MAYO CLINIC LABORATORIES

Test Definition: VWACT

von Willebrand Factor Activity, Plasma

Overview

Useful For

Diagnosis of von Willebrand disease (VWD) and differentiation of VWD subtypes or differentiation of VWD from hemophilia A

Monitoring therapeutic efficacy of treatment with DDAVP (desmopressin) or VWF concentrates in patients with VWD

Reflex Tests

Test Id	Reporting Name	Available Separately	Always Performed
RIST	Ristocetin Cofactor, P	No	No

Testing Algorithm

If von Willebrand factor activity is less than 55%, then the von Willebrand factor ristocetin cofactor activity assay will be performed at an additional charge.

Special Instructions

- Coagulation Guidelines for Specimen Handling and Processing

Method Name

Latex Immunoassay

NY State Available

Yes

Specimen

Specimen Type

Plasma Na Cit

Ordering Guidance

This activity assay is most effective when it is combined with measurement of von Willebrand factor antigen and factor VIII coagulant activity, preferably as a panel of tests with reflexive testing and interpretive reporting. See AVWPR / von Willebrand Disease Profile, Plasma.

Additional Testing Requirements

Tests for F8A / Coagulation Factor VIII Activity Assay, Plasma and VWAG / von Willebrand Factor Antigen, Plasma are recommended in conjunction with this test (von Willebrand activity).

Specimen Required

Specimen Type: Platelet-poor plasma
Collection Container/Tube: Light-blue top (3.2% sodium citrate)
Submission Container/Tube: Plastic vial (polypropylene preferred)
Specimen Volume: 2 mL in 2 vials each containing 1 mL
Collection Instructions:
1. Specimen must be collected prior to factor replacement therapy.
2. For complete instructions, see Coagulation Guidelines for Specimen Handling and Processing.
3. Centrifuge, transfer all plasma into a polypropylene vial, and centrifuge plasma again.
4. Aliquot plasma (1-2 mL per aliquot) into 2 separate polypropylene vials leaving 0.25 mL in the bottom of centrifuged vial.
5. Freeze plasma immediately (no longer than 4 hours after collection) at -20 degrees C or, ideally, < or =-40 degrees C.
6. Send specimens in the same shipping container.
Additional Information:
1. Double-centrifuged specimen is critical for accurate results as platelet contamination may cause spurious results.
2. Each coagulation assay requested should have its own vial.

Forms
If not ordering electronically, complete, print, and send a Coagulation Test Request (T753) with the specimen.

Specimen Minimum Volume
0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma Na Cit	Frozen	14 days	

Clinical & Interpretive

Clinical Information
von Willebrand factor (VWF) is a multimeric adhesive glycoprotein that is important for platelet-platelet and platelet-vessel hemostatic interactions. In addition, plasma VWF serves as a carrier protein for coagulation factor VIII, stabilizing its procoagulant activity. VWF circulates in the blood in 2 distinct compartments; plasma VWF mainly reflects VWF synthesis and release from vascular endothelial cells and platelet VWF (about 10% of the blood VWF) reflects VWF synthesis by bone marrow megakaryocytes with storage primarily in the alpha granules of circulating platelets. VWF antigen measurement assesses the mass of plasma VWF protein but does not reflect VWF functions or platelet VWF. The major function of VWF (mediating platelet-platelet or platelet-vessel interaction) is most commonly assessed by

measurement of plasma ristocetin cofactor activity.

Patients with congenital severe type 3 von Willebrand disease (VWD) have markedly decreased or immeasurably low VWF antigen in the plasma (and in the platelets), and plasma VWF activity is very low or nondetectable. Patients with types 2A and 2B variants of VWD (with abnormal plasma VWF function and multimeric structure) may have normal or decreased plasma VWF antigen but typically have decreased plasma VWF activity and decreased higher molecular weight VWF multimers in the plasma. Patients with type 2M or type 2N VWD have normal levels of antigen, but either decreased VWF activity not caused by absence of higher molecular weight VWF multimers (type 2M VWD) or decreased factor VIII coagulant activity (type 2N VWD). Patients with type 1 VWD (with decreased but normally functioning plasma VWF) have concordantly decreased plasma VWF antigen and activity. Patients with acquired von Willebrand syndrome may have either normal or decreased plasma VWF antigen and decreased VWF activity.

Note: VWF activity measurement is most effective when it is combined with measurement of von Willebrand factor: VWF antigen and factor VIII coagulant activity, preferably as a panel of tests with reflexive testing and interpretive reporting (eg, AVWPR / von Willebrand Disease Profile, Plasma).

Reference Values

55-200%

Normal, full-term newborn infants may have mildly increased levels which reach adult levels by 90 days postnatal. Healthy, premature infants (30-36 weeks gestation) may have increased levels that reach adult levels by 180 days.

Note: Individuals of blood group "O" may have lower plasma von Willebrand factor (VWF) activity than those of other ABO blood groups, such that apparently normal individuals of blood group "O" may have plasma VWF activity as low as 40% to 50%, whereas the lower limit of the reference range for individuals of other blood groups may be 60% to 70%.

Interpretation

von Willebrand factor (VWF) activity is reduced in parallel with VWF antigen in von Willebrand disease (VWD), except in types 2A, 2B, and 2M, and some cases of acquired von Willebrand syndrome (AVWS) in which the VWF activity is disproportionately decreased relative to the level of VWF antigen.

The VWF activity may be decreased in congenital VWD or AVWS that may be associated with are variety of disorders including monoclonal gammopathies, lymphoproliferative disorders, autoimmune disorders, hypothyroidism, severe aortic stenosis, left ventricular assist device, and arteriovenous malformation.

The VWF activity may be increased in association with pregnancy or estrogen use (including oral contraceptives), acute (acute-phase reactant) or chronic inflammation, exercise or stress, liver disease, vasculitis, and thrombotic thrombocytopenic purpura/hemolytic uremic syndrome (TTP/HUS). Such increases in VWF activity may obscure the laboratory diagnosis of mild VWD.

Cautions

Measurement of von Willebrand factor (VWF) activity alone has limited diagnostic value. The diagnosis of von Willebrand disease requires a combination of clinical and laboratory information. VWF activity assay results generally must be used together with assays of VWF antigen and factor VIII coagulant activity for optimum clinical utility and diagnostic efficiency.

Results may be affected by:

-Unfractionated heparin >4.0 U/mL; may cause an overestimation of the test result
-Hemoglobin >70 mg/dL; may cause the result to be underestimated
-Bilirubin >4.2 mg/dL; may cause the result to be underestimated
-Triglycerides >1020 mg/dL; may cause the result to be underestimated
-Rheumatoid factor >200 IU/mL; may cause an overestimation of the test result

Specimens from patients who have received preparation of mouse monoclonal antibody for diagnosis or therapy may contain human antimouse antibody (HAMA). The presence of HAMA may cause an overestimation of results in immunoassays that utilize mouse monoclonal antibodies. This assay contains a blocking agent against HAMA to minimize this interference.

Supportive Data

This assay (HemosIL von Willebrand factor [VWF] activity) performed on the ACL TOP instrument demonstrates the following validation characteristics: intra- and interassay precision (CV) are less than or equal to 10%; the lower limit of detection is 3%; with excellent linearity (r [2]=0.999) up to 1,000%. For apparently healthy subjects (n=368) and for patients with type 1 von Willebrand disease (VWD) (n=57), the HemosIL VWF activity assay correlates well with the platelet agglutination assay for VWF ristocetin cofactor (RCo) activity. For patients with type 2A, 2B, or 2M VWD (independently determined by VWF:RCo, VWF antigen, and plasma VWF multimer analysis), the sensitivity and specificity of the HemosIL VWF activity is 100%. Moreover, compared to VWF:RCo, the HemosIL VWF activity is more sensitive to loss of the highest molecular weight VWF multimers among patients with AVWS. This is also reflected in type 3 VWD patients receiving Humate P therapy where the VWF activity is 10% to 20% lower than the VWF:RCo. Plasma VWF multimer analysis of these patients revealed loss of the highest molecular weight VWF multimers. Finally, a VWF activity:VWF antigen ratio greater than 0.8 reliably excludes congenital type 2A and 2B VWD, and AVWS (including loss of the highest VWF multimers due to left ventricular assist device).

Clinical Reference

1. Montgomery RR. Structure and function of von Willebrand factor. In: Colman RW, Hirsh J, Marder VJ, et al, eds. Hemostasis and Thrombosis: Basic Principles and Clinical Practice. 4th ed. Lippincott Williams and Wilkins; 2001:249-274
2. Sadler JE, Lillicrap DL. von Willebrand disease: diagnosis, classification, and treatment. In: Marder VJ, Aird WC, Bennett JS, Schulman S, White II GC, eds. Hemostasis and Thrombosis: Basic Principles and Clinical Practice. 6th ed. Lippincott Williams and Wilkins; 2013:670-683
3. Favaloro EJ and Lippi G. eds. Hemostasis and Thrombosis, Methods and Protocols. 1st ed. Humana Press; 2017
4. Salem RO, Van Cott EM. A new automated screening assay for the diagnosis of von Willebrand Disease. Am J Clin Pathol. 2007;127(5):730-735
5. Favaloro EJ, Lippi G, eds. Hemostasis and Thrombosis: Methods and Protocols. Humana Press; 2017.

Performance

Method Description

This is a latex particle-enhanced immunoassay to quantify von Willebrand factor (VWF) activity in plasma. The activity of VWF is determined by measuring the increase of turbidity produced by the agglutination of the latex reagent. A specific anti-VWF monoclonal antibody adsorbed onto the latex reagent, directed against the platelet-binding site of VWF (glycoprotein Ib receptor), reacts with the VWF of patient plasma. The degree of agglutination is directly proportional to the activity of VWF in the sample and is determined by measuring the decrease of transmitted light caused by the

aggregates.(Package insert: HemosIL von Willebrand Factor Activity. Instrumentation Laboratory Company; 12/2020)

PDF Report
No

Day(s) Performed
Monday through Saturday

Report Available
1 to 3 days

Specimen Retention Time
7 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test has been modified from the manufacturer's instructions. Its performance characteristics were determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
85397

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
VWACT	von Willebrand Factor Activity, P	68324-3

Result ID	Test Result Name	Result LOINC® Value
VWACT	von Willebrand Factor Activity, P	68324-3