This Does What?!?
How has genetic engineering changed things?

Target Grade Levels: 9-12
Subject Areas: Biology
Time Required: Four-eight 60-minute class periods

Lesson Objectives:
1. Students will investigate examples of beneficial and nonbeneficial transgenetic organisms.
2. Students will become familiar with the processes involved with genetic engineering.
3. Students will communicate arguments for or against the use of genetically modified organisms.

Materials Required:
- Internet
- Petri plates
- Incubator
- Growth media
- Electrophoresis apparatus
- Materials supplied by the Bhattacharyya Lab at Iowa State University

Lesson Summary
Lila occasionally leaves class with no explanation. The teachers in her school are well aware of the reason she leaves; Lila is a diabetic. Ms. Information, the biology teacher, one day asked Lila if she would mind answering questions about her disability. Lila agreed, and the class responded with a great discussion that ended with the class researching the sources of insulin. When it was revealed the modern source of insulin is genetically modified bacteria, Ms. Information was delighted to find the students were interested to find out what other products come from genetically modified organisms and how the whole process works. They wonder if all products produced by GMOs have been beneficial and ask how scientists know the organisms have been modified.
Lesson Plans

Students will research at least three products that involve GMOs. These can be products on the market currently or those being researched. The students will report back to the class the name of the products, the organisms involved, whether the products are currently used successfully, if not, why not. This will lead to the process of genetic modification. To aid in the illustration, a partnership with the Bhattacharyya Lab at Iowa State University provides materials and help with a visiting graduate student. The students will work with *E. coli* and using restriction enzymes and the other needed materials provided by the Lab, students will observe the change using white/blue plating and electrophoresis.

Differentiation

Research can be done very easily via the Internet, in case of a conflict with the graduate students’ schedule. Videos can replace the visit: [www.youtube.com/watch?v=LP_7_7J4ZmU](http://www.youtube.com/watch?v=LP_7_7J4ZmU) and [study.com/.../bacterial-transformation-definition-pro](http://study.com/.../bacterial-transformation-definition-pro) and [http://www.agron.iastate.edu/news/podcasts/media/20150611.afrimux.mp4](http://www.agron.iastate.edu/news/podcasts/media/20150611.afrimux.mp4) with electrophoresis demonstrated in class using *E. coli* sent by the University.

Teaching Tips

This investigation could work right after students isolate DNA from their cheek cells and explore whether plants have DNA, proving the existence by isolating DNA in various plant sources.

Further questions can be addressed at: [brentchambers@bellevue.k12.ia.us](mailto:brentchambers@bellevue.k12.ia.us)