Overview

Useful For
Identifying patients who are homozygous for the atypical gene, and have low levels of pseudocholinesterase (PCHE) which are not inhibited by dibucaine

Identifying patients who are heterozygous for the atypical gene, have lower than normal levels of PCHE and varying levels of inhibition with dibucaine

Testing Algorithm
Includes pseudocholinesterase, total.

Method Name
Photometric, Acetylthiocholine Substrate with Dibucaine Addition

NY State Available
Yes

Specimen

Specimen Type
Serum

Necessary Information
Patient’s age and sex are required.

Specimen Required

Patient Preparation: For cases of prolonged apnea following surgery, wait 24 hours before obtaining specimen.

Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Specimen Volume: 1 mL

Collection Instructions:

1. Serum gel tubes should be centrifuged within 2 hours of collection.

2. Red-top tubes should be centrifuged and aliquoted within 2 hours of collection.

Specimen Minimum Volume
0.25 mL

Reject Due To

| Gross hemolysis | Reject |
Specimen Stability Information

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Clinical and 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, in the lungs and spleen, in nerve endings, and in the 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 also found in liver, pancreas, heart, and white matter. Its biological role is unknown.

The organophosphorus-containing insecticides 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 acute hepatitis and chronic hepatitis of long duration will show a 30% to 50% decrease in PCHE values, while 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 patients (<1% of the population) are homozygous for an atypical gene controlling PCHE. These individuals generally have low levels of PCHE which are not inhibited by dibucaine and fluoride, will not hydrolyze the drugs succinylcholine and mivacurium rapidly enough, and may enter a period of prolonged apnea. In addition to fluoride and dibucaine alleles, a "silent gene" has also been identified which shows little or no activity. More recently, the J and K variants also have been identified. All combinations of heterozygotes of the various alleles have been found. This is important because these atypical enzymes will show varying levels of enzyme activity and resistance to dibucaine although the patients clinically show prolonged apnea.

Reference Values

DIBUCAINE INHIBITION

70-90%

Congenital deficiency: 18-20%

PSEUDOCHOLINESTERASE, TOTAL
Males: 3,100-6,500 U/L

Females

18-49 years: 1,800-6,600 U/L

> or =50 years: 2,550-6,800 U/L

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

**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.

Several reports have shown that 65% to 75% of patients who respond abnormally to succinylcholine had at least 1 abnormal gene, had low activity due to an acquired deficiency such as liver disease, or had received an inappropriate dose of drug. The remaining 25% to 35% of patients appeared to have the usual or normal genotype but nevertheless displayed long periods of apnea. Although reasons could not be established, it is possible that these cases represent unknown genotypes. Therefore, although many symptomatic patients will show moderate to significant resistance to dibucaine and low enzyme activity, not all will. In all cases, it is recommended that succinylcholine and mivacurium be avoided, or the dose greatly reduced.

**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 in order to confirm the presence of the abnormal allele in these individuals.

Dibucaine inhibition is of no value over total PCHE in attempting to diagnose organophosphorus pesticide exposure. The same is true in liver disease.

Certain drugs and anesthetic agents may inhibit 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.

**Clinical Reference**


Method Description
The substrate, acetylthiocholine, is cleaved by pseudocholinesterase (PCHE) into acetate and thiocholine. The thiocholine reacts with dithiobisnitrobenzoic acid (Ellman's reagent) to form the yellow-colored 5-mercapto-2-nitrobenzoic acid which is monitored at 405 nm. The rate of color formation is directly proportional to the PCHE activity. (McQueen MJ: Clinical and analytical considerations in the utilization of cholinesterase measurements. Clin Chim Acta 1995;237:91-105)

PDF Report
No

Day(s) and Time(s) Test Performed
Monday through Sunday; Continuously

Analytic Time
Same day/1 day

Maximum Laboratory Time
2 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
82480-Pseudocholinesterase, total
82638-Pseudocholinesterase, dibucaine inhibition

LOINC® Information

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