

Decoding Your Lab Report

Lab reports are a routine but mysterious part of medical visits. Whether you are being diagnosed with diabetes for the first time or getting your A1C test for the hundredth time, you are likely going to need to undergo some kind of testing so that your doctor will know what's going on and recommend the proper course of treatment, if necessary. But when you see your test results, will you know what it means?

The Basics

The lab report format is not the same for all reports. Yet the information contained within the report should be, according to the Clinical Laboratory Improvement Amendments (CLIA).¹ This legislation requires that all laboratory reports contain certain elements:

- For positive patient identification, either the patient's name and identification number, or a unique patient identifier and identification number.
- The name and address of the laboratory location where the test was performed.
- The test report date.
- The test performed.
- Specimen source, when appropriate. (The specimen source is whatever material used for testing, i.e, blood, serum, plasma, urine, swab for cultures, etc.)
- The test result and, if applicable, the units of measurement or interpretation, or both.
- Any information regarding the condition and disposition of specimens that do not meet the laboratory's criteria for acceptability.²

You will find most if not all of the patient and performing lab information, and applicable dates and times (most likely military time) at the very top and/or bottom of your lab report. This information may also include your ordering doctor's name (i.e., the doctor who ordered the test); your primary care physician's name and address (copies should be sent to your PCP if not ordered by him/her); and ID numbers that will help identify your report from all others.

The Variables

Other parts of the lab report will deal with the specimen that was tested and the results of the test. The lab report format may include:

- **Laboratory accession number.** Number(s) assigned to the sample(s) when it arrives at the laboratory. Some labs will have a single accession number for all your tests and other labs may have multiple accession numbers that help the lab identify the samples.
- **Name of the test performed.** Test names are often abbreviated on lab reports. You may want to look for abbreviated test names in the pull down menu on the home page of this site or type the acronym into the search box to find information on specific tests.
- **Test result.** Some results are written as numbers when a substance is measured in a sample as with a cholesterol level (quantitative). Other reports may simply give a positive or negative result as in pregnancy tests (qualitative). Still others may include text, such as the name of bacteria for the result of a sample taken from an infected site.

- **Abnormal test results.** Lab reports will often draw attention to results that are abnormal or outside the reference range by setting them apart or highlighting them in some way. For example, “**H**” next to a result may mean that it is higher than the reference range. “**L**” may mean “low” and “**WNL**” usually means “within normal limits.”
- **Critical results.** Those results that are dangerously abnormal must be reported immediately to the responsible person, such as the ordering physician. The laboratory will often draw attention to such results with an asterisk (*) or something similar and will usually note on the report the date and time the responsible person was notified.
- **Units of measurement (for quantitative results).** The units of measurement that labs use to report your results can vary from lab to lab. Regardless of the units that the lab uses, your results will be interpreted in relation to the reference ranges supplied by the laboratory.
- **Reference intervals (or reference ranges).** These are the ranges in which “normal” values are expected to fall. The ranges that appear on your report are established and supplied by the laboratory that performed your test. They are made available to the doctor who requested the test(s) and to other health care providers to aid in the interpretation of the results.
- **Interpretation of results.** In certain circumstances, the lab may note on the report what certain test results may indicate.
- **Condition of specimen.** Any pertinent information regarding the condition of specimens that do not meet the laboratory’s criteria for acceptability will be noted. This type of information may include a variety of situations in which the specimen was not the best possible sample needed for testing. For example, if the specimen was not collected or stored in optimal conditions or if it was visually apparent that a blood sample was hemolyzed (breakdown of red blood cells) or lipemic (presence of excess lipids in the blood), it will be noted on the report. In some cases, the condition of the specimen may preclude analysis (the test is not run and results are not generated) or may generate additional comments directing the use of caution in interpreting results.
- **Deviations from test preparation procedures.** Some tests have specific procedures to follow before a sample is collected or a test is performed. If such procedures are not followed for some reason, it may be noted on the report. For example, if a patient forgets to fast before having a glucose test performed, the report may reflect this fact.
- **Medications, health supplements, etc. taken by the patient.** Some tests results are affected by [medications](#), [vitamins](#), and other health [supplements](#), so laboratories may obtain this information from the test request form and transcribe it onto the lab report.

Name That Test

For diabetes, there are several panels of tests a doctor may order for either diagnosis or maintenance of the disease.

A1C

The most feared/revered of all the tests, the [A1C](#) measures blood glucose control over a 2- to 3-month period. This is the standard test used to determine blood glucose control in people with diabetes.

Lipid Panel

The lipid profile tests blood fats and are used to determine the risk of [heart disease](#) or [stroke](#). High triglyceride and [cholesterol](#) levels can be caused by diabetes. Some tests are:

- HDL-C – HDL cholesterol is good cholesterol and contains the highest amount of protein. It should be greater than 40 mg/dl (2.2 mmol/l) in men and greater than 50 mg/dl (2.7 mmol/l) in women.
- LDL-C – LDL cholesterol, which contains the highest amount of cholesterol, is also called bad cholesterol because LDL deposits can build up on the walls of arteries, should be below 100 mg/dl (5.5 mmol/l). The target for high-risk level patients, including those with diabetes, is less than 70 mg/dl (3.9 mmol/l).
- Triglycerides – levels should be less than 150 mg/dl (8.3 mmol/l).
- VLDL-C – Very low-density lipoprotein cholesterol is part of an extended profile your doctor may order. It is the third of the major lipoprotein particles (the other two being HDL and LDL). VLDL contains the highest amount of triglyceride.
- Non-HDL-C – also part of the extended profile, Non-HDL-cholesterol can build up in the arteries, form plaques, and cause narrowing of the vessels and blockages.

Related tests: Direct LDL-C; Homocysteine; Lp-PLA2 (Lipoprotein-associated phospholipase A₂); hs-CRP (High-sensitivity C-reactive protein); Apo A (Apolipoprotein A-I); Apo B (Apolipoprotein B-100); Lp(a) (Lipoprotein (a))

Glucose

Glucose tests are generally used to diagnose all forms of diabetes. They are:

- FPG – The [Fasting Plasma Glucose](#) test is the primary indicator of diabetes, but it is also used to evaluate the effectiveness of medication or dietary therapy in those already diagnosed with diabetes.
- OGTT – The [Oral Glucose Tolerance Test](#) can diagnose prediabetes, diabetes, and gestational diabetes. Women not considered part of the high-risk group for developing gestational diabetes may first be given a screening test called the glucose challenge test or GCT. If a problem is identified in the GCT, the OGTT is then performed for further information.
- [Random Plasma Glucose](#) – This test is a screening test for diabetes when a patient has had food or drink and therefore can't do the FPG or OGTT.

Hormone Panel

- Insulin – this test helps evaluate insulin production; diagnose an insulinoma (a tumor of the insulin-producing islet cells in the pancreas, causing low blood glucose levels); and helps determine the cause of hypoglycemia
- C-Peptide – also known as Insulin C-peptide, this test monitors insulin production by the beta cells in the pancreas and helps determine the cause of hypoglycemia
- TSH – [thyroid](#) disorders are common in people with diabetes, especially women, because one autoimmune disease (diabetes) often begets another (thyroid disorders). TSH screen and helps diagnose these disorders.

- T4 – When TSH is abnormal, a T4 test may be ordered to help evaluate thyroid gland function; help diagnose hypothyroidism or hyperthyroidism; and screen for hypothyroidism in newborns.

Related tests: T3; Thyroid Antibodies

Kidney Function

- Microalbumin – Often ordered as a microalbumin/creatinine ratio, this is a test that measures very small amounts of protein in the urine (microalbuminuria). It is a symptom of the very early stages of kidney disease. Microalbumin is usually measured annually.
- Creatinine Clearance – helps detect and evaluate kidney dysfunction or decreased blood flow to the kidneys.
- eGFR – Estimated Glomerular Filtration Rate assesses kidney function.
- CMP – Comprehensive Metabolic Panel is a frequently ordered panel of tests that gives your doctor important information about the current status of your kidneys, liver, and electrolyte and acid/base balance as well as of your blood sugar and blood proteins.
- BUN – evaluates kidney function or monitors the effectiveness of dialysis and other treatments related to kidney disease or damage.
- Creatinine – determine if your kidneys are functioning normally and monitors treatment for kidney disease.
- Cystatin C – helps detect and monitor acute and chronic kidney dysfunction

Related tests: BUN/creatinine ratio; BMP

Urine

Random urine samples are tested for glucose, protein, and [ketones](#) during a physical. However, this is not a good test for blood sugars slightly above normal because glucose is only found in the urine when the kidney is not able to filter the excess sugar. Also, urine can stay in the bladder for hours so it is not a good indicator of current blood plasma glucose levels.

- Ketones – not normally found in the urine, the presence of ketones can indicate insufficient insulin.
- Urinalysis – screens for metabolic and kidney disorders and for [urinary tract infections](#).

Urinalysis

- *Urine Specific Gravity:* measure of how concentrated the urine is to help the physician evaluate if the sample is the best one to detect a particular sample. Urine is usually most concentrated in the morning.
- *Urine glucose:* Glucose is normally not present in urine. When glucose is present, the condition is called glucosuria and it results from high blood glucose levels, such as may be seen in people with diabetes.
- *Ketones:* Ketones are not normally found in urine. Ketones in urine can give an early indication of insufficient insulin.
- *Blood:* This test is used to detect hemoglobin in the urine, which indicates blood in the urine. Increased levels of blood in the urine can be due to numerous diseases of the kidney and urinary tract.
- *Protein:* Measures the amount of albumin in the urine. Albumin is an early indicator of kidney dysfunction. If blood sugar levels are high, it taxes the kidneys, and the increased pressure results in protein spilling into the urine.

- *Bilirubin*: Bilirubin is not present in the urine of normal, healthy individuals. Presence of bilirubin in urine is an early indicator of liver disease.
- *Urobilinogen*: Urobilinogen is normally present in urine in low concentrations. This test helps detect liver diseases as well as biliary obstructions.
- *Nitrite*: Normally the urinary tract and urine are free of bacteria. When bacteria are present, they can convert nitrate to nitrite in your urine. A positive nitrite test can indicate a urinary tract infection.
- *Microscopic Examination*: After urine has been centrifuged, the concentrated urine sediment is examined to count and identify substances:
 - *RBC microscopic*: Normally, a few RBC's are present in urine sediment. Inflammation, injury, or disease in the kidneys can cause increased levels of RBC's.
 - *WBC microscopic*: The number of WBC's in urine is normally low. When the number is high, it indicates infection or inflammation in the urinary tract.

CBC with differential platelet

The Complete Blood Count (CBC) is a panel of broad screening tests to check for disorders such as diabetes, anemia, and infection. This panel test examines different parts of the blood and includes the following:

- Red Blood Cells:
 - *RBC count*: a count of the actual number of red blood cells per volume of blood.
 - *Hematocrit*: measures the percentage of red blood cells in a given volume of whole blood.
 - *MCV*: Mean corpuscular volume is a measurement of the average size of your RBC's. Larger or smaller than normal RBC's indicate health issues.
 - *RDW*: Red cell distribution width is a calculation of the variation in the size of your RBCs.
- White Blood Cells:
 - *WBC count and differential*: a count of the actual number of white blood cells per volume of blood, as well as the different types of white blood cells present. WBC's fight infections and diseases. Increased levels indicate infections. There are five types of WBC's:
 - *Basophil*: Type of white blood cell (leukocyte) that normally constitutes 1% or less of the total WBC count. Increased or decreased levels indicate disease.
 - *Eosinophil*: Type of WBC (leukocyte) that normally constitutes about 1-3% of the total WBC count. Function in resisting infections and allergic reactions.
 - *Neutrophil*: Normally the most abundant type of white blood cell in healthy adults.
 - *Lymphocyte*: normally makes up 25% of total white blood cell count but can vary widely. Occur in two forms: B cells, which produce antibodies, and T cells, which recognize foreign substances and process them for removal.
 - *Monocyte*: normally makes up 5-10% of the total WBC count. Functions in the ingestion of bacteria and other foreign particles.
- Hemoglobin:

- *Hemoglobin*: measures the amount of oxygen-carrying protein in the blood. If you have diabetes, excess glucose in your blood can attach to hemoglobin and raise the level of hemoglobin A1c.
- *MCH*: Mean corpuscular hemoglobin is a calculation of the average amount of oxygen-carrying hemoglobin inside a red blood cell.
- *MCHC*: Mean corpuscular hemoglobin concentration is a calculation of the average concentration of hemoglobin inside a RBC.
- Platelets:
 - *Platelet count*: Number of platelets in a given volume of blood.
 - *MPV*: Mean platelet volume calculates the average size of your platelets, giving your doctor information about your platelet production.

CMP

The Comprehensive Metabolic Panel is a series of 14 tests that is used as a broad screening tool to evaluate organ function of your kidneys and liver. This frequently ordered panel gives your doctor information about your current glucose and protein levels, as well as your electrolyte and acid/base balance. Abnormal glucose levels in your blood may be a sign of diabetes.

Tests to Distinguish Between Types

Once diabetes has been diagnosed, there are tests to help determine if it is type 1 or type 2. **Antibody tests** – Glutamic Acid Decarboxylases (GADA); insulin-associated tyrosine phosphatase antibody (IA2A); insulin autoantibody (IAA); and [islet cell](#) antibody (ICA) – can provide evidence of autoimmune activity, which is specific to type 1. Type 2 is not an autoimmune disease.

This is just the beginning. Your lab report may have more or different acronyms depending upon the conditions your doctor is seeking to diagnose or monitor. Your lab report format may also include sections not listed here. That is why it is important to be in communication with your doctor and if you do not understand something, never be afraid to ask.

Sources

1 - U.S Department of Health and Human Services. Clinical Laboratory Improvement Amendments. <http://www.cms.hhs.gov/clia/>. (Accessed 01/10)

2 – Centers for Disease Control and Prevention. Current CLIA Regulations. http://www.cdc.gov/clia/regs/subpart_k.aspx#493.1291 (Accessed 01/10)

3 – Lab Tests Online. Deciphering Your Lab Report. http://www.labtestsonline.org/understanding/features/lab_report.html (Accessed 01/10)