



Lab Update

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Laboratory Phone: 585-LABS

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LabUpdate is a periodic publication of the Clinical Laboratories of UC Health. By way of this publication, lab users are provided: 1) updated operational information relevant to the practice of laboratory medicine within UC Health facilities, and 2) didactic material generally applicable to laboratory medicine.

LAB UPDATE

University Hospital Clinical Laboratory

If you are interested in the on site availability of a particular test, please contact the Laboratory Client Services Department at 585-LABS or via email to Jenny Ford at jennifer.ford@uchealth.com.

MOLECULAR DIAGNOSTICS

Enterovirus PCR on CSF

The Microbiology and Molecular Laboratory of UC Health offers an amplified nucleic acid-based test for enterovirus in CSF. The assay is an FDA-approved reverse-transcription polymerase chain reaction (RT-PCR) test that uses the Cepheid® GeneXpert® Dx system for the presumptive qualitative detection of enterovirus RNA in CSF specimens. This test, in conjunction with other laboratory results and clinical information, may be used as an aid in the laboratory diagnosis of enterovirus infection in patients with a clinical suspicion of meningitis or meningoencephalitis.

Enterovirus taxonomically encompasses polioviruses, coxsackieviruses, echoviruses, and enteroviruses. Enteroviruses are ssRNA viruses that cause a wide range of infections and are most often spread through fecal-oral, oral-oral, respiratory droplets, and fomites, with exposure to respiratory droplets from an infected person being the most common in developed countries.

The common symptoms are fever, severe headache, stiff

neck, photophobia, drowsiness or confusion, nausea and vomiting.

Over 80% of viral meningitis cases are caused by enteroviruses; they are the most common cause of meningitis in the United States, with an estimated 30,000 to 50,000 hospitalizations each year. Enteroviral meningitis usually resolves within 7-10 days. The majority of cases of enteroviral meningitis are seen in late summer and early fall. An enterovirus test, together with clinical observation and other clinical information, can help physicians identify patients with enteroviral meningitis to aid in patient management.

Nucleic acid amplification tests have become the gold standard for laboratory diagnosis because of the low sensitivity of viral culture for the diagnosis of enteroviral meningitis. Clinical studies have reported that the GeneXpert EV assay showed a sensitivity of 95%, sensitivity of 100%, PPV of 100% and NPV of 98%. The analytical sensitivity and specificity were also high, resulting in a highly accurate test for the diagnosis of enteroviral meningitis.

The test (LastWord code: *Enterovirus Detect by PCR*) will be available seven days a week from 7 am until 9 pm. The test takes approximately 2.5 hours. Results of the test are Positive, Negative or Invalid.

The comment: "Positive Xpert EV results do not rule out other causes of meningitis, including bacteria, mycobacteria, other viruses (e.g. herpes family viruses, arboviruses, mumps virus, etc) and fungi. Negative Xpert EV results do not rule out enterovirus as causes of meningitis, but that enterovirus was not detected" will be appended to each test. Grossly bloody specimens are not compatible with this test.

For questions, please contact Dr. Rhodes at 584-3923 or Vicki Stegner at 584-6014.

CHEMISTRY

Clinical Usefulness of Venous Blood Gas

Although several studies indicate venous samples suffice for measurement of blood pH, such samples are not generally considered appropriate for blood gas analyses, especially measurement of pO₂ (1, 2). The use of venous samples for blood gas analyses may be warranted when: 1) assessing cardiac output from a Swan-Ganz catheter, or 2) monitoring placement of a central line.

At University Hospital, venous samples collected for blood gas analyses must be drawn from an indwelling catheter into a blood gas syringe. Venous blood drawn from a peripheral “stick” into a vacutainer® tube yields both inaccurate pO₂ and pCO₂ values.

VPH - Venous Blood Gas PH

CAN be drawn by phlebotomists.

Container requirements are: **Green Lithium Heparin on Ice**

VBG - Venous Blood Gas

Can **NOT** be drawn by phlebotomists.

This specimen is to be collected by Nursing Staff or Physician.

Container requirements are: **Syringe (Non Lab draw).**

VO2SAT - Venous O2 SAT, Measured

Will **NOT** be drawn by phlebotomists.

This specimen is to be collected by Nursing Staff or Physician.

Container requirements are: **Syringe (Non Lab draw).**

Ordering the correct Vitamin D test

The role of vitamin D in bone and mineral metabolism was first recognized when it was identified as a factor that could cure rickets. However, vitamin D is now recognized as a prohormone, which has multiple roles in maintaining optimal health. Vitamin D3 (cholecalciferol) and vitamin D2 (ergocalciferol) are the most abundant forms of vitamin D in the body. Vitamin D is synthesized in the skin from 7-dehydrocholesterol in response to sunlight.

The best nutritional sources of D3 are oily fish, primarily salmon and mackerel. Vitamin D2's nutritional sources are some vegetables, yeast and fungi. The vegetarian diet is abundant in vitamin D2. Vitamin D (D3, D2 and metabolites) is converted to 25-hydroxyvitamin D in the liver.

The measurement of 25-OH vitamin D concentration in the serum or plasma is the best indicator of vitamin D nutritional status. The optimal level of 25-OH vitamin D is subject to some debate, but >32ng/mL is accepted as sufficient for bone health. Vitamin D toxicity is a recognized problem, but a rare occurrence. Instead, a recent growing public health problem is vitamin D insufficiency. Several research studies have identified widespread vitamin D insufficiency in apparent healthy populations world-wide. Vitamin D deficiency is commonly treated with vitamin D2 or D3 medications in doses ranging from 50,000 IU/month to 50,000 IU/week. Fortified foods and nutrition supplements may contain either form. To ensure accurate assessment of the total vitamin D, all forms, including D3, D2 and metabolites, must be measured.

How is it used?

Recent studies have identified an inactive 3-epimer of 25-OH vitamin D, which may be present in the serum of infants under the age of one year. Thus it is important that an assay avoid measuring the inactive 3-epi form and only measure the active D3 and D2 forms equally. 25-hydroxyvitamin D is used to determine if bone weakness, bone malformation, or abnormal metabolism of calcium [reflected by abnormal calcium, phosphorus, or parathyroid hormone (PTH) level] is occurring as a result of a deficiency or excess of vitamin D.

Since vitamin D is a fat-soluble vitamin and is absorbed from the intestine like a fat, vitamin D is sometimes used to monitor individuals with diseases that interfere with fat absorption, such as cystic fibrosis and Crohn's disease, and in patients who have had gastric bypass surgery and may not be able to absorb enough Vitamin D. Vitamin D is sometimes used to determine effectiveness of treatment when vitamin D, calcium, phosphorus, and/or magnesium supplementation is prescribed.

When is it ordered?

25-hydroxyvitamin D

If calcium is low or the patient has symptoms of vitamin D deficiency, such as bone malformation in children (rickets) and bone weakness, softness, or fracture in adults (osteomalacia) 25-hydroxyvitamin D usually is ordered to identify a possible deficiency in vitamin D. Vitamin D deficiency is thought to be much more common than previously believed. Some studies have shown that as many as 50% of the elderly and women being treated for osteoporosis may be Vitamin D deficient. 25-hydroxyvitamin D is often ordered before an individual begins drug therapy for osteoporosis. Some osteoporosis medications now include the recommended Vitamin D dose.

1,25-dihydroxyvitamin D

If calcium is high or the patient has a disease that might produce excess amounts of vitamin D, such as sarcoidosis or some forms of lymphoma, 1,25-dihydroxyvitamin D usually is ordered. Rarely, this testing may be indicated when abnormalities of 1-alpha-hydroxylase are suspected. Vitamin D levels also may be used to help diagnose or monitor problems with parathyroid gland functioning since PTH is essential for vitamin D activation.

When vitamin D, calcium, phosphorus, or magnesium supplementation is necessary, vitamin D levels are sometimes measured to monitor treatment effectiveness.

What does the test result mean?

There are differences among Vitamin D methods, making a universal reference range difficult to establish.

Total 25-hydroxyvitamin D (D2 + D3) is the correct measure of Vitamin D status. There is currently no consensus on the level which indicates deficiency.

25-hydroxyvitamin D

Low blood levels of 25-hydroxyvitamin D may mean that you are not getting enough exposure to sunlight or enough dietary vitamin D to meet your body's demand or that there is a problem with its absorption from the intestines. Occasionally, drugs used to treat seizures, particularly phenytoin (Dilantin), can interfere with the production of 25-hydroxyvitamin D in the liver. There is increasing evidence that vitamin D deficiency may increase the risk of some cancers, immune diseases, and cardiovascular disease. High levels of 25-hydroxyvitamin D usually reflect excess supplementation from vitamin pills or other nutritional supplements.

1,25-dihydroxyvitamin D

Low levels of 1,25-dihydroxyvitamin D can be seen in kidney disease and are one of the earliest changes to occur in persons with early kidney failure.

High levels of 1,25-dihydroxyvitamin D may occur when there is excess parathyroid hormone or when there are diseases, such as sarcoidosis or some lymphomas, which can make 1,25-dihydroxyvitamin D outside of the kidneys.

Is there anything else I should know?

High levels of vitamin D and calcium can lead to the calcification and damage to organs, particularly the kidneys and blood vessels. If magnesium levels are low, they can cause a low calcium level that is resistant to vitamin D and parathyroid hormone regulation. It may be necessary to supplement both magnesium and calcium to regain normal function.

How do I order Vitamin D?

25-hydroxyvitamin D

LastWord- Vitamin D,25-Hydroxy
Performed at University Hospital Lab
Reference range: 30-100 ng/mL

We offer 25-hydroxyvitamin D as an in-house assay on the LIAISON platform (Diasorin, Stillwater, MN). The LIAISON 25 OH Vitamin D TOTAL Assay uses chemiluminescent immunoassay technology for the quantitative determination of 25-hydroxyvitamin D and other hydroxylated vitamin D metabolites in human serum to be used in the assessment of vitamin D sufficiency. Assay results should be used in conjunction with other clinical or laboratory data to assist the clinician in making individual patient management decisions in an adult population.

1,25-dihydroxyvitamin D

LastWord- Vitamin D 1,25 Calciferol
Referred to LabCorp.
Reference range: 100-750 pg/mL

1,25-dihydroxyvitamin D is sent to LabCorp for testing. The analyte is extracted from serum using column chromatography and followed by a radioimmunoassay (RIA).