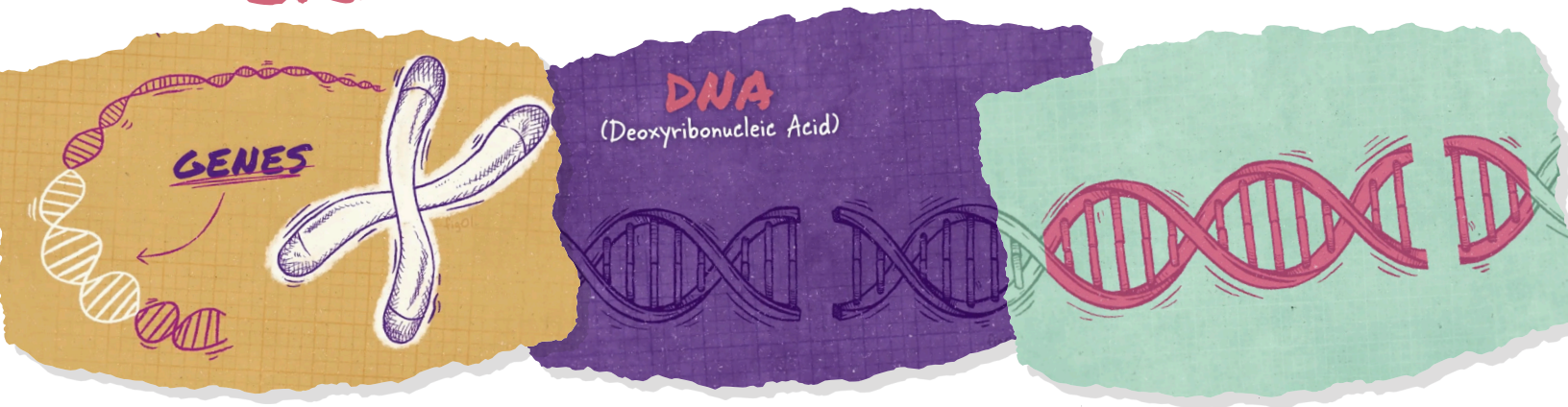
Understanding Gene Editing

VERTEX

At Vertex, we believe true scientific transformation happens at the intersection of human biology and medical innovation. We are continuously developing our drug discovery and development toolbox to advance cutting-edge science in order to solve some of the most difficult medical and scientific problems. One of these tools is gene editing using CRISPR/Cas9.

What is GENE EDITING using CRISPR/CAS9?

Gene editing is a therapy that targets genetic diseases at the root by correcting or interrupting DNA at the precise location of the problem.

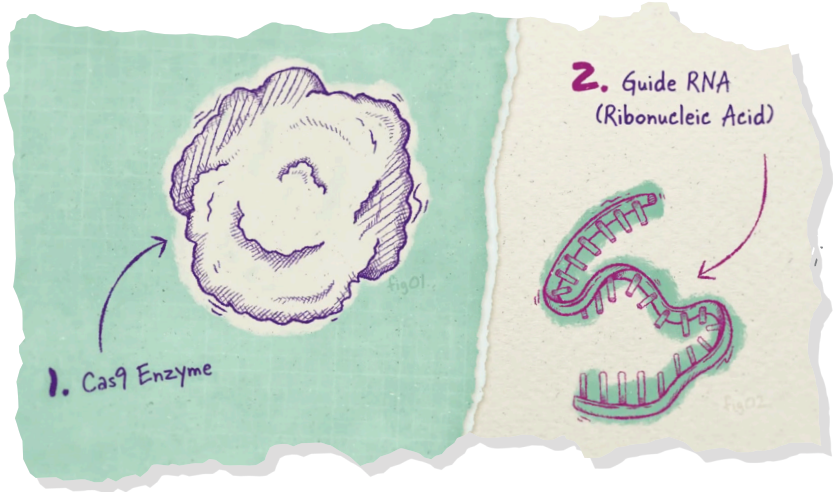


1. Target genes at precise location

2. Edit DNA within genes

3. Stop or change disease

One approach to gene editing is known as CRISPR/Cas9. This two-part system is made up of a specialized protein called Cas9 that **can edit DNA, and a guide called a guide RNA that directs Cas9 to a specific location.** They work together to allow scientists to find and target genes with incredible precision, and then modify them in order to change a disease process in the body



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VERTEX

Vertex is investigating gene editing using CRISPR/Cas9 for the treatment of SICKLE CELL DISEASE and TRANSFUSION DEPENDENT BETA THALASSEMIA

1 Sickle cell disease (SCD) and transfusion-dependent beta thalassemia (TDT) **are inherited blood disorders that are caused by mutations in the beta-globin gene, resulting in abnormally functioning hemoglobin** in the case of SCD, or reduced or absent beta-globin in TDT.

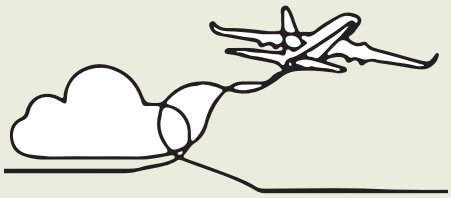
2 Symptoms arise as abnormal red blood cells produced by the faulty beta-globin gene begin to circulate in the body shortly after birth. **They can cause devastating symptoms** like chronic pain, organ damage, inadequate oxygen levels, and even premature death.

3 Gene editing using CRISPR/Cas9 has the potential to **treat these diseases by targeting and editing the specific gene** that may initiate a shift in the patient's body to produce healthy red blood cells.

4 This approach is unique in that it uses **patients' own cells** and is a one-time treatment. It is currently being investigated in SCD and TDT patients in clinical trials.

EXAMPLE PATIENT JOURNEY

A The patient's blood is collected and blood stem cells, in which edits can be made, are isolated.



B The blood stem cells are sent to a laboratory where CRISRP/Cas9 is used to edit the cells.

C A number of quality checks are performed to ensure the cells were edited accurately and are ready to go back into the patient.

D The edited cells are re-introduced to the body through a bone marrow transplant, which requires the patient to stay in the hospital for a number of weeks for monitoring.

E The edited cells are infused back into the patient through an IV.

F A healthcare professional monitors the patient to make sure the edited cells begin to grow in the patient's bone marrow and make new healthy blood cells, which is called engraftment.

Note: This patient journey is provided for illustration purposes and may vary by gene-edited therapy/patient.