Test Definition: PCHE1

Pseudocholinesterase, Total, Serum

Overview

Useful For

Monitoring exposure to organophosphorus insecticides and herbicides

Monitoring patients with liver disease, particularly those undergoing liver transplantation

Identifying patients who are homozygous or heterozygous for an atypical gene and have low levels of pseudocholinesterase

This test is **not useful for** the differential diagnosis of jaundice.

Highlights

Pseudocholinesterase (PCHE) testing has two main uses:
-Monitoring for toxic exposure in people who work with organophosphate compounds by establishing a baseline PCHE activity level. Then routine testing is used to monitor for a significant reduction in PCHE activity.
-Preoperative screening for patients with a history or family history of prolonged paralysis and apnea after the use of the muscle relaxant, succinylcholine, for anesthesia

This test can also diagnose acute organophosphate insecticide and herbicide exposure.

Method Name

Colorimetric Assay

NY State Available

Yes

Specimen

Specimen Type

Serum

Necessary Information

Patient's age and sex are required.

Specimen Required

Patient Preparation: For patients with prolonged apnea following surgery, wait at least 24 hours before obtaining specimen.
Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube:
Preferred: Serum gel

Acceptable: Red top
Submission Container/Tube: Plastic vial
Specimen Volume: 0.5 mL
Collection Instructions:
1. Serum gel tubes should be centrifuged within 2 hours of collection.
2. Red-top tubes should be centrifuged, and the serum aliquoted into a plastic vial within 2 hours of collection.

Specimen Minimum Volume
0.25 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Ambient	24 hours	
	Frozen	365 days	

Clinical & Interpretive

Clinical Information
Serum cholinesterase, often called pseudocholinesterase (PCHE), is distinguished from acetylcholinesterase, or "true cholinesterase," by both location and substrate.

Acetylcholinesterase is found in erythrocytes, lungs and spleen, nerve endings, and gray matter of the brain. It is responsible for the hydrolysis of acetylcholine released at the nerve endings to mediate transmission of the neural impulse across the synapse.

PCHE, the serum enzyme, is found in the liver, pancreas, heart, and white matter of the brain. Its biological role is unknown.

The organophosphorus-containing insecticides and herbicides are potent inhibitors of the true cholinesterase and cause depression of PCHE. Low values of PCHE are also found in patients with liver disease. In general, patients with advanced cirrhosis and carcinoma with metastases will show a 50% to 70% decrease. Essentially normal values are seen in chronic hepatitis, mild cirrhosis, and obstructive jaundice.

PCHE metabolizes the muscle relaxants succinylcholine and mivacurium, and therefore, alterations in PCHE will influence the physiologic effect of these drugs.

In normal individuals (approximately 94% of the population), certain drugs and other agents such as dibucaine and fluoride will almost completely inhibit the PCHE activity.

A small number of individuals (<1% of the population) have been shown to have genetic variants of the enzyme and, therefore, cannot metabolize the muscle relaxants succinylcholine and mivacurium and experience prolonged apnea. These individuals generally have low levels of PCHE, which is not inhibited by dibucaine or fluoride. These individuals are either homozygous or compound heterozygous for an atypical gene controlling PCHE.

Simple heterozygous individuals have also been identified who show intermediate enzyme values and inhibition.

Reference Values

Males
5320-12,920 U/L

Females
0-15 years: 5320-12,920 U/L
16-39 years: 4260-11,250 U/L
40-41 years: 5320-12,920 U/L
> or =42 years: 5320-12,920 U/L
Note: Females aged 18-41 years who are pregnant or taking hormonal contraceptives, the reference interval is 3650-9120 U/L.

Interpretation

Patients with normal pseudocholinesterase (PCHE) activity show 70% to 90% inhibition by dibucaine, while patients homozygous for the abnormal allele show little or no inhibition (0%-20%) and usually low levels of enzyme.

Heterozygous patients have intermediate PCHE levels and response to inhibitors.

The atypical gene is inherited in an autosomal recessive pattern. In a positive patient, family members should be tested.

Decreasing or low levels may indicate exposure to organophosphorus insecticides or herbicides if liver disease and an abnormal allele have been ruled out.

Cautions

There are some homozygous and heterozygous individuals who are sensitive to succinylcholine although their total pseudocholinesterase (PCHE) values are normal. A dibucaine inhibition test is necessary to confirm the presence of the abnormal allele in these individuals.

Certain drugs and anesthetic agents may produce in vitro inhibition of the PCHE activity. Therefore, it is recommended that blood specimens be drawn 24 to 48 hours post-operatively on those patients who have experienced prolonged apnea after surgery.

Chemotherapy may interfere with test results, depending on the impact it has on the liver. PCHE levels may be lower due to this, and if so, testing should be repeated at a later date.

Method Change: Pseudocholinesterase values measured after 01/28/2020 are approximately 80% increased compared to historical values and should be interpreted in the context of the current reference interval.

In very rare cases of gammopathy, particularly type IgM (Waldenstrom macroglobulinemia), may cause unreliable results.

Clinical Reference

1. Soliday FK, Conley YP, Henker R. Pseudocholinesterase deficiency: A comprehensive review of genetic, acquired, and drug influences. AANA J. 2010;78:313-320
2. Robles A, Michael M, McCallum R. Pseudocholinesterase deficiency: What the proceduralist needs to know. Am J Med Sci. 2019;357(3):263-267. doi:10.1016/j.amjms.2018.11.002
3. Lurati AR. Organophosphate exposure with pseudocholinesterase deficiency. Workplace Health and Saf. 2013;61(6):243-245. doi:10.1177/216507991306100602
4. den Blaauwen DH, Poppe WA, Tritschler W. Cholinesterase (EC 3.1.1.8) with butyrylthiocholine-iodide as substrate: References depending on age and sex with special reference to hormonal effects and pregnancy. J Clin Chem Clin Biochem. 1983;21:381-386

Performance

Method Description

Cholinesterase catalyzes the hydrolysis of butyrylthiocholine to thiocholine and butyrate. Thiocholine instantaneously reduces the yellow hexacyanoferrate (III) to the almost colorless hexacyanoferrate (II). This decrease in color can be measured photometrically.(Package insert: Cholinesterase Gen 2 Reagent. Roche Diagnostics; V.10.0, 01/2022)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

Same day/1 to 3 days

Specimen Retention Time

7 days

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

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 has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

82480

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PCHE1	Pseudocholinesterase, Total, S	2098-2

Result ID	Test Result Name	Result LOINC® Value
PCHE1	Pseudocholinesterase, Total, S	2098-2