

Factor X or anti-Xa Assay. Which Do I Use?

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Coagulation laboratories often receive isolated orders for *factor X* (10) assays. Laboratory practitioners realize that the medical or surgical unit personnel who wrote the order probably meant the *chromogenic anti-Xa heparin assay*, given that the incidence of factor X deficiency is 1 in 500,000, whereas heparin monitoring is a routine daily request. We blame laboratory nomenclature for creating this confusion; we provide mnemonics like factor X, FX, anti-Xa, factor IX, FIX, FV, FII, and so on. It is the laboratory practitioner's responsibility to ensure communication with medical and surgical units despite our assortment of Roman numerals and contractions.

Anti-Xa heparin assay

The anti-Xa assay is a sensitive, specific, and reproducible colorimetric assay we employ to measure heparin concentration. The anti-Xa assay replaces the partial thromboplastin time (PTT) and may be used to monitor unfractionated heparin and low molecular weight heparin (table).

The anti-Xa assay is based on a "hybrid" calibration curve that we used to assess unfractionated heparin or any of the low molecular weight heparin formulations (table).

Factor X

The *factor X assay* is a clot-based assay designed to identify and quantitate factor X deficiency, a rare autosomal recessive bleeding disorder that appears in early childhood. Factor X assays are performed as part of a coagulation assay profile designed to establish the cause for a bleeding disorder. The factor X assay is seldom performed alone.

The *chromogenic factor X assay* (CFX) may also be used to detect factor X deficiency, and is more sensitive, specific, and reproducible than the clot-based assay. It also monitors Coumadin (warfarin, vitamin K antagonist) anticoagulant therapy, as factor X is vitamin K-dependent and is suppressed by Coumadin. The CFX assay substitutes for the prothrombin time with international normalized ratio ("protime," PT/INR) and may be used in instances where the PT/INR is unreliable, such as the presence of lupus anticoagulant, specific coagulation factor inhibitors, factor deficiencies, or when bridging from direct thrombin inhibitor therapy (argatroban, bivalirudin, dabigatran) to Coumadin. CFX is likely to gain acceptance as its merits become more widely recognized.

Formulations of Heparin, Direct Anti-Xa Anticoagulants, and Coumadin with Their Recommended Assays

Formulation	Generic	Trademark	Action	Assay
Standard unfractionated heparin (UFH)	Heparin	Heparin	Potentiates antithrombin, neutralizes thrombin and Xa	Partial thromboplastin time (PTT), chromogenic anti-Xa heparin assay
Low molecular weight heparin (LMWH)	Enoxaparin	Lovenox	Potentiates antithrombin, neutralizes Xa	Chromogenic anti-Xa heparin assay
	Tinzaparin	-		
	Nadroparin	-		
	Dalteparin	-		
Dicumarol	Warfarin	Coumadin	Vitamin K antagonist	Prothrombin time with international normalized ratio (PT/INR) or chromogenic factor X assay

The following publications can help in understanding this complex issue:

Fritsma Factor, www.fritsmafactor.com, your interactive hemostasis resource.

McGlasson DL. Monitoring Unfractionated Heparin and Low Molecular Weight Heparin Anticoagulation with an anti-Xa Chromogenic Assay using a Single Calibration Curve. *Lab Medicine*. 2005;36(5):297-299.

McGlasson DL et al: Effects of Pre-analytical Variables on the anti-Fxa Chromogenic Assay when Monitoring Unfractionated Heparin and Molecular Weight Heparin Anticoagulation. *Blood Coagulation and Fibrinolysis*. 2005;16(3):173-176.

Austin JH et al: Use of the Chromogenic Factor X assay in Patients Transitioning from Argatroban to Warfarin Therapy. *Pharmacotherapy* 2012;32:493-501.

McGlasson DL, Romick BG, Rubal BJ. Comparison of a chromogenic factor X assay with international normalized ratio for monitoring oral anticoagulation therapy. *Blood Coagulation and Fibrinolysis* 2008, 19:513-517.

Rosborough TK, Jacobsen JM, Shepherd MF. Relationship between chromogenic factor X and international ratio differs during early warfarin initiation compared with chronic warfarin administration. *Blood coagulation and Fibrinolysis* 2009;20:433-435.

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Moll S, Ortel TL. Monitoring warfarin therapy in patients with lupus anticoagulants. *Ann Intern Med* 1997;127:177-185.

DL McGlasson. Monitoring Coumadin-The Original Oral Anticoagulant. *Clin Lab Sci* 2013;26:43-47.