Comparing Tests for Diabetes and Prediabetes: A Quick Reference Guide

On this page:

- Confirming Diagnosis of Type 2 Diabetes and Prediabetes
- Interpreting Laboratory Results
- Comparing Diabetes Blood Tests
- Comparing Diagnoses

This fact sheet compares the following tests:

- A1C test
- fasting plasma glucose (FPG) test
- oral glucose tolerance test (OGTT)
- random plasma glucose (RPG) test

In addition, the National Diabetes Education Program (NDEP) offers a pocket guide, Diabetes Numbers At-a-Glance, which can be ordered at www.ndep.nih.gov. Both resources utilize current American Diabetes Association (ADA) clinical recommendations for diagnosing and managing diabetes and prediabetes.[1]

Confirming Diagnosis of Type 2 Diabetes and Prediabetes

Diagnosis must be confirmed unless symptoms are present. Repeat the test using one of the following methods:

- Repeat the same test on a different day—preferred.
- If two different tests are used—e.g., FPG and A1C—and both indicate diabetes, consider the diagnosis confirmed.
- If the two different tests are discordant, repeat the test that is above the diagnostic cut point.

If diagnosis cannot be confirmed using the results of two tests, but at least one test indicates high risk, health care providers may wish to follow the patient closely and retest in 3 to 6 months.[1]

Interpreting Laboratory Results

When interpreting laboratory results health care providers should

- consider that all laboratory test results represent a range, rather than an exact number[2]
- be informed about the A1C assay methods used by their laboratory[2]
- send blood samples for diagnosis to a laboratory that uses an NGSP-certified method for A1C analysis to ensure the results are standardized[3]
- consider the possibility of interference in the A1C test when a result is above 15% or is at odds with other diabetes test results[1]
- consider each patient's profile, including risk factors and history, and individualize diagnosis and treatment decisions in discussion with the patient[1]

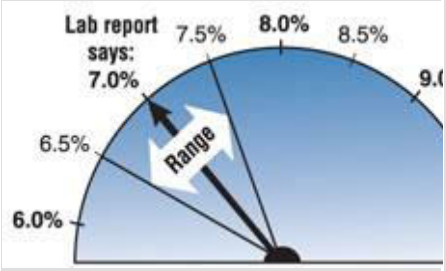
Comparing Diabetes Blood Tests‡

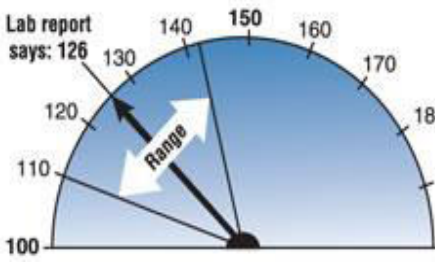
PDF Version (461 KB)

Comparing Diabetes Blood Tests‡

PDF Version (461 KB)

Test	Uses	Technical Features	PROS	CONS
A1C Test	• Screening and diagnosis of prediabetes ○ 5.7–6.4%† • Screening and diagnosis of type 2 diabetes ○ ≥ 6.5%† ○ repeat for confirmation of diagnosis • Monitoring of	• Diagnosis requires a laboratory test certified by the NGSP, not meter—point-of-care A1C tests are only suitable for monitoring • Sample any time of day, no fasting • Sample: anticoagulated whole blood • Sample stability: superior • Sensitivity: less than the FPG test and the OGTT • Coefficient of variation: assay	• Reflects long-term blood glucose concentration • Unaffected by acute changes in glucose levels	• Lower sensitivity: identifies fewer cases of diabetes than the glucose tests • Interference resulting in falsely increased or lowered results due to* ○ genetic variants including

	diabetes	variability, see www.ngsp.orgExternal Link Disclaimer  Courtesy of David Aron, M.D., Louis Stokes Department of Veterans Affairs Medical Center With a coefficient of variation as large as that allowed by the National Glycohemoglobin Standardization Program, a reported A1C result of 7.0% could indicate a true A1C of anywhere from ~6.5 to 7.5%.	due to stress or illness • Highly correlated with risks for complications such as retinopathy and cardiovascular disease (CVD) • Convenient for patient and health care providers • Most stable sample after collection • Low within-patient variability • Established international standardization of lab tests • Accuracy of test is monitored	HbS, HbC, HbD, and HbE traits and HbF:** affects people of African, Mediterranean, and Southeast Asian heritage ○ kidney disease ○ liver disease ○ iron deficiency anemia ○ heavy bleeding • Not recommended for rapidly progressing diabetes, e.g., type 1 diabetes in children • May not be available in some laboratories/areas of the world • Expensive *See www.ngsp.orgExternal Link Disclaimer for information on A1C interference and recommended testing methods. **See the NIDDK publication The A1C Test and Diabetes at www.diabetes.niddk.nih.gov.
FPG Test	• Screening and diagnosis of prediabetes or impaired fasting glucose (IFG) ○ 100–125 mg/dL† • Screening and diagnosis of diabetes ○ ≥126 mg/dL† ○ repeat for confirmation of diagnosis	• Diagnosis requires a laboratory test, not meter • Sample in morning, after 8-hour fast • Sample: sodium fluoride plasma preferred • Sample stability: low—requires processing within 30 minutes • Sensitivity: greater than the A1C test, less than the OGTT • Coefficient of variation: assay variability:	• Low cost • Assay is widely available • Assay is automated	• Indicates single-point blood glucose level • Affected by short-term lifestyle changes: stress or illness • Less tightly linked to diabetes complications than A1C • Not convenient for patient or health care provider: requires fasting and scheduling a morning appointment or



Courtesy of David Aron, M.D., Louis Stokes Department of Veterans Affairs Medical Center

With a coefficient of variation 5.7% (typical biological variation within the same person), an FPG test result of 126 mg/dL could indicate a true FPG of anywhere from ~110 to 142 mg/dL.

				• return visit • Diurnal variation • Sample not stable after collection • High within-patient variability • Many laboratories measure serum, which is not recommended • Inadequate standardization of assays

OGTT	• Screening and diagnosis of prediabetes or impaired glucose tolerance (IGT)
	  ○ 140–199 mg/dL at 2 hr.†
	• Screening and diagnosis of diabetes
	  ○ ≥200 mg/dL at 2 hr.†
	  ○ repeat for confirmation of diagnosis
	• Screening and diagnosis of gestational diabetes mellitus (GDM)*
		• Sample in morning, after 8-hr. fast and 2 hrs. after glucose load
		• Sample stability: low—requires processing within 30 minutes
		• Patients should ingest at least 150 g/day of carbohydrates for 3 days prior
		• Sensitivity: greater than the A1C or the FPG tests
		• Range of variability: 16.7%
			• Sensitive indicator of risk of developing diabetes
			• Early marker of impaired glucose balance
				• Affected by short-term lifestyle changes: stress, illness, and medications
				• Not convenient for patient or health care provider: requires fasting and scheduling a morning appointment or return visit
				• Extensive patient preparation
				• Sample not stable after collection
				• High within-patient variability
				• Low reproducibility
				• Expensive

RPG Test	• Diagnosis of diabetes—used only with classic symptoms of hyperglycemia or hyperglycemic crisis:
	  ○ polyuria, polydypsia, and unexplained weight loss
	  ○ 200 mg/dL†
		• Sample any time, no fasting
		• Sample stability: low—requires processing in fewer than 2 hours
			• Convenient
			• Part of basic metabolic panel screen
				• Indicates single-point blood glucose level
				• Used only in symptomatic patients, not recommended for screening
				• Insensitive measurement
				• Greater within-patient variability
				• Affected by short-term lifestyle changes and prandial state

‡Adapted from Sacks DB. A1C versus glucose testing: a comparison. *Diabetes Care.* 2011;34(4):518–523.

‡Adapted from Sacks DB. A1C versus glucose testing: a comparison. *Diabetes Care.* 2011;34(4):518–523.

†American Diabetes Association. Standards of medical care in diabetes—2011. *Diabetes Care.* 2011;34(Supp 1):S11–S61.

*Testing for GDM is not covered in this publication.

Comparing Diagnoses

In some people, a blood glucose test may indicate a diagnosis of diabetes even though an A1C test does not.

The reverse can also occur—an A1C test may indicate a diagnosis of diabetes even though a blood glucose test does not.

Because of these variations in test results, health care providers should repeat tests before making a diagnosis. People with differing test results may be in an early stage of the disease, where blood glucose levels have not risen high enough to show on every test.

References

1. American Diabetes Association. Standards of medical care in diabetes—2011. *Diabetes Care.* 2011;34(Supp 1):S11–S61.
2. Sacks DB. A1C versus glucose testing: a comparison. *Diabetes Care.* 2011;34(4):518–523.
3. See www.ngsp.orgExternal Link Disclaimer for information on A1C test interference and recommended testing methods.

This information may contain content about medications and, when taken as prescribed, the conditions they treat. When prepared, this content 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.govExternal Link Disclaimer. Consult your health care provider for more information.

This content is provided as a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), part of the National Institutes of Health. The NIDDK translates and disseminates research findings through its clearinghouses and education programs to increase knowledge and

understanding about health and disease among patients, health professionals, and the public. Content produced by the NIDDK is carefully reviewed by NIDDK scientists and other experts.

The NIDDK would like to thank:
Randie Little, Ph.D., University of Missouri-Columbia; David B. Sacks, M.B., Ch.B., F.R.C.Path., NIH Clinical Center; David Aron, M.D., Louis Stokes Department of Veterans Affairs Medical Center

This information is not copyrighted. The NIDDK encourages people to share this content freely.

March 2014