The Blood Project

UNDERSTANDING SICKLE CELL TRAIT

A brief guide for patients with sickle cell trait

Sickle cell trait (SCT) is not a disease. It means you carry **one normal hemoglobin gene** and **one sickle hemoglobin gene**. Because you have enough normal hemoglobin, your red blood cells work normally in everyday life.
Most people with SCT remain healthy throughout their lives and never have complications. SCT matters mainly in **a few specific situations**, such as **extreme physical exertion**, **severe dehydration**, **very high altitude**, or **family planning**.
This handout explains what SCT is, when it matters, and what steps you can take to stay healthy.

What is sickle cell trait?

Sickle cell trait occurs when a person inherits **one normal hemoglobin A gene** and **one sickle hemoglobin S gene**. Because the normal gene is present, red blood cells function normally under everyday conditions.
SCT is common in people with ancestry from areas where malaria was historically widespread, including parts of **Africa**, the **Middle East**, **India**, and the **Mediterranean**, but it can occur in people of any background.
Sickle cell trait does not turn into sickle cell disease.

Why it happens (inheritance)

SCT is **inherited**, not caused by the environment. A person is born with one normal hemoglobin gene and one sickle gene.

- Each child of a parent with SCT has a **50% chance** of inheriting SCT.
- If **both parents** have SCT, each pregnancy has a **25% chance** of sickle cell disease, a **50% chance** of SCT, and a **25% chance** of inheriting neither gene.

Nothing later in life can cause SCT to develop.

Does it cause symptoms?

Most people with SCT never have symptoms. Red blood cells work normally in routine daily life, including school, work, exercise, and travel.
Rare symptoms may appear **only in extreme conditions**, such as:

- **all-out physical exertion without rest**, especially in hot environments
- **severe dehydration**
- **rapid ascent to very high altitude** (typically above **10,000–12,000 feet** without acclimatization)

Some people with SCT may experience **occasional blood in the urine**. This is often not serious, but **should always be evaluated** to rule out other causes.

Is it dangerous?

SCT is **generally not dangerous**.
Rare problems can occur under **extreme physical stress or low-oxygen conditions**, including:

- collapse during intense conditioning drills (such as running to exhaustion without breaks)
- heat-related illness
- muscle breakdown (**rhabdomyolysis**)

- left-sided abdominal pain at very high altitude, caused by temporary loss of blood flow to the spleen (**splenic infarction**)

These events are **uncommon** and are **largely preventable** with:

- good hydration
- pacing intense activity
- regular rest breaks
- gradual acclimatization to heat or altitude

SCT is not sickle cell disease and does not cause chronic pain crises, progressive anemia, or frequent medical problems.

People with SCT **compete safely at all levels of athletics**, including professional and Olympic sports. SCT is not a reason to avoid exercise, it is a reason to train **smartly**.

How is it evaluated?

SCT is confirmed with **blood testing**, usually hemoglobin electrophoresis or similar tests.

Many people learn they have SCT through **routine screening**, such as newborn testing, pregnancy care, athletic participation, or military service. These screening programs exist to **provide information and prevent rare complications**, not because SCT is dangerous.

Once SCT is confirmed, **no routine ongoing testing is needed** unless symptoms occur or there are questions about family planning.

Do I need a bone marrow biopsy?

No.

SCT is diagnosed with blood tests. There is **no role** for bone marrow biopsy.

How is it treated?

There is **no treatment required** for SCT itself.

Care focuses on **education and prevention** in specific settings:

- staying well hydrated
- taking rest breaks during intense exercise
- pacing early conditioning or training
- acclimatizing gradually to altitude

If blood appears in the urine, your doctor may evaluate to be sure there are no other causes.

Genetic counseling may be helpful for people planning a family.

When should I contact my doctor?

Contact your doctor if you notice:

- **visible blood in the urine**
- **severe or unusual muscle pain** during intense exercise
- **collapse or fainting** during exertion
- **trouble at high altitude**, especially severe left-sided abdominal pain
- questions about **pregnancy or family planning**

Seek care sooner if symptoms occur during **heat**, **dehydration**, or **strenuous activity**.

What is the usual plan going forward?

Once SCT is identified, **no regular follow-up is needed** unless symptoms occur or questions arise about physical activity, altitude travel, pregnancy, or future children.

Most people with SCT can safely participate in **all sports, jobs, and activities** with awareness of hydration, pacing, and rest.

If you are planning a family, **partner testing** (a simple blood test ordered by a primary care clinician or OB-GYN) helps clarify whether future children could inherit sickle cell disease. **Genetic counseling** is available if both partners are carriers.

Key points to remember

- **sickle cell trait is not a disease**, and most people remain healthy throughout life
- **rare problems occur only in extreme conditions**, such as all-out exertion, dehydration, or very high altitude
- **hydration, pacing, and rest** protect against exertional problems and allow full participation in sports and exercise
- **blood in the urine should always be evaluated**, even though SCT may be the explanation
- **family planning matters**, because two parents with trait can have a child with sickle cell disease
- **no routine treatment or follow-up is needed** unless symptoms or family-planning questions arise