

For People of African,  
Mediterranean, or  
Southeast Asian Heritage:

## Important Information about Diabetes Blood Tests



U.S. Department  
of Health and  
Human Services

NATIONAL INSTITUTES OF HEALTH

**NIDDK** NATIONAL INSTITUTE OF  
DIABETES AND DIGESTIVE  
AND KIDNEY DISEASES

National Diabetes Information Clearinghouse



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## Introduction

If you are of African, Mediterranean, or Southeast Asian heritage, you could have a 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 health care provider may think your blood glucose, also called blood sugar, level is higher or lower than it really is.



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If you are of African, Mediterranean, or Southeast Asian heritage, you could have a 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 health problems is also called having the trait or being a carrier.

One condition caused by hemoglobin S is **sickle cell trait**, which occurs most often in people of African heritage. Having the trait means you inherited a gene for the hemoglobin variant from one parent. Genes carry information about which features are passed down from parents to children. People with sickle cell trait usually have no health problems. Inheriting genes from both parents for the variant hemoglobin S, however, results in sickle cell disease, which is painful. You would know if you or your child had sickle cell disease.

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

## What is the A1C test?

The A1C blood test, also called the hemoglobin A1C test, HbA1c, or **glycohemoglobin** test, reflects your average blood glucose levels for the past 3 months. Your health care provider will send you to a lab to have a small sample of your blood drawn for the test. Your health care provider might use the A1C test to diagnose your diabetes. After being diagnosed with diabetes, you should have the A1C test at least twice a year. Your health care provider uses the results of your A1C tests to see whether you need to make 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 health care provider might think that you have diabetes when you don't. Your health care provider might also change your diabetes medicine or make other changes in how you take care of your diabetes based on false A1C test results. These changes could cause low blood glucose, or **hypoglycemia**.

If your test result is falsely low, your health care provider 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 health care provider 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 health problems. 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 blood glucose test or self-monitoring of blood glucose don't match the results of your A1C test
- your A1C result is different than expected
- your A1C result is very high—above 15 percent
- your most recent A1C result is very different from your last A1C result

Your health care provider can order other blood tests to confirm whether you have a hemoglobin variant.



## **Where can my health care provider find more information about hemoglobin variants and the A1C test?**

Your health care provider can access a fact sheet that explains the limitations of the A1C test online at [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov) or 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 health care provider can arrange for your A1C test to be done at a lab 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 keep in mind that each blood glucose test gives information for 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—a less common form of hemoglobin.
- You can have a hemoglobin variant but not know it.
- Having a hemoglobin variant does not increase your risk for diabetes, but it can affect your diabetes test results.
- A variant form of hemoglobin in your blood can give you false A1C test results. The results might show that your average blood glucose level is higher or lower than the actual level.
- Your health care provider can arrange for your A1C test to be done at a lab 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 keep in mind that each blood glucose test gives information for only one point in time.

## Hope through Research

The NIDDK conducts and supports research related to the causes, treatment, and prevention of diabetes.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit *www.ClinicalTrials.gov*.

## 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**

### **American Diabetes Association**

1701 North Beauregard Street

Alexandria, VA 22311

Phone: 1-800-DIABETES (1-800-342-2383)

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Email: [AskADA@diabetes.org](mailto:AskADA@diabetes.org)

Internet: [www.diabetes.org](http://www.diabetes.org)

## **For More Information about Sickle Cell Trait and Other Blood Conditions**

### **National Heart, Lung, and Blood Institute Health Information Center**

P.O. Box 30105

Bethesda, MD 20824-0105

Phone: 301-592-8573

Fax: 240-629-3246

Email: [nhlbiinfo@nhlbi.nih.gov](mailto:nhlbiinfo@nhlbi.nih.gov)

Internet: [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov)

## Acknowledgments

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

## National Diabetes Education Program

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Internet: [www.ndep.nih.gov](http://www.ndep.nih.gov)

[www.yourdiabetesinfo.org](http://www.yourdiabetesinfo.org)

The National Diabetes Education Program is a federally funded program sponsored by the U.S. Department of Health and Human Services' National Institutes of Health and the Centers for Disease Control and Prevention and includes over 200 partners at the federal, state, and local levels, working together to reduce the morbidity and mortality associated with diabetes.



# National Diabetes Information Clearinghouse

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Internet: [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)

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This publication may contain information about medications. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (1-888-463-6332) or visit [www.fda.gov](http://www.fda.gov). Consult your health care provider for more information.



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AND HUMAN SERVICES  
National Institutes of Health

**NIDDK** | NATIONAL INSTITUTE OF  
DIABETES AND DIGESTIVE  
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NIH Publication No. 12-6283  
October 2011



The NIDDK prints on recycled paper with bio based ink.