Monkey genes help us see what makes us human

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Washington (Reuters) - Many of risk of suicide, and U.S. regulators macaque monkeys but not in our nearest relative, the chimpanzee, researchers reported on Thursday in a study that sheds more light on what makes humans different.

A team of more than 170 scientists from around the world has sequenced the genome – the entire genetic map – of the rhesus macaque, a monkey heavily used by medical researchers.

They can use this information to "triangulate" their way through the genomes of primates – the family of mammals that includes humans, great apes and monkeys.

"This sequence and its comparison to that of the human and chimpanzee enable us to look back at history at how these species evolved and diverged," said Dr. Richard Gibbs of the Baylor College of Medicine in Houston, Texas, who led the project.

"It points to genes that are important for defining the difference between the species."

Humans and chimps split away from their common ancestor between 4 million and 7 million years ago, depending on the estimate. Macaques split off about 25 million years ago, so having their DNA map adds a new dimension when examining the genes.

While humans and chimps share about 98 percent of their DNA, macaques share about 93 percent.

But what is more interesting is what they have in common with us, the researchers write in a series of reports published in the journal Science.

Dr. Mark Batzer of Louisiana State University and colleagues found one big thing they have in common with is mobile elements – also called jumping genes. These are stretches of DNA that move around on the chromosomes that carry them.

"They make up about half of all the primate genomes that have been studied to date," Batzer said in a telephone interview.

"So they are really big components of our genomes. Given that these elements are actively duplicating themselves, they can actually create a lot of genetic disorders."

Researchers have learned that where a gene ends up, physically, in the chromosomes affects its function. Jumping genes can cause inherited high cholesterol, also called familial hypercholesterolemia, breast cancer, hemophilia, and Tay-Sachs disease.

"Who cares if a macaque has hypercholesterolemia, right? What we do care about is, hey, we have got these things in our own genomes that are constantly causing new mutations. Why are they doing it and how do we stop them?" Batzer asked.

"We are getting some insights into what makes these elements tick, move – how they work," he added.

"They are really potent agents of genetic mutation."

Also, macaques appear to have been exposed to more retroviruses than humans have. Retroviruses include the AIDS virus, and can make themselves a permanent part of an animal's DNA.

This is important because macaques are widely used for testing AIDS vaccines and drugs. Most primates are immune to the AIDS virus but macaques can be infected with a related version called simian immunodeficiency virus, or SIV.

And the researchers found a gene that may explain why Indian macaques and Chinese macaques have a different response to the virus. Chinese macaques develop symptoms more slowly when infected with SIV.

"Obviously there must be differences like that out in the human population as well," Batzer said.

The genetic sequences of macaques, humans, chimpanzees, orangutans, dogs, cattle, roundworms and other species are freely available at http:www.ncbi.nih.gov/Genbank. ❑

Source: Reuters Health