Test Definition: INFXP

Infliximab Quantitation with Antibodies to Infliximab, Serum

Overview

Useful For

Evaluating patients for loss of response, partial response on initiation of therapy, autoimmune or hypersensitivity reactions, primary nonresponse, reintroduction after drug holiday, endoscopic/computed tomography enterography recurrence (in inflammatory bowel disease), acute infusion reactions and proactive monitoring

These assays **do not** differentiate between the originator and biosimilar products.

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
INFX	Infliximab, S	Yes, (INFXR)	Yes
INXAB	Infliximab Ab, S	No	Yes

Testing Algorithm

When this test is ordered, infliximab quantitation and testing for antibodies to infliximab will always be performed.

For more information see Ulcerative Colitis and Crohn Disease Therapeutic Drug Monitoring Algorithm.

Special Instructions

- Ulcerative Colitis and Crohn Disease Therapeutic Drug Monitoring Algorithm

Method Name

INFX: Selective Reaction Monitoring Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)
INXAB: Electrochemiluminescent Bridging Immunoassay with Acid Dissociation

NY State Available

Yes

Specimen

Specimen Type

Serum Red

Specimen Required

Patient Preparation: For 12 hours before specimen collection, patient **should not t**ake multivitamins or dietary supplements (eg, hair, skin, and nail supplements) containing biotin (vitamin B7).
Supplies: Sarstedt Aliquot Tube, 5 mL (T914)

Collection Container/Tube:
Preferred: Red top
Acceptable: Serum gel
Submission Container/Tube: Plastic vial
Specimen Volume: 1.2 mL Serum
Collection Instructions:
1. Draw blood immediately before next scheduled dose (trough specimen).
2. Within 2 hours of collection, centrifuge and aliquot serum into plastic vial.

Forms

If not ordering electronically, complete, print, and send a Gastroenterology and Hepatology Test Request (T728) with the specimen.

Specimen Minimum Volume

Serum: 0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	Reject
Heat-Treated	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum Red	Refrigerated (preferred)	28 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information

Drug and target:
Infliximab is a chimeric monoclonal antibody (IgG1 kappa) which targets tumor necrosis factor-alpha (TNF-alpha). Infliximab works by preventing TNF-alpha from binding its cellular receptors through competitive inhibition. Infliximab recognizes both soluble TNF-alpha trimers circulating in plasma and transmembrane TNF-alpha on cell surfaces.(1) Infliximab also exhibits anti-inflammatory properties by downregulating several cytokines while enhancing IL-10 production.(2,3) The reference product for infliximab is Remicade (Janssen Pharmaceuticals).(4) Several biosimilars are US Food and Drug Administration (FDA)-approved, including but not limited to: Renflexis (infliximab-abda, Organon), Inflectra (infliximab-dyyb, Pfizer Inc), Ixifi (infliximab-qbtx, Pfizer Inc), and Avsola (infliximab-axxq, Amgen). Biosimilars have the same primary amino acid sequence as Remicade. Therefore, "infliximab" will be used to refer to the reference product and the biosimilar products interchangeably. This test cannot distinguish between Remicade and the infliximab

biosimilar products.

Indications:
As of December 2025, infliximab is FDA-approved for Crohn disease (CD) (adult and pediatric), ulcerative colitis (UC) (adult and pediatric), rheumatoid arthritis (RA) (in combination with methotrexate), ankylosing spondylitis, psoriatic arthritis, and plaque psoriasis.(5) Doses vary by indication, and follow a main framework of intravenous (IV) infusions as induction at weeks 0, 2 and 6, followed by scheduled maintenance IV infusions every 8 weeks thereafter. For CD and UC, the initial dosing regimen is 5mg/kg IV over at least 2 hours. For RA, the dosing starts at 3mg/kg IV. There is a newer subcutaneous formulation of infliximab, not entirely interchangeable with IV infliximab. Its availability depends on the geographic location and indication. In the US, it is approved for maintenance stages of CD and UC.

Pharmacokinetic highlights:
Infliximab has a volume of distribution of 3 to 6 L and clearance rates of 11-15 mL/hr with a half-life of 14 days. Steady-state concentrations in the body are achieved by week 14.(5,6) Infliximab clearance is affected by disease state, concomitant use of immunosuppressants, high concentrations of TNF-alpha and C-reactive protein, low albumin concentrations, high body mass index, and presence of anti-drug-antibodies.(7-9) Male patients seem to clear infliximab faster than female patients.(9)

Immunogenicity:
Patients may develop anti-drug antibodies to infliximab (ATI).(5,10-12) Concomitant use of immunomodulators can reduce the formation of anti-drug antibodies in some patients.(5) ATI formation may increase drug clearance in treated patients and/or neutralize the drug effect, thereby potentially contributing to the loss of response. ATI could also cause adverse events such as serum sickness and hypersensitivity reactions. Infliximab drug level quantitation is commonly performed in conjunction with immunogenicity assessment for ATI.

Evidence for therapeutic drug monitoring:
Therapeutic drug monitoring (TDM) of infliximab is supported by evidence for both reactive and proactive strategies, with stronger consensus for reactive use. Reactive TDM is performed in the setting of loss of response or infusion reactions. Reactive TDM is well validated to distinguish pharmacokinetic failure (low drug, absent antibodies) from immunogenicity (anti-drug antibodies), enabling rational dose escalation or switching and improving cost-effectiveness.(13-15) Proactive TDM studies, involving routine measurement during maintenance stages of therapy, suggests benefits in reducing immunogenicity, maintaining remission, and optimizing long-term exposure, particularly early in therapy and in high-risk patients.(16)

Measurement of infliximab concentrations is indicated at trough, immediately prior to the next scheduled infusion.(5,6) Infliximab concentrations tend to reach steady state and stabilize after 14 weeks (approximately 100 days).(17) Quantitation of peak infliximab concentrations is strongly discouraged.

Reference Values

INFLIXIMAB QUANTITATION:
Limit of quantitation is 1.0 mcg/mL. Therapeutic ranges are disease specific.

Pediatric reference ranges are not established.

INFLIXIMAB ANTIBODIES
Absence of antibodies to infliximab (ATI) is defined as <50 U/mL
Presence of ATI is reported as positive when concentrations are > or =50 U/mL

Interpretation

Low trough concentrations may be associated with loss of response to infliximab due to possible development of an immune response to infliximab. Testing for antibodies to infliximab is suggested in patients with trough concentrations less than or equal to 5.0 mcg/mL.

Infliximab trough concentrations less than or equal to?5.0 mcg/mL in patients with loss of response to therapy may suggest a possible benefit of treatment with a different monoclonal antibody therapy.

Infliximab concentrations less than or equal to 35 mcg/mL suggest possible testing at a time point other than trough if IV infusions are used and should be evaluated within the clinical context of the patient.

Interpretation and patient management will be different according to disease state, clinical presentation (symptomatic versus appropriate response to therapy), several other laboratory tests and a combination of the drug concentration and presence of anti-drug antibodies to infliximab (ATI).

A low titer ATI is reported with a quantitative value of 50 to 499 U/mL. A high-titer ATI is reported with a quantitative value greater than or equal to 500 U/mL, using the Mayo Clinic assay.

Infliximab quantitation, mcg/mL	Antibodies to infliximab	Comment
<5	Negative	Absence of detectable antibody-to-infliximab (ATI). Low concentration of infliximab (IFX) may be attributable to other parameters related to infliximab clearance.
<5	Positive	Presence of ATI detected, which correlates with low concentration of infliximab. ATIs may be associated with increased clearance and lower circulating concentrations of IFX.
5-10	Negative	Absence of detectable ATI. At this concentration of IFX, a low-titer ATI (50-499 U/mL) cannot be completely excluded. However, the presence of a high-titer ATI (> or =500 U/mL) is unlikely. If there is clinical suspicion for a low-titer ATI, suggest submission of a new sample obtained at trough. This test has demonstrated drug tolerance of up to 100 mcg/mL IFX for ATI > or =500 U/mL and up to 10 mcg/mL IFX for ATI <500 U/mL

	Low positive (50-499 U/mL)	Presence of ATI detected. At this concentration of IFX, the detected titer of the ATI may be modestly underestimated. This test has demonstrated drug tolerance of up to 100 mcg/mL IFX for ATI > or =500 U/mL and up to 10 mcg/mL IFX for ATI <500 U/mL
	High positive (> or =500 U/mL)	Presence of ATI detected. This test has demonstrated drug tolerance of up to 100 mcg/mL IFX for ATI > or =500 U/mL and up to 10 mcg/mL IFX for ATI <500 U/mL
>10	Negative	Absence of detectable ATI. At this concentration of IFX, a low-titer ATI (50-499 U/mL) cannot be completely excluded. The presence of a high-titer ATI (> or =500 U/mL) is unlikely, but also cannot be completely excluded. If there is clinical suspicion for an ATI, suggest submission of a new sample at trough, preferably during maintenance phase. This test has demonstrated drug tolerance of up to 100 mcg/mL IFX for ATI > or =500 U/mL and up to 10 mcg/mL IFX for ATI <500 U/mL
	Low positive (50-499 U/mL)	Presence of ATI detected. At this concentration of IFX, the detected titer of the ATI may be underestimated. Suggest submission of a new sample obtained at trough, preferably during maintenance phase. This test has demonstrated drug tolerance of up to 100 mcg/mL IFX for ATI > or =500 U/mL and up to 10 mcg/mL IFX for ATI <500 U/mL
	High positive (> or =500 U/mL)	Presence of ATI detected. This test has demonstrated drug tolerance of up to 100 mcg/mL IFX for ATI > or =500 U/mL and up to 10 mcg/mL IFX for ATI <500 U/mL

Cautions

While the immunogenicity rates between reference product and biosimilars are similar, there could be epitope differences in the anti-drug-antibodies for each formulation.

Clinical management decisions for patients receiving infliximab treatment should not be based solely on quantitation of infliximab or assessment of antibodies-to-infliximab (ATI). Test results must be interpreted within the clinical context of

the patient.

Toxicity effects other than acute hypersensitivity infusion reactions have not been described nor correlated with infliximab concentrations.(5)

During the initial induction phase of treatment (weeks 0, 2, and 6), steady-state has not yet been achieved and concentrations of infliximab may vary significantly between infusions.(9)

Therapeutic concentrations of infliximab may vary according to the disease (eg, Crohn disease, ulcerative colitis, or rheumatoid arthritis).

Samples containing more than 12.5 ng/mL biotin (vitamin B7) may interfere (in the form of depressed signal) with INXAB / Infliximab Antibodies, Serum.

These assays are designed to quantify infliximab and detect anti-drug antibodies specific to it, regardless of formulation. It is suitable for testing both the reference product and all US Food and Drug Administration/European Medicines Agency-approved biosimilars. They cannot differentiate between the originator and biosimilar products.

Pediatric and adult reference ranges were validated for ATI assay, and the presence of an ATI is established as greater than or equal to 50 U/mL by this electrochemiluminescent method.

The presence of infliximab in patient serum is a recognized interference in most ATI methods. This assay includes an acid dissociation step, which partially mitigates this interference.

Clinical Reference

1. Liang S, Dai J, Hou S, et al. Structural basis for treating tumor necrosis factor a (TNFa)-associated diseases with the therapeutic antibody infliximab. J Biol Chem. 2013;288(19):13799-13807. doi:10.1074/jbc.M112.433961
2. Koelink PJ, Bloemendaal FM, Li B, et al. Anti-TNF therapy in IBD exerts its therapeutic effect through macrophage IL-10 signalling. Gut. 2020;69(6):1053-1063. doi:10.1136/gutjnl-2019-318264
3. Guo Y, Lu N, Bai A. Clinical use and mechanisms of infliximab treatment on inflammatory bowel disease: A recent update. BioMed Res Int. 2013;2013. doi:10.1155/2013/581631
4. Willrich MAV, Murray DL, Barnidge DR, Ladwig PM, Snyder MR. Quantitation of infliximab using clonotypic peptides and selective reaction monitoring by LC-MS/MS. Int Immunopharmacology. 2015;28(1):513-520. doi:10.1016/j.intimp.2015.07.007
5. Remicade (infliximab) [prescribing information]. Horsham, PA: Janssen Biotech, Inc; 2025
6. Silva-Ferreira F, Afonso J, Pinto-Lopes P, Magro F. A systematic review on infliximab and adalimumab drug monitoring: Levels, clinical outcomes and assays. Inflamm Bowel Dis. 2016;22(9):2289-2301. doi:10.1097/MIB.0000000000000855
7. Colombel JF, Sandborn WJ, Reinisch W, et al. Infliximab, azathioprine, or combination therapy for Crohn's disease. N Engl J Med. 2010;362(15):1383-1395. doi:10.1056/NEJMoa0904492
8. Jurgens M, Mahachie John JM, Cleynen I, et al. Levels of C-reactive protein are associated with response to infliximab therapy in patients with Crohn’s disease. Clin Gastroenterol Hepatol. 2011;9(5):421-7.e1. doi:10.1016/j.cgh.2011.02.00doi:10.1016/j.cgh.2011.02.008
9. Ordas I, Mould DR, Feagan BG, Sandborn WJ. Anti-TNF monoclonal antibodies in inflammatory bowel disease: Pharmacokinetics-based dosing paradigms. Pharmacol Ther. 2012;91(4):635-646. doi:10.1038/clpt.2011.328

10. Colman RJ, Xiong Y, Mizuno T, et al. Antibodies-to-infliximab accelerate clearance while dose intensification reverses immunogenicity and recaptures clinical response in paediatric Crohn's disease. Aliment Pharmacol Ther. 2022;55(5):593-603. doi:10.1111/apt.16733
11. van der Gugten JG, Bressler B, DeMarco ML. An automated mass spectrometric blood test for therapeutic drug monitoring of infliximab. Clin Mass Spectrom. 2019;12:16-22. doi:10.1016/j.clinms.2019.01.003
12. Brun MK, Gehin JE, Bjørlykke KH, et al. Clinical consequences of infliximab immunogenicity and the effect of proactive therapeutic drug monitoring: exploratory analyses of the randomised, controlled NOR-DRUM trials. Lancet Rheumatol. 2024;6(4):e226-e236. doi:10.1016/S2665-9913(23)00341-7
13. Afif W, Loftus E v., Faubion WA, et al. Clinical utility of measuring infliximab and human anti-chimeric antibody concentrations in patients with inflammatory bowel disease. Am J Gastroenterol. 2010;105(5):1133-1139. doi:10.1038/ajg.2010.9
14. Imaeda H, Bamba S, Takahashi K, et al. Relationship between serum infliximab trough levels and endoscopic activities in patients with Crohn's disease under scheduled maintenance treatment. J Gastroenterol. 2014;49(4):674-682. doi:10.1007/s00535-013-0829-7
15. Steenholdt C, Bendtzen K, Brynskov J, Thomsen OO, Ainsworth MA. Cut-off levels and diagnostic accuracy of infliximab trough levels and anti-infliximab antibodies in Crohn's disease. Scand J Gastroenterol. 2011;46(3):310-318. doi:10.3109/00365521.2010.536254
16. Syversen SW, Jorgensen KK, Goll GL, et al. Effect of therapeutic drug monitoring vs standard therapy during maintenance infliximab therapy on disease control in patients with immune-mediated inflammatory diseases: A randomized clinical trial. JAMA. 2021;326(23):2375-2384. doi:10.1001/jama.2021.21316
17. Willrich MAV., Lazar-Molnar E, Snyder MR, Delgado JC. Comparison of clinical laboratory assays for measuring serum infliximab and antibodies to infliximab. J Appl Lab Med. 2018;2(6):893-903. doi:10.1373/jalm.2017.024869
18. Feuerstein JD, Nguyen GC, Kupfer SS, et al. American gastroenterological association institute guideline on therapeutic drug monitoring in inflammatory bowel disease. Gastroenterology. 2017;153(3):827-834.doi:10.1053/j.gastro.2017.07.03

Performance

Method Description

Infliximab Quantitation:
Testing for infliximab is performed using a laboratory-developed test using liquid chromatography tandem mass spectrometry.(Unpublished Mayo method)

Infliximab Antibodies:
Testing for antibodies to infliximab is performed using a laboratory-developed immunoassay.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

INFX: Monday through Friday

INXAB: Monday, Wednesday, Friday

Report Available
3 to 6 days

Specimen Retention Time
2 weeks

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

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 was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
INFX-80230
INXA -82397

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
INFXP	Infliximab QN with Antibodies, S	103791-0

Result ID	Test Result Name	Result LOINC® Value
36654	INXAB Interpretation	59462-2
63417	Infliximab Ab, S	72623-2
63000	Infliximab, S	39803-2
36847	Interpretation	59462-2