

Overview

Useful For

Diagnosis and the follow-up of liver fibrosis, steatosis and inflammation

Estimating hepatic fibrosis

Assessing inflammation for metabolic diseases

Assessing severity of nonalcoholic steatohepatitis (NASH) in patients with nonalcoholic fatty liver disease with steatosis (NAFLD)

Assessing steatosis or fatty liver

Reassuring patients with steatosis only, without fibrosis

Managing patients with severe injuries such as advanced fibrosis and NASH

Profile Information

Test ID	Reporting Name	Available Separately	Always Performed
INTNS	NASH-FibroTest, Interpretation	No	Yes
APOAF	Apolipoprotein A1, S	No	Yes
A2MF	Alpha-2-Macroglobulin, S	Yes, (Order A2M)	Yes
HAPTF	Haptoglobin, S	Yes, (Order HAPT)	Yes
ALTF	Alanine Aminotransferase (ALT), S	Yes, (Order ALT)	Yes
GGTF	Gamma Glutamyltransferase (GGT), S	Yes, (Order GGT)	Yes
TBILF	Bilirubin, Total, S	Yes, (Order BILIT)	Yes
ASTF	Aspartate Aminotransferase (AST), S	Yes, (Order AST)	Yes
CHOLF	Cholesterol, Total, S	Yes, (Order CHOL)	Yes
TRIGF	Triglycerides, S	Yes, (Order TRIG)	Yes
GLURF	Glucose, Fasting, P	Yes, (Order GLUCF)	Yes

Testing Algorithm

This test is a patented test algorithm developed by BioPredictive. It combines 10 standard biomarkers: gamma-glutamyltransferase (GGT), total bilirubin, alpha-2-macroglobulin, apolipoprotein A1, haptoglobin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), total cholesterol, triglycerides, and fasting glucose. These markers are weighted depending on the patient's age and gender.

Testing is compliant with BioPredictive's technical recommendations and approvals.

Method Name

INTNS: Algorithm and interpretation provided through BioPredictive

APOAF: Automated Turbidimetric Immunoassay

A2MF: Nephelometry

HAPTF: Nephelometry

ALTF: Photometric Rate, L-Alanine with Pyridoxal-5-Phosphate

GGTF: Photometric Rate

TBILF: Photometric, Diazonium Salt (DPD)

ASTF: Photometric Rate, L-Aspartate with Pyridoxyl-5-Phosphate

CHOLF: Enzymatic Colorimetric

TRIGF: Enzymatic Colorimetric

GLURF: Photometric, Hexokinase

NY State Available

Yes

Specimen**Specimen Type**

Plasma NaFI-KOx
Serum

Necessary Information

Age and sex are required.

Specimen Required

Both serum and plasma are required for this test.

Patient Preparation: Fasting for 12 hours or more is **required**

Specimen Type: Serum

Supplies: Amber Frosted Tube, 5 mL (T192)

Collection Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Submission Container/Tube: Amber vial

Specimen Volume: 4 mL

Collection Instructions:

1. Centrifuge and aliquot serum within 2 hours of collection.
2. Centrifuged serum must be light protected within 4 hours of collection. It is acceptable to draw the blood and then protect it from light after centrifugation as long as it's within 4 hours of collection.
3. Label specimen as serum.

Specimen Type: Plasma

Container/Tube: Grey top (potassium oxalate/sodium fluoride)

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

Collection Instructions:

1. Centrifuge and aliquot plasma
2. Label specimen as plasma.

Forms

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

Specimen Minimum Volume

Serum: 2 mL

Plasma: 0.25 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject
Patients <14 years of age	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma NaFI-KOx	Refrigerated (preferred)	7 days	
	Frozen	14 days	

Specimen Type	Temperature	Time	Special Container
	Ambient	7 days	
Serum	Refrigerated (preferred)	7 days	LIGHT PROTECTED
	Frozen	14 days	LIGHT PROTECTED
	Ambient	24 hours	LIGHT PROTECTED

Clinical and Interpretive

Clinical Information

This test estimates the 3 elementary features of metabolic liver disease: steatosis, activity, and fibrosis. The estimation is made by measuring 10 standard serum biomarkers (gamma-glutamyl transferase, total bilirubin, alpha-2-macroglobulin, apolipoprotein A1, haptoglobin, alanine aminotransferase, aspartate aminotransferase, cholesterol, triglycerides and fasting plasma glucose). Results from these tests are combined with the patient's age and gender to estimate hepatic fibrosis (FibroTest), steatosis (SteatoTest 2) and activity (NashTest 2) scores.

Reference Values

NASHTEST 2 INTERPRETATION

NashTest 2 Score	Grade	Interpretation
0.00-0.25*	N0	no NASH
0.25-0.50*	N1	mild NASH
0.50-0.75*	N2	moderate NASH
0.75-1.00*	N3	severe NASH

*Boundary values can apply to 2 stages based on rounding. For example, a NashTest 2 score of 0.245 will round up to 0.25 and be staged N0. A NashTest 2 score of 0.254 will round down to 0.25 and be staged N2.

STEATOTEST 2 INTERPRETATION

SteatoTest 2 Score	Grade	Interpretation
0.00-0.40*	S0	no steatosis (<5%)
0.40-0.55*	S1	mild steatosis (5-33%)
0.55-1.00*	S2	moderate/severe steatosis (34-100%)

*Boundary values can apply to 2 stages based on rounding. For example, a SteatoTest 2 score of 0.395 will round up to 0.40 and be staged S0. A SteatoTest 2 score of 0.404 will round down to 0.40 and be staged S1.

FIBROTEST INTERPRETATION

FibroTest Score	Stage	Interpretation
0.00-0.21*	F0	No fibrosis

0.21-0.27*	F0-F1	No fibrosis
0.27-0.31*	F1	Minimal fibrosis
0.31-0.48*	F1-F2	Minimal fibrosis
0.48-0.58*	F2	Moderate fibrosis
0.58-0.72*	F3	Advanced fibrosis
0.72-0.74*	F3-F4	Advanced fibrosis
0.74-1.00	F4	Severe fibrosis (Cirrhosis)

*Boundary values can apply to 2 stages based on rounding. For example, a FibroTest score of 0.305 will round up to 0.31 and be staged F1. A FibroTest score of 0.314 will round down to 0.31 and be staged F1-F2.

ALPHA-2-MACROGLOBULIN

< or =18 years: 178-495 mg/dL

>18 years: 100-280 mg/dL

ALANINE AMINOTRANSFERASE (ALT)

Males

<12 months: No established reference values

> or =1 year: 7-55 U/L

Females

<12 months: No established reference values

> or =1 year: 7-45 U/L

APOLIPOPROTEIN A1

Males

<24 months: No established reference values

2-17 years

Low: <115 mg/dL

Borderline low: 115-120 mg/dL

Acceptable: >120 mg/dL

> or =18 years: > or =120 mg/dL

Females

<24 months: No established reference values

2-17 years

Low: <115 mg/dL

Borderline low: 115-120 mg/dL

Acceptable: >120 mg/dL

> or =18 years: > or =140 mg/dL

GAMMA-GLUTAMYLTRANSFERASE (GGT)

Males

0-11 months: <178 U/L

12 months-6 years: <21 U/L

7-12 years: <24 U/L

13-17 years: <43 U/L

> or =18 years: 8-61 U/L

Females

0-11 months: <178 U/L

12 months-6 years: <21 U/L

7-12 years: <24 U/L

13-17 years: <26 U/L

> or =18 years: 5-36 U/L

HAPTOGLOBIN

30-200 mg/dL

BILIRUBIN, TOTAL

0-6 days: Refer to www.bilitool.org for information on age-specific (postnatal hour of life) serum bilirubin values.

7-14 days: <15.0 mg/dL

15 days to 17 years: < or =1.0 mg/dL

> or =18 years: < or =1.2 mg/dL

ASPARTATE AMINOTRANSFERASE (AST)**Males**

0-11 months: not established

1-13 years: 8-60 U/L

> or =14 years: 8-48 U/L

Females

0-11 months: not established

1-13 years: 8-50 U/L

> or =14 years: 8-43 U/L

CHOLESTEROL, TOTAL

The National Lipid Association and the National Cholesterol Education Program (NCEP) have set the following guidelines for lipids (total cholesterol, triglycerides, high-density lipoprotein [HDL] cholesterol, low-density lipoprotein [LDL] cholesterol, and non-HDL cholesterol) in adults ages 18 and up:

TOTAL CHOLESTEROL

Desirable: <200 mg/dL

Borderline high: 200-239 mg/dL

High: > or =240 mg/dL

The Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents has set the following guidelines for lipids (total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, and non-HDL cholesterol) in children 2 to 17 years of age:

TOTAL CHOLESTEROL

Acceptable: <170 mg/dL

Borderline high: 170-199 mg/dL

High: > or =200 mg/dL

TRIGLYCERIDES

The National Lipid Association and the National Cholesterol Education Program (NCEP) have set the following guidelines for lipids (total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, and Non HDL cholesterol) in adults ages 18 and up:

TRIGLYCERIDES

Normal: <150 mg/dL

Borderline high: 150-199 mg/dL

High: 200-499 mg/dL

Very high: > or =500 mg/dL

The Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents has set the following guidelines for lipids (total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol, and non-HDL cholesterol) in children ages 2 to 17:

TRIGLYCERIDES

2-9 years

Acceptable: <75 mg/dL

Borderline high: 75-99 mg/dL

High: > or =100 mg/dL

10-17 years

Acceptable: <90 mg/dL

Borderline high: 90-129 mg/dL

High: > or =130 mg/dL

For SI unit Reference Values, see <https://www.mayocliniclabs.com/order-tests/si-unit-conversion.html>

GLUCOSE FASTING

0-11 months: not established

> or =1 year: 70-100 mg/dL

Interpretation

This test provides numeric scores that assess hepatic fibrosis (FibroTest), hepatic inflammation (NashTest 2), and steatosis (SteatoTest 2). Interpretation of the scores is provided in the report. Individual results from the 10 component tests are also provided with institution-specific reference intervals.

FibroTest is reported relative to a scale ranging from F0-F4 (F0=no fibrosis, F1=minimal fibrosis, F2=moderate fibrosis, F3=advanced fibrosis, F4=severe fibrosis [cirrhosis]). Fibrosis scores may overlap (eg, F0/F1, F1/F2).

NashTest 2 is reported relative to a scale ranging from N0-N3 (N0=no nonalcoholic steatohepatitis: NASH, N1=mild NASH, N2=moderate NASH, N3=severe NASH).

Steatosis is reported relative to a scale ranging from S0-S2S3 (S0=no steatosis [<5%], S1=mild steatosis [5-33%],

S2/S3=moderate/severe steatosis [34-100%]). A stage of S1 or S2S3 is considered clinically significant.

Cautions

The tests have to be deferred for: acute hemolysis, acute hepatitis, acute inflammation, extra hepatic cholestasis.

The advice of a specialist should be sought for interpretation in chronic hemolysis or Gilbert syndrome.

The test interpretation has not been validated for liver transplant patients.

Isolated extreme values of one of the components should lead to caution in interpreting the results.

In case of discordance between a biopsy result and a test, it is recommended to seek the advice of a specialist. The causes of these discordances could be due to a flaw of the test or to a flaw in the biopsy: ie, a liver biopsy has a 33% variability rate for one fibrosis stage.

NashTest 2 is set to N0 is the absence of steatosis based on the definition of nonalcoholic steatohepatitis (NASH). SteatoTest 2 scores of less than 0.40 (S0) will default NashTest 2 to N0.

Clinical Reference

1. BioPredictive: Technical Recommendations for FibroTest, FibroMax, and NASH-FibroTest assays, Bio Predictive. Version 3.0.
2. Poynard T, Peta V, Munteanu M, et al: The diagnostic performance of a simplified blood test (SteatoTest-2) for the prediction of liver steatosis. *Eur J Gastroenterol and Hepatol*. 2019 Mar;31(3)393-402. doi: 10.1097/MEG.0000000000001304
3. Munteanu M, Pais R, Peta V, et al: Long term prognostic value of the FibroTest in patients with non-alcoholic fatty liver disease, compare to chronic hepatitis C, B, and alcoholic liver disease. *Aliment Pharmacol Ther*. 2018 Nov;48(10):1117-1127. doi: 10.1111/apt.14990
4. Poynard T, Munteanu M, Charlotte F, et al: Diagnostic performance of a new noninvasive test for nonalcoholic steatohepatitis using a simplified histological reference. *Eur J Gastroenterol and Hepatol*. 2018 May;30(5):569-577. doi: 10.1097/MEG.0000000000001064
5. Poynard T, Munteanu M, Charlotte F, et al: Impact of steatosis and inflammation definitions on the performance of NASH tests. *Eur J Gastroenterol Hepatol*. 2018 Apr;30(4):384-391. doi:10.1097/MEG.0000000000001033
6. Munteanu M, Tiniakos D, Anstee Q, et al: Diagnostic performance of FibroTest, SteatoTest and ActiTest in patients with NAFLD using the SAF score as histological reference. *Aliment Pharmacol Ther*. 2016 Oct;44(8):877-889. doi: 10.1111/apt.13770
7. Vilar-Gomez E, Chalasani N: Non-invasive assessment of non-alcoholic fatty liver disease: Clinical prediction rules and blood-based biomarkers. *J Hepatol*. 2018 Feb;68(2):305-315. doi: 10.1016/j.jhep.2017.11.013
8. Ratziu V, Charlotte F, Heurtier A, et al: Sampling variability of liver biopsy in nonalcoholic liver disease. *Gastroenterology*. 2005 Jun;128(7):1898-1906. doi:[10.1053/j.gastro.2005.03.084](https://doi.org/10.1053/j.gastro.2005.03.084)

Performance

Method Description

NASH-FibroTest Interpretation:

Proprietary algorithm owned by BioPredictive.

Alpha-2-Macroglobulin and Haptoglobin:

In this method, the light scattered onto the antigen-antibody complexes is measured. The intensity of the measured scattered light is proportional to the amount of antigen-antibody complexes in the sample under certain conditions. If the antibody volume is kept constant, the signal behaves proportionally to the antigen volume.

A reference curve is generated by a standard with a known antigen content on which the scattered light signals of the samples can be evaluated and calculated as an antigen concentration. Antigen-antibody complexes are formed when a sample containing antigen and the corresponding antiserum are put into a cuvette. A light beam is generated with a light-emitting diode, which is transmitted through the cuvette. The light is scattered onto the immuno-complexes that are present. Antigen and antibody are mixed in the initial measurement, but no complex is formed yet. An antigen-antibody complex is formed in the final measurement.

The result is calculated by subtracting value of the final measurement from the initial measurement. The distribution of intensity of the scattered light depends on the ratio of the particle size of the antigen-antibody complexes to the radiated wavelength. (Unpublished Mayo method; instruction manual: Siemens Nephelometer II, Siemens, Inc; Version 2.3. 2008; Addendum to the Instruction Manual 2.3, 08/2017)

Alanine Aminotransferase (ALT):

Alanine aminotransferase (ALT) activity is determined by a kinetic method using a coupled enzyme reaction where the rate of NADH consumption is measured at 340 nm. The NADH decrease is directly proportional to the ALT activity. (Package insert: Roche ALT reagent. Roche Diagnostics 2018)

Apolipoprotein A1:

Anti-apolipoprotein A-1 antibodies react with the antigen in the sample to form antigen/antibody complexes which, following agglutination, can be measured turbidimetrically. (Package insert: Tina-quant Apolipoprotein A-1. Roche Diagnostics, 2019)

Gamma-Glutamyltransferase (GGT):

This is an enzyme colorimetric method (rate method) where gamma-glutamyltransferase (GGT) transfers the gamma-glutamyl group of the substrate (L-gamma-glutamyl-3-carboxy-4-nitroanilide) to glycylglycine. The amount of 5-amino-2-nitrobenzoate liberated is proportional to the GGT activity and can be determined photometrically. (Package insert: Boehringer Mannheim GGT reagent, Indianapolis, IN, 2017)

Bilirubin, Total:

Total bilirubin, in the presence of a suitable solubilizing agent, is coupled with 3,5-dichlorophenyl diazonium in a strongly acidic medium. The color intensity of the red azo dye formed is directly proportional to the total bilirubin and can be determined photometrically. (Package insert: Bilirubin Total Gen. 3. Roche Diagnostics; 2019)

Aspartate Aminotransferase (AST):

Aspartate aminotransferase (AST) is measured by a coupled enzyme kinetic method where the rate of decrease of NADH, determined at 340 nm, is directly proportional to the AST activity. (Package insert: Roche AST reagent. Roche Diagnostics; 2019)

Cholesterol, Total:

Cholesterol is measured by an automated enzymatic method. The reagents include cholesterol ester hydrolase, cholesterol oxidase, and a coupled colorimetric end-point chemistry system. (Package insert: Roche Cholesterol Reagent. Roche Diagnostics; 2018)

Triglycerides:

Serum triglycerides are measured by an automated enzymatic method. The chemistry includes hydrolysis of the triglycerides and phosphorylation of the resulting glycerol. The method is referenced to the Center of Disease Control standardized method performed in the Cardiovascular Risk Assessment Laboratory. (Package insert: Bayer Triglyceride Reagent. Bayer Diagnostics Corp; package insert: Roche Triglyceride Reagent. Roche Diagnostics; 2020)

Glucose, Fasting:

Glucose in the serum, in the presence of hexokinase, is converted to glucose-6-phosphate (G-6-P). Glucose-6-phosphate dehydrogenase (G-6-PDH) oxidizes G-6-P in the presence of NADP to gluconate-6-phosphate and NADPH. The rate of NADPH formation is directly proportional to glucose concentration in the serum and is measured photometrically. (Package insert: Roche Glucose Reagent. Roche Diagnostics; 2019)

PDF Report

No

Day(s) and Time(s) Test Performed

HAPTF, A2MF: Monday through Saturday; 3 p.m.

ALTF, GGTF, TBILF, ASTF, CHOLF, TRIGF, GLURF: Monday through Sunday; Continuously

APOAF: Monday through Saturday; Continuously

Analytic Time

1 day

Maximum Laboratory Time

3 days

Specimen Retention Time

7 days

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. 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. This test has not been cleared or approved by the U.S. Food and Drug Administration.

CPT Code Information

0003M

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
NSFIB	NASH-FibroTest	93691-4

Result ID	Test Result Name	Result LOINC Value
TBILF	Bilirubin, Total, S	1975-2
ALTF	Alanine Aminotransferase (ALT), S	1743-4
A2MF	Alpha-2-Macroglobulin, S	1835-8
APOAF	Apolipoprotein A1, S	1869-7
GGTF	Gamma Glutamyltransferase (GGT), S	2324-2
HAPTF	Haptoglobin, S	46127-7
GLURF	Glucose, Fasting, P	1558-6
TRIGF	Triglycerides, S	2571-8
CHOLF	Cholesterol, Total, S	2093-3
ASTF	Aspartate Aminotransferase (AST), S	30239-8
SCRF	FibroTest Score	48795-9
STGF	FibroTest Stage	48794-2
INTEF	FibroTest Interpretation	88447-8
SCRN2	NashTest 2 Score	93692-2
GRDN	NashTest 2 Grade	93693-0
INTEN	NashTest 2 Interpretation	93694-8
SCRS2	SteatoTest 2 Score	93695-5
GRDS	SteatoTest 2 Grade	93696-3
INTEI	SteatoTest 2 Interpretation	93697-1
CMMS	NASH-FibroTest Comment	48767-8
NUM	BioPredictive Serial Number	74715-4