

Overview

Useful For

Screening for bile acid malabsorption in patients with irritable bowel syndrome-diarrhea (IBS-D)

Testing Algorithm

See [Bile Acid-Associated Tests Ordering Guide](#)

Special Instructions

- [Bile Acid-Associated Tests Ordering Guide](#)

Method Name

Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Patient Preparation:

1. Patient must be fasting for at least 12 hours; fasting morning specimen is preferred.
2. Patient should not be taking bile acid sequestrants or statins.

Collection Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

Collection Instructions:

1. Centrifuge and aliquot 1 mL of serum into plastic vial.
2. Send specimen frozen.

Forms

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

Specimen Minimum Volume

0.5 mL

Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Frozen (preferred)	90 days	
	Refrigerated	72 hours	
	Ambient	24 hours	

Clinical & Interpretive**Clinical Information**

Bile acids are synthesized from cholesterol in the liver and released into the digestive tract where they function to emulsify dietary fats and facilitate lipid absorption in the small intestine. More than 95% of bile acids are then reabsorbed primarily by active uptake in the distal ileum, while less than 5% are excreted in stool. The synthesis of bile acids in the liver is regulated by a negative feedback mechanism from the bile acids reabsorbed from the intestine. 7 Alpha-hydroxy-4-cholesten-3-one (7aC4) is an intermediate in the biosynthesis pathway of cholesterol to bile acids. The concentration of 7aC4 in serum is a surrogate for the amount of bile acid synthesis in the liver. There is some diurnal variation in 7aC4 serum concentrations, so measurement should be performed on a fasting morning sample.

Patients with increased bile acid in their stool suffer from chronic diarrhea termed bile acid diarrhea (BAD). Approximately 10% to 33% of patients with irritable bowel syndrome with primarily diarrhea (IBS-D) have BAD. Identifying patients with BAD can be done by measuring total and fractionated bile acids in stool. The increased bile acids in feces can be caused by an inability to reabsorb bile acids in the terminal ileum (bile acid malabsorption: BAM). The loss of intestinal reabsorption leads to increase synthesis of bile acids in the liver. Recent studies have shown that serum concentrations of 7aC4 are elevated in patients with BAD and can be used as a surrogate to the timed fecal collection. Several intestinal diseases or functional abnormalities can lead to BAD. Identification of these patients can influence treatment decisions that could include the use of bile acid sequestrants.

Conversely, patients with IBS with predominately constipation (IBS-C) may have lower circulating 7aC4 as compared to healthy individuals.

Reference Values

> or =18 years: 2.5-63.2 ng/mL

Reference values have not been established for patients who are <18 years of age.

Interpretation

In patients with irritable bowel syndrome-diarrhea (IBS-D), elevated 7alpha-hydroxy-4-cholesten-3-one (7aC4) is consistent with bile acid diarrhea (BAD). A result of 17.6 ng/mL or greater is 83% sensitive and 53% specific for BAD. In these cases, a confirmatory 48-hour fecal bile acid test could be considered. A result above 52.5 ng/mL is 40% sensitive and 85% specific for BAD.

Interpretation in patients with chronic diarrhea (bile acid malabsorption: BAM):

-----17.6-----	-----52.5-----
<u>BAM unlikely</u> (consider other conditions)	<u>Indeterminate</u> (consider confirmatory fecal bile acids test or trial of bile acid sequestrant)
	<u>BAM likely</u> (consider bile acid sequestrant therapy)

Cautions

Testing should not be performed on individuals with liver disease or dysfunction.

Supportive Data

From an internal study of 55 patients with irritable bowel syndrome-diarrhea (IBS-D), a fasting serum 7 alpha-hydroxy-4-cholesten-3-one (7aC4) result of > or =17.6 ng/mL was 83% sensitive and 53% specific for identifying patients with elevated fecal bile acids (eg, patient with bile acid diarrhea).(1) In a different study, a result of 52.5 or greater resulted in 40% sensitivity and 85% specificity for bile acid malabsorption.(2)

Clinical Reference

- Vijayvargiya P, Camilleri M, Carlson P, et al: Performance characteristics of serum C4 and FGF19 measurements to exclude the diagnosis of bile acid diarrhoea in IBS-diarrhoea and functional diarrhoea. *Aliment Pharmacol Ther.* 2017;46(6):581-588. doi: 10.1111/apt.14214
- Vijayvargiya P, Camilleri M, Shin A, et al: Methods for diagnosis of bile acid malabsorption in clinical practice. *Clin Gastroenterol Hepatol.* 2013;11(10):1232-1239
- Camilleri M, Nadeau A, Tremaine WJ, et al: Measurement of serum 7 alpha-hydroxy-4-cholesten-3-one (or 7AC4), a surrogate test for bile acid malabsorption in health, ileal disease and irritable bowel syndrome using liquid chromatography-tandem mass spectrometry. *Neurogastroenterol Motil.* 2009;21(7):734-743
- Wong BS, Camilleri M, Carlson P, et al: Increased bile acid biosynthesis is associated with irritable bowel syndrome with diarrhea. *Clin Gastroenterol Hepatol.* 2012 Sep;10(9):1009-1015.e3

Performance

Method Description

7 Alpha-hydroxy-cholesten-3-one (7aC4) is extracted from the sample. After addition of a deuterium-labeled 7aC4 internal standard, 7aC4 is measured by liquid chromatography-tandem mass spectrometry (LC-MS/MS).(Donato LJ, Lueke A, Kenyon SM, Meeusen JW, Camilleri M: Description of analytical method and clinical utility of measuring serum 7-alpha-hydroxy-4-cholesten-3-one (7aC4) by mass spectrometry. *Clin Biochem.* 2018;52:106-111)

PDF Report

No

Day(s) Performed

Wednesday

Report Available

2 to 9 days

Specimen Retention Time

14 days

Performing Laboratory Location

Rochester

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. This test has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

82542

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
7AC4	7AC4, Bile Acid Synthesis, S	94866-1

Result ID	Test Result Name	Result LOINC® Value
65504	7AC4, Bile Acid Synthesis, S	94866-1