human diseases such as cancer and diabetes in mice.

The $1.5 million prize will be shared by Mario R. Capecchi, Howard Hughes Medical Institute investigator and professor of human genetics and biology at the University of Utah, Salt Lake City; Sir Martin J. Evans, professor of mammalian genetics at Cardiff University, in Wales; and Oliver Smithies, professor of pathology and laboratory medicine, University of North Carolina, Chapel Hill.

"The ability to inactivate any gene at will within the mouse genome, made possible by the studies recognized by the prize, has revolutionized our ability to understand the human and other mammalian genomes," says Jeremy M. Berg, director of the National Institutes of Health's National Institute of General Medical Sciences, which has funded research by Capecchi and Smithies. "Furthermore, this 'knockout' mouse technology has enabled the creation of many strains of mice that serve as living laboratories for studying human health and disease."

Capecchi said in a statement he was honored to share the prize with Smithies and Evans. "We have all been very fortunate in having a long-standing scientific friendship and in being able to profoundly contribute to each other's work," he said. "This prize is a tribute to our collective efforts."

Evans added, "I'm very pleased that British science is being honored in this way. It is a boyhood dream come true."

The researchers' "gene targeting" technique replaces a selected gene in the DNA of mouse embryonic stem cells with a different genetic sequence. The altered stem cells are then injected into embryos. The embryos are implanted in female mice, which later give birth to mice in which some of the cells—including some germ cells—contain the new sequence. These offspring in turn are bred to produce descendants that carry the new sequence in all cells. The method can replace a defective gene with a functional copy. Alternatively, it can replace a normal gene with an inactive version, generating knockout mice. The technique can be refined to limit modification of a gene's activity to specific cells or organs within the mouse or to a particular time during its life.

With this approach, "it is now possible to produce almost any type of DNA modification in the mouse genome, allowing scientists to establish the roles of individual genes in health and disease," according to the Nobel Foundation. The foundation added that gene targeting "is now being applied to virtually all areas of biomedicine, from basic research to the development of new therapies."—SOPHIE ROVNER


Capecchi

SEAN GRAFF


Evans

CARDIFF UNIVERSITY


Smithies

UNC CHAPEL HILL