**WHAT IS SICKLE CELL TRAIT?**

Sickle cell trait is not a disease. Sickle cell trait is the inheritance of one gene for sickle hemoglobin and one for normal hemoglobin. Sickle cell trait will not turn into the disease. Sickle cell trait is a life-long condition that will not change over time.

- During intense exercise, red blood cells containing the sickle hemoglobin can change shape from round to quarter-moon, or “sickle.”
- Sickled red cells may accumulate in the bloodstream during intense exercise, blocking normal blood flow to the tissues and muscles.
- During intense exercise, athletes with sickle cell trait have experienced significant physical distress, collapsed and even died.
- Heat, dehydration, altitude and asthma can increase the risk for and worsen complications associated with sickle cell trait, even when exercise is not intense.
- Athletes with sickle cell trait should not be excluded from participation as precautions can be put into place.

**DO YOU KNOW IF YOU HAVE SICKLE CELL TRAIT?**

People at high risk for having sickle cell trait are those whose ancestors come from Africa, South or Central America, India, Saudi Arabia and Caribbean and Mediterranean countries.

- Sickle cell trait occurs in about 8 percent of the U.S. African-American population, and between one in 2,000 to one in 10,000 in the Caucasian population.
- Most U.S. states test at birth, but most athletes with sickle cell trait don’t know they have it.
- The NCAA recommends that athletics departments confirm the sickle cell trait status in all student-athletes.
- Knowledge of sickle cell trait status can be a gateway to education and simple precautions that may prevent collapse among athletes with sickle cell trait, allowing you to thrive in your sport.

**HOW CAN I PREVENT A COLLAPSE?**

- Know your sickle cell trait status.
- Engage in a slow and gradual preseason conditioning regimen.
- Build up your intensity slowly while training.
- Set your own pace. Use adequate rest and recovery between repetitions, especially during “gassers” and intense station or “mat” drills.
- Avoid pushing with all-out exertion longer than two to three minutes without a rest interval or a breather.
- If you experience symptoms such as muscle pain, abnormal weakness, undue fatigue or breathlessness, stop the activity immediately and notify your athletic trainer and/or coach.
- Stay well hydrated at all times, especially in hot and humid conditions.
- Avoid using high-caffeine energy drinks or supplements, or other stimulants, as they may contribute to dehydration.
- Maintain proper asthma management.
- Refrain from extreme exercise during acute illness, if feeling ill, or while experiencing a fever.
- Beware when adjusting to a change in altitude, e.g., a rise in altitude of as little as 2,000 feet. Modify your training and request that supplemental oxygen be available to you.
- Seek prompt medical care when experiencing unusual physical distress.

For more information and resources, visit www.NCAA.org/health-safety
Sickle Cell

Home  >  Health and Safety  >  Sickle Cell Trait  >  Resources

ACSM and NCAA Joint Statement
Sickle Cell Trait and Exercise

The NCAA and American College of Sports Medicine hosted a roundtable in March 2012 which brought together leading experts on sickle cell trait in athletics. The discussion focused on the growing literature surrounding the impact of sickle cell trait while exercising in an attempt to provide guidance for the recreational athlete and general public. The meeting included representatives from ACSM, American Society of Hematology, Centers for Disease Control and Prevention, National Collegiate Athletic Association, National Athletic Trainers’ Association, and the Korey Stringer Institute.

The consensus of the meeting follows. The group continues to work on the development of a fact sheet with ASCM; a scientific expert journal publication article; and the establishment of a research agenda for further study on the impact of sickle cell trait in the active individual.

Sickle cell trait is not a disease. It is a descriptive term for a hereditary condition in which an individual has one normal gene for hemoglobin (A) and one abnormal gene for hemoglobin (S), giving the genetic hemoglobin type (AS). Sickle cell trait is common in areas where malaria is endemic and provides a survival advantage against that disease. Having sickle cell trait (AS) is different from sickle cell disease (SS), in which two abnormal genes are present. Individuals with sickle cell trait commonly have ancestors from Africa, South or Central America, the Caribbean, Mediterranean countries, India, or Saudi Arabia. Even though sickle cell trait occurs in eight to ten percent of U.S. African-American population, it is present in athletes at all levels of competition and ethnicities, including professional and Olympic.

Sickle Cell Trait is not a barrier to exercise or participation in sport. Persons with sickle cell trait alone do not have anemia and sickle cell trait cannot turn into sickle cell disease. There are more than four million people in the United States with sickle cell trait and very few experience any related complications. In general, sickle cell trait is a benign condition. No sports medicine body currently suggests exclusion from sport or exercise for the athlete with sickle cell trait.

Exercise and sport are safe and, in fact, may be somewhat protective in individuals with sickle cell trait. Regular exercise can lower blood viscosity, inflammation and oxidative stress in those with sickle cell trait and provides many positive health benefits in individuals both with and without sickle cell trait. It appears that problems can occur primarily with intense
physical exertion when a coach or other individual is trying to push athletes to extreme physiologic limits or when an individual exercises intensely in the setting of illness (even relatively mild illness) or perhaps stimulant use. There is evidence in the laboratory and in the field that hydration can counteract or improve hematologic parameters in exercising individuals with sickle cell trait; therefore, paying careful attention to and ensuring adequate hydration may reduce clinical risk.

Sickle cell trait has been linked to an increased risk of exercise-associated sudden death in individuals undergoing intense physical exertion, and possibly rhabdomyolysis. Exercise-associated sudden death in individuals who have sickle cell trait most commonly occurs in those undergoing intense physical exertion such as military recruits in basic training and football athletes during conditioning workouts; although, it can occur in other sports and activities as well. The definitive contributing mechanisms for the increased risk of death are unknown; however, it is reported that at baseline individuals with sickle cell trait have increased blood viscosity, slightly reduced red blood cell deformability, increased red blood cell fragility and increased levels of inflammatory markers. The clinical implications of these distinguishing features are unknown.

Exertional rhabdomyolysis and exercise-associated death in those with sickle cell trait are hypothesized to occur because of micro-vascular occlusion in the capillary beds of the muscles leading to muscle cell breakdown and consequent release of intracellular contents potentially causing renal failure and/or cardiac arrhythmia. Clinically, when rhabdomyolysis occurs, it seems to present more quickly in athletes with sickle cell trait than those without. While the proposed underlying mechanisms seem to fit clinical observations, much more research is needed to determine the definitive cause of pathology and how or if sickle cell trait contributes. Although not well-documented in population-based studies, case reports provide evidence that individuals with sickle cell trait may also be at greater risk for non-fatal collapse.

Sickle cell trait has also been linked to an increased risk of splenic infarction, as well as an inability to concentrate urine. Splenic infarction typically occurs at high altitudes (usually greater than 5,000 feet), and symptoms may include sudden acute pain in the lower ribs, weakness and nausea. Strenuous physical exertion after a recent arrival at altitude may contribute to its development. Hyponatremia (the inability to concentrate urine) occurs in most individuals with sickle cell trait and may contribute to dehydration.

Knowledge of one’s sickle cell trait status is an important piece of personal health information with possible health and genetic implications. All infants born in the U.S. and some other countries are tested at birth; but this information is not always communicated to the parents or, later in life, to the individual. Accordingly, the following points should be considered by healthcare providers for all athletes:

Serious medical problems associated with sickle cell trait are rare, even during intense athletic training, practice and competition; however, athletes with sickle cell trait have experienced significant physical distress, collapsed and even died.

Individuals with sickle cell trait should not be excluded from physical activity and sports participation unless warranted by medical personnel;

Workout design should consider an individual athlete’s medical condition, skills and abilities and conditioning level.
Prompt access to medical care and planned emergency response are critical components to ensure adequate response to an athlete who collapses or is in distress.

Everyone should know their sickle cell trait status. If unknown, individualized voluntary testing for sickle cell trait should be considered. If testing is performed, it must always be accompanied by education and counseling on the health implications of a positive or negative test, as well as genetic counseling. The athlete should be encouraged to share this information with medical professionals and coaching staff, as they would with any other piece of medical information.

All exercising individuals, including those with known sickle cell trait, should be counseled to:

- Hydrate sufficiently ACSM Position Stand on Exercise and Fluid Replacement;
- Acclimatize gradually to heat, humidity, and altitude ACSM Roundtable on Youth Football; NATA Preseason Heat Acclimatization;
- Condition carefully and gradually for up to several weeks, before engaging in exhaustive exercise regimens;
- Refrain from extreme exercise during or while recovering from an illness, especially one involving fever;
- Immediately stop exercise and seek prompt medical care when experiencing unusual physical distress;

Individuals with SCT should recognize variable signs and symptoms of physical distress. These may include: muscle “cramping” pain with weakness, while notably the muscles are usually not tense or hard, especially in the back or lower extremity; hyperventilation or difficulty to catch one’s breath; other muscle pain; abnormal general weakness; or undue fatigue.

Coaches should conduct appropriate sport-specific conditioning based on sound scientific principles and be ready to promptly intervene when athletes show signs of distress. Individuals should be allowed to self-limit their intensity and discontinue exercise when experiencing unusual fatigue and/or physical distress. NATA Inter-Association Task Force on Sudden Death

Ongoing, collaborative research in the area of exercise and sickle cell trait should be vigorously pursued with sport and sports medicine governing bodies and other appropriate medical associations and experts.
What Is Sickle Cell Trait?
Sickle cell trait (SCT) is not a disease, but having it means that a person has inherited the sickle cell gene from one of his or her parents. People with SCT usually do not have any of the symptoms of sickle cell disease (SCD) and live a normal life.

What Is Sickle Cell Disease?
SCD is a genetic condition that is present at birth. In SCD, the red blood cells become hard and sticky and look like a C-shaped farm tool called a “sickle.” The sickle cells die early, which causes a constant shortage of red blood cells. Also, when they travel through small blood vessels, they get stuck and clog the blood flow. This can cause pain and other serious problems. It is inherited when a child receives two sickle cell genes—one from each parent. A person with SCD can pass the disease or SCT on to his or her children.

How Does Someone Get Sickle Cell Trait?
People who have inherited one sickle cell gene and one normal gene have SCT. This means the person won’t have the disease, but will be a trait “carrier” and can pass it on to his or her children.

Who Is Affected By Sickle Cell Trait?
SCT affects 1 in 12 Blacks or African Americans in the United States.
- SCT is most common among Blacks or African Americans, but can be found among people whose ancestors come from sub-Saharan Africa; the Western Hemisphere (South America, the Caribbean, and Central America); Saudi Arabia; India; and Mediterranean countries such as Turkey, Greece, and Italy.
- Approximately 3 million people living in the United States have SCT and many are unaware of their status.

What Are The Chances That A Baby Will Have Sickle Cell Trait

- If both parents have SCT, there is a 50% (or 1 in 2) chance that the child also will have SCT if the child inherits the sickle cell gene from one of the parents. Such children will not have symptoms of SCD, but they can pass SCT on to their children.
- If both parents have SCT, there is a 25% (or 1 in 4) chance that the child will have SCD.
- There is the same 25% (or 1 in 4) chance that the child will not have SCD or SCT.
- If one parent has SCT, there is a 50% (or 1 in 2) chance that the child will have SCT and an equal 50% chance that the child will not have SCT.
What Health Complications Are Associated With Sickle Cell Trait?

Most people with SCT do not have any symptoms of SCD, although — in rare cases — people with SCT might experience complications of SCD, such as “pain crises” and, in extreme circumstances, sudden death. More research is needed to find out why some people with SCT have complications and others do not.

In their extreme form and in rare cases, the following conditions could be harmful for people with SCT:

- Increased pressure in the atmosphere (e.g., while scuba diving).
- Low oxygen levels in the air (e.g., when mountain climbing, exercising extremely hard in military boot camp, or training for an athletic competition).
- Dehydration (e.g., too little water in the body).
- High altitudes (e.g., flying, mountain climbing, or visiting a city at a high altitude).

How Will A Person Know If He Or She Has Sickle Cell Trait?

A simple blood test can be done to find out if someone has SCT.

- Testing is available at most hospitals or medical centers, from SCD community-based organizations, or at local health departments.
- A small sample of blood is taken from the finger (a “needle prick”) and evaluated in a laboratory.
- If the results of the test reveal that someone has SCT, it is important that he or she know what SCT is, how it can affect him or her, and if and how SCD runs in his or her family.

The best way to find out if and how SCD runs in a person’s family is for the person to see a genetic counselor. These professionals have experience with genetic blood disorders. The genetic counselor will look at the person’s family history and discuss with him or her what is known about SCD in the person’s family. It is best for a person with SCD to learn all he or she can about this disease before deciding to have children.

For more information visit: www.cdc.gov/sicklecell