Test Definition: 7AC4

7AC4, Bile Acid Synthesis, S

Overview

Useful For

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

Method Name

Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) Stable Isotope Dilution Analysis

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

Forms

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

Specimen Minimum Volume

0.5 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

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

Clinical and 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). 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:

----------17.6----------52.5----------

BAM unlikely Indeterminate BAM likely

(consider other (consider confirmatory (consider bile acid

conditions)fecal bile acids test or trial sequestrant therapy)

of bile acid sequestrant)

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 BAD).(1) In a different study, a result of 52.5 or greater resulted in 40% sensitivity and 85% specificity for BAM.(2)

Clinical Reference

1. Donato LJ, Lueke A, Kenyon SM, Meeusen JW, et al: 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 doi: 10.1016/j.clinbiochem.2017.10.008

2. 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

3. 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

4. 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

5. 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 is quantified in serum by liquid chromatography-tandem mass spectrometry (LC-MS/MS).(Unpublished Mayo Method)

PDF Report

No

Day(s) and Time(s) Test Performed

Wednesday; 8 a.m.

Analytic Time

2 days

Maximum Laboratory Time

9 days

Specimen Retention Time

14 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

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