

# Sickle Cell Trait

By Dan Martin, Ed.D., ATC

- It is estimated that eight percent of the U.S. African-American population has sickle cell trait (SCT).
- SCT does not necessarily preclude an individual from sport participation.
- Signs and symptoms of a sickling crisis must be recognized early to prevent complications, including the risk of death.
- Basic precautions will greatly decrease the risk of a sickling crisis.

## SIGNIFICANCE

*Sickle cell trait* (SCT) is not a disease, but a description of a type of hemoglobin gene. Hemoglobin carries oxygen in the bloodstream. SCT differs from sickle cell anemia in that the trait is present when one gene for sickle hemoglobin is inherited from one parent while a normal hemoglobin gene is inherited from the other. If a sickle cell gene is inherited from each parent, the child will then have sickle cell anemia.

*Sickle cell anemia* is a serious disorder which typically causes severe medical problems early in childhood which continue into adulthood. People with SCT rarely have any symptoms of the condition. However, they may develop problems under extreme physical stress or with low oxygen levels (high-altitude).

People with ancestors from Africa, Mediterranean countries, India, South or Central America, and Saudi Arabia are at increased risk for having SCT. SCT occurs in about eight percent of the African-American population in the U.S.

SCT exercise-related deaths do occur in both athletics and in the military. Individuals with SCT participating in intense exercise are particularly vulnerable to the effects of heat and dehydration. The potential for a sickling collapse can be decreased if the athlete takes preventative measures. Early recognition of the signs and symptoms by the athlete, coaches and medical staff, with stopping all activity and initiating appropriate treatment will greatly reduce the potential for long-term consequences or death.

## BACKGROUND

The U.S. military first linked SCT to an increased risk of sudden death during extreme physical exertion decades ago. SCT has also been linked to several deaths which have occurred during off-season conditioning in collegiate football players over the past decade. Currently, SCT does not appear to be a prominent issue in high school athletes. This is likely due to the fact that the intensity and duration of physical activity in high school athletes does not reach that seen in collegiate conditioning drills.

SCT generally does not present problems with daily activities. The vast majority of athletes with the trait compete at the high school, college, and professional levels without complications. However, there is always the possibility that a sickling collapse can occur with intense exertion, potentially resulting in death.

## PHYSIOLOGY

During intense exertion, red blood cells can change from the typical donut-shaped appearance to a "sickle" or a "quarter-moon" shape. In this shape, these cells no longer carry oxygen efficiently and become rather stiff and sticky. These "sickle cells" can then stick together and block normal blood flow to any tissue or organ. This can produce pain, weakness, swelling of the arms or legs, muscle cramping and shortness of breath. Kidney and other vital organ function can also be affected.

Even what appears to be a mild exertional distress can turn lethal in an individual with SCT. The kidneys and spleen may be damaged and exercise-related rhabdomyolysis (skeletal muscle breakdown) may also occur. Asthma (see Asthma chapter), acute illness, dehydration (see Fluid Replacement and Dehydration chapter), heat stress (see Heat-related Illness chapter) and high altitude can predispose an individual with SCT to a sickling crisis during intense physical exertion.



### **IDENTIFYING THE ATHLETE WITH SICKLE CELL TRAIT**

The preparticipation evaluation form (see Preparticipation Evaluation chapter) should have a question about the athlete's sickle cell status. If the athlete or parents are unaware of the athlete's status, they may very likely be able to find the information from their primary care provider or state newborn screening records. The NCAA currently recommends that the SCT status of all athletes be determined. Most states in the U.S. have been conducting newborn SCT screening for more than 20 years, thus many athletes may already know, or be able to find out, their status. There is currently no medical organization calling for the universal screening of SCT in high school athletes. Parents who are interested in having their child screened for SCT should discuss it with their primary care provider.

When an athlete with SCT is identified, it is important that the athlete and his or her parents are educated about SCT. It is important to not discourage the athlete from sports participation. However, the athlete must be educated on preventive measures and the potential dangers. It is vital that coaches and the sports medicine staff be aware of the athlete's SCT status, but it is also important to protect the student's privacy as much as possible.

### **RECOGNITION**

If an athlete exhibits any signs or has symptoms of a sickling collapse, he or she must be removed from activity. Continuing to exercise will lead to worsening symptoms, additional serious internal organ damage, or even death. However, if the proper steps are taken, these symptoms are generally easy to manage and will normally subside within a few minutes. The athlete's symptoms typically resolve when he or she is hydrated and rests. During hot weather, the athlete should also be taken into a cool, controlled environment to prevent overheating. If at any time the athlete collapses, (sickling collapse) the episode must be treated as a medical emergency and Emergency Medical System activated (see Emergency Action Planning chapter).

#### **Signs and Symptoms of a pending sickling crisis**

- Appears dazed or confused
- Appears weak
- Not keeping up with other team members (undue fatigue)
- Having difficulty breathing
- Muscle pain, weakness and/or cramping

## MANAGEMENT

Athletes with SCT can generally perform at the same physical level as their teammates, but may not be able to do it for an extended amount of time. For example, athletes with SCT should not run timed, sustained 100-yard sprints, or timed, sustained "suicides" or shuttle runs. The athlete with SCT can still run sprints and suicides, but must be given rest breaks between sprints. Coaches and the athlete with SCT must be aware of his or her physical limits. If the athlete is feeling exhausted, or is showing symptoms of physical distress, he or she must immediately stop, hydrate and rest.

If an athlete is known to have SCT, the following precautions are suggested during physical activity:

- Set own pace
- Engage in slow and gradual preseason conditioning regimen
- Use adequate rest and recovery between intense drills
- Stop activity immediately upon struggling or experiencing muscle pain, abnormal weakness, undue fatigue, or shortness of breath
- Stay well hydrated
- Seek prompt medical care when experiencing unusual distress

Though caution must be taken, the athlete with SCT should always be allowed to compete in all sports and should be treated the same as the other athletes. It needs to be emphasized that athletes with SCT normally do not have problems, except if put under extreme physical duress. The precautions and training modifications discussed in this chapter are intended to allow the athlete with SCT to participate in athletics as safely as possible.

## References

- Centers for Disease Control and Prevention. [www.CDC.gov/ncbddd/sicklecell](http://www.CDC.gov/ncbddd/sicklecell)
- National Collegiate Athletic Association. Guideline 3c: The student-athlete with sickle cell trait. 2010-11 Sports Medicine Handbook (21st edition).
- National Athletic Trainer's Association. <http://www.nata.org/sites/default/files/SickleCellTraitAndTheAthlete.pdf>

## Resources

- National Heart Lung and Blood Institute: [http://www.nhlbi.nih.gov/health/dci/Diseases/Sca/SCA\\_Whats.html](http://www.nhlbi.nih.gov/health/dci/Diseases/Sca/SCA_Whats.html)
- Sickle Cell Disease Association of America: [https://www.sicklecelldisease.org/about\\_scd/index.phtml](https://www.sicklecelldisease.org/about_scd/index.phtml)
- Sickle Cell information center: [www.scinfo.org](http://www.scinfo.org)