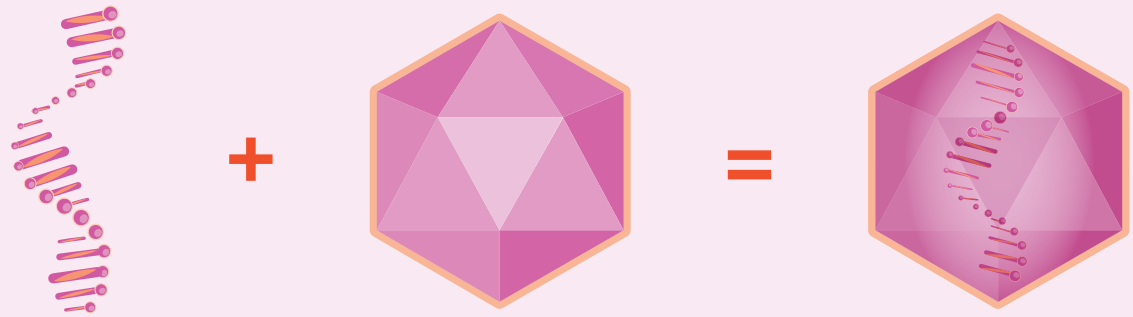
What is a Therapeutic Vector?

The technology moving gene transfer therapy research forward

THE GENE TRANSFER THERAPY PROCESS[1]

Gene transfer therapy is a method being researched for treating genetic disorders that involves introducing a functional, or working, version of a mutated gene into targeted cells. Delivering a functional gene to the right tissue requires an appropriate transport vehicle. One of the most studied methods for transporting and protecting the functional gene is by using an empty viral shell as a vehicle.

NEUTRALIZED VIRUS: AN IDEAL VEHICLE FOR FUNCTIONAL GENE DNA[1]



- An empty viral shell is created without the DNA of the virus
- The functional gene DNA is added to the inside of the empty viral shell, creating a therapeutic vector
- The viral shell protects the functional gene while helping it target the right tissue

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Considerations in designing a therapeutic vector

There are important considerations when identifying a virus to use in creating a therapeutic vector for research. For years, scientists have explored many virus types, such as lentiviruses, adenoviruses, and adeno-associated viruses (AAVs).

GENERAL CONSIDERATIONS

SAFETY

The neutralized shells of many different viruses are being considered for use in gene transfer therapy. Some of these viruses are pathogenic (or causing illness) in nature, while others are not.[1]

ANTIBODY FORMATION

Preexisting antibodies to many viruses, that could have been formed as early as childhood, could make certain gene therapies less effective or not effective at all.[1]

TROPISM

Different viruses bind to different cell types. Certain vectors have been selected or designed to have targeted tropism, or tendency, that directs binding to specific organs or cell types.[1]

HISTORY

Clinicians have been exploring gene transfer therapy for more than 50 years, and more than 950 studies are ongoing or have been completed.[2-5]

CONSIDERATIONS REGARDING AAV GENE TRANSFER

AAV SAFETY

AAVs are not known to be pathogenic.[1]

AAV ANTIBODY FORMATION

Human exposure to AAVs varies from region to region for each type. Although antibodies to one type of AAV may exclude patients from a particular treatment, research is being conducted across many different types of AAV for gene transfer therapy.[6]

AAV TROPISM

Different AAVs have the ability to recognize specific tissues or cells. Each AAV type has a tendency to target specific tissue(s) or cell(s) (brain, retina, liver heart, muscle, etc). When used in people, this targeting property can be made more specific with the introduction of a piece of DNA that allows the functional gene to be expressed in the target tissue.[1]

AAV HISTORY

- AAV vector research in hemophilia A has been in clinical trials since 2015[7]
- First gene therapy trial in hemophilia B using AAV vector technology begins[8]
- Gene therapies using AAV vectors for a genetic disease that causes blindness and for spinal muscular atrophy have been approved in the United States[3,9]

No gene therapies for hemophilia A or B have been approved for use or determined to be safe or effective.

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