**Transgenics: ethical concerns**

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The field of transgenics allows scientists to develop organisms that express a novel trait not normally found in a species; for example, potatoes that are protein rich, or rice that has elevated levels of vitamin A (known as “golden rice”). Transgenics may be also used to save endangered species such as the American Chestnut tree, which is currently being repopulated by Chinese-American chestnut hybrids specifically engineered with a genetic resistance to the chestnut blight—the deadly fungus that nearly decimated native populations in the early 1900s. Scientists are also using transgenics to develop novel vaccines, including edible vaccines.

Transgenic combinations may also include plant-animal-human transgenes, such as when the DNA of human tumor fragments is inserted into tobacco plants in order to develop a vaccine against non-Hodgkin’s lymphoma.4 Researchers have similarly developed a flu vaccine using human DNA and tobacco plants. Other transgenic plants have been used to create edible vaccines. By incorporating a human protein into bananas, potatoes, and tomatoes, researchers have been able to successfully create edible vaccines for hepatitis B, cholera, and rotavirus, the latter of which can cause fatal bouts of diarrhea. Another recent transgenic plant project, known as the “glowing plant project,” incorporated a gene from a firefly into a houseplant, creating plants that display a soft illumination in the darkness. One of the proposed goals is to create trees that could illuminate streets and pathways, thereby saving energy and reducing our dependence upon limited energy resources; however, the public release of such plants has sparked a heated debate centered around potential environmental impacts of introducing highly genetically engineered plants into natural ecosystems. BioSteel® is a high strength, resilient silk product created by inserting the genes from a silk-spinning spider into the genome of a goat’s egg prior to fertilization. When the transgenic female goats mature, they produce milk containing the protein from which spider silk is made. The fiber artificially created from this silk protein has several potentially valuable uses, such as making lightweight, strong, yet supple bulletproof vests. Other industrial and medical applications include stronger automotive and aerospace components, stronger and more biodegradable sutures, and bioshields, which can protect military personnel and first responders from chemical threats such as sarin gas. Concerns: What, if any, health risks are associated with transgenics and genetically modified foods?; Are there long-term effects on the environment when transgenic or genetically modified organized are released in the field?; Should research be limited and, if so, how should the limits be decided? How should the limits be enforced nationally and internationally?