The Sickle Cell Disease Coalition Research & Clinical Trials Working Group is focused on distilling key sickle cell disease (SCD) information presented at national conferences and disseminating it to the SCD community. Each summary is written in plain language to ensure comprehension of topics covered. This summary is from the 2020 American Society of Hematology Annual Meeting. The original abstract entitled "Safety and Efficacy of CTX001 in Patients with Transfusion-Dependent β-Thalassemia and Sickle Cell Disease: Early Results from the Climb THAL-111 and Climb SCD-121 Studies of Autologous CRISPR-CAS9–Modified CD34+ Hematopoietic Stem and Progenitor Cells" *is available online as well.*

Researchers test a new therapy called CTX001™ that uses gene editing to increase hemoglobin in patients with sickle cell disease and beta thalassemia

Every year, the American Society of Hematology meets to talk about new research. At its 2020 meeting, researchers shared what they have learned about using a technique called "gene editing" to increase the amount of fetal hemoglobin (HbF) in patients with SCD or a form of beta thalassemia (b thalassemia) that requires continuous transfusions.

Hemoglobin carries oxygen through your blood to all of the cells in your body. Before birth, the fetus relies on HbF to get oxygen from his or her mother's blood. Once born, the baby's cells stop making HbF and start making the adult form of hemoglobin, called hemoglobin a (HbA). A factor in the blood named BCL11A is what turns off the production of HbF so that HbA is made. In SCD this adult form of hemoglobin doesn't work properly because of a defect in the genes that tell cells how to make hemoglobin. Patients with SCD have hemoglobin S (HbS) rather than HbA. Turning back on the ability to make HbF could raise hemoglobin levels to treat anemia, reduce the need for blood transfusions, and lessen the number of painful vaso-occlusive crises in SCD.

What researchers learned:

Scientists used gene editing to change the makeup of BCL11A in certain types of early-stage blood cells. The experimental therapy, called CTX001, modifies these cells so that they produce high levels of HbF in red blood cells. These altered cells are then put back into the patient as a stem cell transplant. By increasing the levels of HbF (which transports oxygen very efficiently) CTX001 was expected to lower the rate of vaso-occlusive crises in SCD patients and the endless need for blood transfusions in people with a form of b thalassemia.

In a study of a small number of SCD and thalassemia patients, all patients receiving CTX001 showed increases in total Hb and HbF over time. The first patient with thalassemia who received CTX001 remained transfusion-free for more than 15 months. Patients with SCD had no vaso-occlusive crises since receiving the CTX001 infusion. The first SCD patient who received CTX001 remained free of crises for more than 1 year. Early data suggest that the beneficial effects might be long lasting. The most important side effects were those associated with the stem cell transplant procedures. These early data show that CTX001 is a potential functional cure for the treatment of a form of b thalassemia and SCD.

Keep in mind

The results of research studies are always limited in what they can and can't tell you. This research to date has involved a small number of patients. Larger studies will be needed to know about the safety and effectiveness of this new therapy—larger studies are underway.
Always consult your doctor before entering a clinical trial.

Questions to ask your doctor

- Would I be a candidate for this therapy once it becomes more widely available?
- Are there clinical trials I could join?

Access the American Society of Hematology Research Collaborative's SCD Clinical Trials Pamphlet to learn more about clinical trials for SCD.