# Example of viruses in genetic engineering research paper

Science, Genetics

The study of viruses to understand their ability to cause disease led to a recognition by scientists that viruses could be used to transport genetic material into cells (Thomas, Ehrhardt, and Kay, 2003). Viruses are a life form that injects its own genetic material into its host cell in order to hijack the cellular protein-making functions. By injecting the host cell with its own viral genetic material, the cell no longer makes proteins for its own functions and instead makes viruses. Commonly, the production of the virus causes the host cell to die and that cell death is a part of the viral disease process (Weiss, 2010). Scientists recognized that this native ability to move genetic material into host cells could be exploited to move genetic material they wanted into host cells. The ability to move genetic material and have it used by host cells to make wanted proteins is a key component of genetic engineering. The term for the use of a virus to move foreign genetic information into cells is a vector. Viral vectors are viruses that act as carriers and injectors of foreign genes into host cells but have been altered to no longer result in the production of disease-causing viruses (Thomas, Ehrhardt, and Kay, 2003).

Many different kinds of viruses have been adapted into many different kinds of vectors. By using different kinds of viruses, different host cells can be targeted, different amounts of genetic material can be carried, and different goals of the genetic engineering can be accomplished (Thomas, Ehrhardt, and Kay, 2003). For example, genetically altered adenoviruses are one of the most commonly used kinds of viral vectors (Reetz et al., 2013). One reason for this is that adenoviruses can target many different kinds of host cells, a characteristic that can be useful. However, for some uses such as reversing

liver damage, scientists want to target the genetic material to very specific cells, such as a particular kind of liver cell called a hepatic stellate cell (HSC). So changes can be made in the adenovirus to make it specific to HSCs (Reetz et al., 2013). Adenoviruses can be used as vectors when gene therapy is the goal of the genetic engineering. The aim of gene therapy is to repair a problem at the cellular level by providing genetic material that causes the cell to make a protein that compensates for the defect. In particular, to reverse liver damage, the adenovirus vector could be used to put the gene for hepatocyte growth factor (HGF) into HSCs to help repair the damage (Reetz et al., 2013).

The role of viral vectors in genetic engineering will only grow as the attempts to use gene therapy increase. That is because viral vectors are much more efficient at getting the genetic material into host cells than other, non-viral vectors (Thomas, Ehrhardt, and Kay, 2003). But there have been safety issues with the use of viral vectors for human gene therapy, including a side effect of causing cancer. Other problems have been attack by the patient’s immune system against the vector and lack of long-term use of the foreign genetic material by the host cell (Thomas, Ehrhardt, and Kay, 2003). Scientists believe that some of these problems can be overcome, perhaps by producing tailor-made vectors for each individual therapy, or maybe even for each particular patient. Whatever the form that future viral vectors take, scientist will be certain that they target host cells capable of producing the protein needed and it will be easy to administer to the patient. Finally, it will provide the genetic information to the host cell in a way that results in enough production of the protein for the required length of time to meet the

goal of having the gene therapy act as a cure and not just a treatment of the disease (Thomas, Ehrhardt, and Kay, 2003).

## References

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