

# WHAT ARE THE RISKS OF GENE THERAPY?

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Many forms of gene therapy are being researched only in adults, at least initially, and some gene therapies won't work in patients with certain **antibodies** or other preexisting conditions. Ongoing clinical trials are being conducted in various populations to determine other potential risks of treatment with gene therapy.



## SAFETY IS A TOP PRIORITY

It's important to understand that many safety precautions are being taken during the development of gene therapy. Clinical trials in the United States are closely monitored by the Food and Drug Administration (FDA) and the National Institutes of Health. Based on an assessment by the FDA, there are more than 800 active gene therapy investigational drugs currently on file with the FDA. Patient safety is the top priority. Ongoing clinical trials and research have identified some risks associated with gene therapy and further research and experience may uncover additional risks that are currently unknown.

## POTENTIAL RISKS

Gene transfer that uses an **adeno-associated virus** (AAV) vector to deliver the new genetic material may have several risks:

- As with any virus, the body's immune system could respond to the newly introduced therapeutic vector as if it were an intruder. An immune system reaction can lead to inflammation and other serious risks
- An immune reaction could also make gene therapy work less effectively or not at all. That is why prospective gene therapy patients are often screened to determine whether they have antibodies against the particular virus being used
- While the objective of using a particular vector is to direct the new gene to a specific tissue type, viruses can affect other cells that weren't targeted, potentially causing damage or additional illness or disease
- After delivery of the gene therapy, vector particles can be released from the recipient's body. Called **vector shedding**, this can occur through feces, urine, saliva, and other excreted bodily fluids. Shedding raises the possibility of passing those remaining materials on to untreated individuals (through close contact). Its significance is currently being evaluated in gene therapy clinical trials
- Whether gene therapy may have an adverse impact on the health of the organ or tissues targeted is being evaluated with long-term studies
- Gene therapy may result in creation of too much of the protein. The effect of this overproduction, or overexpression, could vary based on the type of protein being created
- It is not yet clear how long the effects of gene therapy may last

## WE HOPE YOU NOW BETTER UNDERSTAND THE SCIENCE OF GENE THERAPY

Research continues, but scientists and clinicians alike are excited about the potential of gene therapy to change lives for the better. Keep your eyes and ears open, because more discoveries are being made every day.

## GLOSSARY

**Antibody**—A blood protein created in response to a substance (antigen) not recognized by the body. Antibodies then bind to specific antigens, helping to destroy them. Some antibodies destroy antigens directly. Others make it easier for white blood cells to destroy the antigen.

**Adeno-associated virus**—Any of several viruses that enter the nucleus of a host cell but are dependent on coinfection with an adenovirus or herpesvirus for their replication. They infect a wide

range of hosts but do not appear to cause disease and are being researched in gene therapy as vectors to introduce genes into cells.

**Vector shedding**—The release of the vector/genetic materials through secretions and/or excrement of the patient. Assessment of shedding can be used to understand the potential risk associated with transmission to third parties and the potential risk to the environment.

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