Scientists identify two transposons that are active in human cells

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(Phys.org)—Transposable elements—or transposons—are DNA sequences that move in the genome from one location to another. Discovered in the 1940s, for years they were thought to be unimportant and were called "junk DNA." But now scientists recognize that these bits of DNA play vital roles in gene and genome evolution, and are important genetic tools for genome engineering.

A group of scientists recently identified two transposable elements—TcBuster and Space Invader—that are highly active in human cells, offering powerful genetic tools for mammalian genome engineering.

TcBuster, found in a beetle (Tribolium castaneum), was discovered at the University of California, Riverside—specifically, in the lab of Peter Atkinson, a professor of entomology and the director of the Center for Disease Vector Research. It has an activity comparable with other transposons already used in human gene therapy clinical trials.

"TcBuster is an active transposon, which means it can excise from and integrate into DNA," Atkinson said. "This is important because it has the ability to move genes into genomes and so can be developed as a genetic tool outside of Tribolium. It has been very difficult to identify active transposons but our ability to do so has increased with the use of bioinformatics tools with which to interrogate the ever expanding genomes that are being sequenced. Insects turn out to be particularly rich sources of active transposable elements. The bioinformatics approach we

took enabled us to identify several such transposons."

Atkinson explained that TcBuster transposes at a high frequency, approaching that of the piggyBac and Sleeping Beauty transposons, considered to be the gold standard of transposons used in human gene therapy for delivering beneficial genes to the human gene in order to treat genetic disease.

"There are several clinical trials underway in labs using piggyBac in human gene therapy," he said. "TcBuster's high activity provides a new transposable element tool for this approach to treating some diseases."

Research results were published online, ahead of print, in the *Proceedings of the National Academy of Sciences* on Oct. 22 and in *PLOS ONE* earlier this month. Atkinson is a coauthor on both research papers.

More information: www.ncbi.nlm.nih.gov/pubmed/23091042 and www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0042666

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