# Researchers discover molecular security system that protects cells from potentially harmful DNA

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Researchers at the University of Minnesota have discovered a molecular security system in human cells that deactivates and degrades foreign DNA. This discovery could open the door to major improvements in genetic engineering and gene therapy technologies.

Led by Reuben Harris, associate professor of biochemistry, molecular biology and biophysics in the College of Biological Sciences, the report's findings will be published online by *Nature Structural and Molecular Biology* on Jan. 10.

In the study, Harris and colleagues show how APOBEC3A, an enzyme found in human immune cells, disables double-stranded foreign DNA by changing cytosines (one of the four main bases in DNA) to uracils (an atypical DNA base). Persisting DNA uracils result in mutations that disable the DNA. In addition, the authors show that other enzymes step in to degrade the uracil-containing foreign DNA and sweep its remains out of the cell.

"Scientists have known for a long time that some human cells take up DNA better than others, but we haven't had good molecular explanations," Harris says. "This is definitely one of the reasons. Foreign DNA restriction is a fundamental process that could have broad implications for a variety of genetic diseases."

By understanding how the mechanism works, scientists can develop ways to manipulate it to enable more effective methods to swap bad genes for good ones. Harris is also intrigued to learn why the mechanism doesn't affect a cell's own DNA.

The discovery of an analogous foreign DNA restriction mechanism in bacteria launched the field of genetic engineering during the 1970s. Once bacterial DNA restriction enzymes were understood, their power was harnessed to cut and paste segments of DNA for a wide variety of therapeutic and industrial purposes.

Provided by University of Minnesota