Light-activated genes in bacteria engineered with CRISPR-Cas9

Scientists may have taken a step closer to making science fiction a medical reality. Researchers at Duke University have developed a method for activating genes in vitro using any specific pattern they choose just by flipping on the light.

The ability to use light for activating genes in precise locations allows investigators to observe gene function, create complex growth systems for tissues, and possibly even create light-induced healing technologies that are often a staple of sci-fi movies and television.

The results from this study were published recently in Nature Chemical Biology in an article entitled “A light-inducible CRISPR-Cas9 system for control of endogenous gene activation”.

“This technology should allow a scientist to pick any gene on any chromosome and turn it on or off with light, which has the potential to transform what can be done with genetic engineering,” said Lauren Polstein, Ph.D. student and lead author on the study. “The advantage of doing this with light is we can quickly and easily control when the gene gets turned on or off and the level to which it is activated by varying the light’s intensity. We can also target where the gene gets turned on by shining the light in specific patterns, for example by passing the light through a stencil.”

The Duke researchers took advantage of the viral defense system utilized by many bacteria and genetically crossed it with phototropic genes from plants. Specifically, the researchers used a light-activated CRISPER/Cas9 effector (LACE) system that induces the transcription of endogenous genes in the presence of blue wavelength light. The light sensing portion of the system comes from two plant proteins that naturally interlock in the presence of light, allowing the plant to identify the length of day, which regulates plants physiological functions like flowering and seed germination.

Read full, original article: Scientists Coax Genes into the Light