Telocyte Newsletter
Q1 2018

TELOCYTE
A FUTURE BEYOND ALZHEIMER'S

An update on gene therapy:

Gene therapy has made remarkable progress since the death of Jesse Gelsinger, twenty years ago. Since then, gene therapy has gradually climbed back toward clinical success, but the key questions remain those of efficacy, safety, appropriate clinical targets, and cost. There are five different approaches to gene therapy in current trials, each with different clinical applications. The potential applications depend on the pathology, the organs involved, and current technical limitations. Some are appropriate to specific genetic diseases, some to certain cancers, some to infectious disease, and some to age-related (i.e., epigenetic) disease.

The first approach is *in vivo* gene replacement, which delivers a normal allele to many or all affected cells, to alleviate the effects of an abnormal allele. Such approaches are typically aimed at children with genetic disease, such as the recent successful demonstration (see Brian Kaspar's information below) of gene therapy to treat spinal muscular atrophy (SMA), and a similar recent success in treating hemophilia.

The second approach, *in vivo* gene editing, actually edits cells genes, rather than replacing them. In a recent trial involving Hunter's syndrome, the patient's own DNA was literally "rewritten" directly in the cells of the patient's body.

The third approach, *ex vivo* gene editing, removes and alters the patient's cells, which are then returned to the patient's body. This approach is especially promising for refractory leukemias and lymphomas, but may also be applicable to several other cancers.

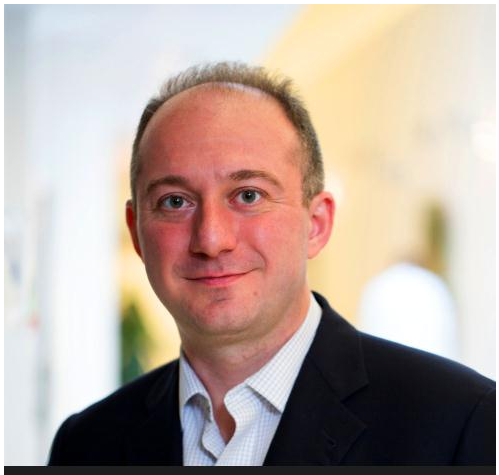
The fourth approach, *in vitro* phage editing, alters bacteriophages that are then used to attack bacteria, and may prove effective in treating resistant bacteria rapidly and effectively.

Telocyte exemplifies the fifth approach, *in vivo* gene therapy to reset aging cells, and offers the most extraordinary potential in geriatric medicine. This approach uses viral vectors to deliver an active human telomerase gene to transiently reset gene expression in aging cells, restoring normal young cell function and reversing age-related pathology. Telomerase therapy has proven effective in human cells, in human tissues, and in animal studies. Human trials will use Alzheimer's disease as the initial clinical target, but with potential for vascular aging, osteoarthritis, osteoporosis, and a host of other age-related diseases.

As the FDA Commissioner recently said, gene therapy is "no longer the stuff of science fiction."

Meet our Scientific Advisory Board:

Last quarter, we featured Suzanne Hendrix, a specialist in the design of Alzheimer's studies. This quarter, we introduce Brian Kaspar, one of our two world-renown specialists in gene therapy.



Brian Kaspar, PhD
Scientific Advisory Board

Dr. Brian K. Kaspar is a principal investigator in the Center for Gene Therapy at The Research Institute at Nationwide Children's Hospital and Associate Professor in the Department of Pediatrics and Department of Neuroscience at The Ohio State University College of Medicine. In 2013, Dr. Kaspar was named Fellow of the American Association for the Advancement of Science (AAAS). He has published more than 100 scientific articles. He received his PhD in molecular pathology from UC San Diego and did his postdoctoral work on neuroscience and gene therapy at the Salk Institute. Dr. Kaspar founded two biotech companies (Avexis and Milo) working on gene therapy.

In November of 2017, Dr. Kaspar was the senior author of a ground-breaking paper published in *NEJM* (the *New England Journal of Medicine*), which described the successful use of AAV9 gene therapy to successfully treat 15 patients with SMA (spinal muscular atrophy).