Researchers Use Light to Switch On Gene Expression

Imagine being able to control genetic expression by flipping a light switch. Researchers at North Carolina State University are using light-activated molecules to turn gene expression on and off. Their method enables greater precision when studying gene function, and could lead to targeted therapies for diseases like cancer.

Triplex-forming oligonucleotides (TFOs) are commonly used molecules that can prevent gene transcription by binding to double-stranded DNA. NC State chemist Dr. Alex Deiters [1] wanted to find a way to more precisely control TFOs, and by extension, the transcription of certain genes. So Deiters attached a light-activated "cage" to a TFO. When exposed to ultraviolet (UV) light, the cage is removed, and the TFO is free to bind with DNA, inhibiting transcription of the gene of interest.

"In the absence of light, transcription activity is 100 percent," says Deiters. "When we turn on the light, we can take it down to about 25 percent, which is a significant reduction in gene expression."

Additionally, Deiters fine-tuned the process by attaching a caged inhibitor strand to the TFO. In the absence of UV light, the TFO behaves normally, binding to DNA and preventing gene expression. However, when exposed to UV light, the caged inhibitor activates and stops the TFO from binding with DNA, turning gene transcription on.

"We've created a tool that allows for the light-activation of genetic transcription," Deiters says. "By giving researchers greater temporal and spatial control over gene expression, we've expanded their ability to study the behavior of particular genes in whichever environment they choose."

The research appears online in ACS Chemical Biology [2], and was funded by the National Institutes of Health. Deiters worked with NC State graduate students Jeane M. Govan, Rajendra Uprety and James Hemphill and Wake Forest University's Mark O. Lively on the research.

Source URL (retrieved on *03/10/2014 - 12:35pm*):
http://www.mdtmag.com/news/2012/05/researchers-use-light-switch-gene-expression

Links:
[1] http://www.ncsu.edu/chemistry/people/adeiters.html

[2] http://pubs.acs.org/doi/abs/10.1021/cb300161r?prevSearch=%255BContrib%253A%2BDeiters%255D&searchHistoryKey=