

For People of African,
Mediterranean,
or Southeast Asian
Heritage



Important Information about Diabetes Blood Tests



U.S. Department
of Health and
Human Services

 **NIDDK**
NATIONAL INSTITUTES
OF HEALTH

NATIONAL DIABETES INFORMATION CLEARINGHOUSE

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If you are of African, Mediterranean, or Southeast Asian heritage, you could have a variant form of **hemoglobin*** in your red blood cells that affects your diabetes care. Hemoglobin in red blood cells gives blood its red color and carries oxygen from your lungs to all parts of your body. Some forms of hemoglobin can cause false results for a diabetes blood test called the A1C test. If the A1C test gives a false result, your doctor may think your blood glucose level is higher or lower than it really is.



If you are of African, Mediterranean, or Southeast Asian heritage, you could have a variant form of hemoglobin in your red blood cells that affects your diabetes care.

*See page 7 for tips on how to say the words in **bold** type.

What are some common hemoglobin variants?

Most people have only one kind of hemoglobin called hemoglobin A. Some people have both hemoglobin A and another kind such as hemoglobin S, C, or E. These less common forms of hemoglobin are called **hemoglobin variants**. You can have a hemoglobin variant but not know it because you might not have any symptoms of blood disease. Having a variant without symptoms of the disease is also called having the trait or being a carrier.

Many people have heard of **sickle cell trait**, which occurs most often in people of African heritage. Again, having the trait means you inherited a gene for a hemoglobin variant from one parent. Genes carry information about which characteristics are passed down from parents to children. People with sickle cell trait usually have no symptoms. (Inheriting genes from both parents for the variant hemoglobin “S,” however, results in sickle cell disease, which is painful. You would know if you had sickle cell disease.)

People of Mediterranean or Southeast Asian heritage also can inherit hemoglobin variants. Some of these variants cause no symptoms; others cause some health problems. Variant hemoglobin does not increase your risk for diabetes.

What is the A1C test?

The A1C blood test, also called the hemoglobin A1C test or **glycohemoglobin**, provides information about your average blood glucose levels for the past 2 to 3 months. People with diabetes should have the A1C test at least twice a year. Your doctor uses the results of your A1C tests to see whether you need changes in your diabetes medicine, meal plan, or physical activity routine to keep your diabetes under control.

How do hemoglobin variants affect the A1C test and my diabetes care?

A variant form of hemoglobin in your blood can give you false A1C test results. If your test result is falsely high, your doctor might change your diabetes medicine or make other changes in how you take care of your diabetes. These changes could cause low blood glucose, or **hypoglycemia**. If your test result is falsely low, your doctor might make changes in your treatment that could cause your blood glucose to stay too high, increasing your risk for diabetes problems in your eyes, nerves, and kidneys. Not all A1C tests are affected by variant hemoglobin. Your doctor can take steps to make sure you get accurate results from your A1C test.

How will I know whether I have a hemoglobin variant?

Many people with hemoglobin variants have no symptoms. You might be at risk for having a hemoglobin variant if

- you are of African, Mediterranean, or Southeast Asian heritage
- members of your family have sickle cell trait or sickle cell anemia
- the results of your self blood glucose monitoring don't match the results of your A1C test
- your A1C result is different than expected
- your A1C result is high—more than 15 percent
- your most recent A1C result is very different from your last A1C result

Laboratory tests can confirm whether you have a hemoglobin variant.

Where can my doctor find more information about hemoglobin variants and the A1C test?

The fact sheet *Sickle Cell Trait and Other Hemoglobinopathies and Diabetes: Important Information for Physicians* provides information online at www.diabetes.niddk.nih.gov/dm/pubs/hemovari-A1C. Or your doctor can request a copy by calling the National Diabetes Information Clearinghouse at 1-800-860-8747.

How can I know if my diabetes is well-controlled if I have a hemoglobin variant?

Some A1C tests give accurate results in people with a hemoglobin variant. Your doctor can arrange for your A1C test to be done at a laboratory that gives accurate results for people with a hemoglobin variant. Your daily blood glucose tests can also show how well-controlled your diabetes is, but each blood glucose test gives information at only one point in time.

Points to Remember

- If you are of African, Mediterranean, or Southeast Asian heritage, you are at risk for having a hemoglobin variant.
- You can have a variant form of hemoglobin but not know it.
- Hemoglobin variants don't cause diabetes but they can affect diabetes test results.
- If you have a variant form of hemoglobin, the results of your A1C test might not be accurate. The results might show that your average blood glucose level is higher or lower than the actual level.
- Your doctor needs accurate results from your A1C test in order to plan how best to control your diabetes.
- Your doctor can read more about hemoglobin variants and the A1C test in *Sickle Cell Trait and Other Hemoglobinopathies and Diabetes: Important Information for Physicians*, a fact sheet available from the National Diabetes Information Clearinghouse.

Pronunciation Guide

glycohemoglobin (GLY-koh-HEE-moh-GLOH-bin)

hemoglobin (HEE-moh-GLOH-bin)

hemoglobin variants (HEE-moh-GLOH-bin)
(VAIR-ee-uhnts)

hypoglycemia (HY-poh-gly-SEE-mee-uh)

sickle cell trait (SIH-kul) (sel) (trayt)

For More Information about Diabetes

National Diabetes Information Clearinghouse

1 Information Way

Bethesda, MD 20892-3560

Phone: 1-800-860-8747

Fax: 703-738-4929

Email: ndic@info.niddk.nih.gov

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National Diabetes Education Program

1 Diabetes Way

Bethesda, MD 20892-3560

Phone: 1-800-438-5383

Fax: 703-738-4929

Email: ndep@mail.nih.gov

Internet: www.ndep.nih.gov

American Diabetes Association

1701 North Beauregard Street

Alexandria, VA 22311

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Fax: 703-549-6995

Email: AskADA@diabetes.org

Internet: www.diabetes.org

For More Information about Sickle Cell Trait and Other Blood Conditions

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Health Information Center**

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Bethesda, MD 20824-0105

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National Diabetes Information Clearinghouse

1 Information Way
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Fax: 703-738-4929
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Internet: www.diabetes.niddk.nih.gov

The National Diabetes Information Clearinghouse (NDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1978, the Clearinghouse provides information about diabetes to people with diabetes and to their families, health care professionals, and the public. The NDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about diabetes.

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This publication was reviewed by Randie R. Little, Ph.D., National Glycohemoglobin Standardization Program, University of Missouri School of Medicine.

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This booklet is also available at www.diabetes.niddk.nih.gov.

This publication may contain information about medications used to treat a health condition. When this publication was prepared, the NIDDK included the most current information available. Occasionally, new information about medication is released. For updates or for questions about any medications, please contact the U.S. Food and Drug Administration at 1-888-INFO-FDA (463-6332), a toll-free call, or visit their website at www.fda.gov. Consult your doctor for more information.



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National Institute of Diabetes and
Digestive and Kidney Diseases

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