MAYO CLINIC LABORATORIES

Test Definition: NCSRY

Nicotine Survey, Serum

Overview

Useful For

Monitoring tobacco use in a health fair setting

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
NICOS	Nicotine and Metabolites, S	Yes	Yes

Method Name

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

NY State Available

Yes

Specimen

Specimen Type

Serum Red

Necessary Information

Knowledge of time elapsed between last use and specimen collection is important for interpretation of test results.

Specimen Required

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube: Red top (serum gel/SST are **not** acceptable)
Submission Container/Tube: Plastic vial
Specimen Volume: 0.8 mL serum
Collection Instructions: Within 2 hours of collection, centrifuge and aliquot serum into a plastic vial.

Forms

If not ordering electronically, complete, print, and send a Therapeutics Test Request (T831) with the specimen.

Specimen Minimum Volume

Serum: 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 Red	Refrigerated (preferred)	28 days	
	Ambient	28 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information

Tobacco use remains the leading cause of preventable disease, disability, and death in the United States. Nicotine, coadministered in tobacco products such as cigarettes, pipe tobacco, cigars, or chew, is an addicting substance that causes individuals to continue use of tobacco despite concerted efforts to quit. Nicotine stimulates dopamine release and increases dopamine concentration in the nucleus accumbens, a mechanism that is thought to be the basis for addiction for drugs of abuse.

Nicotine-dependent patients use tobacco products to achieve a peak serum nicotine value of 30 to 50 ng/mL, the concentration at which the nicotine high is maximized. Nicotine is metabolized in the liver to cotinine. Cotinine accumulates in serum in proportion to dose and hepatic metabolism (which is genetically determined); most tobacco users accumulate cotinine in the range of 200 to 800 ng/mL. Serum concentrations of nicotine and metabolites in these ranges indicate the patient is using tobacco or is receiving high-dose nicotine patch therapy.

Nicotine is rapidly metabolized, exhibiting an elimination half-life of approximately 2 hours. Cotinine exhibits an apparent elimination half-life of approximately 24 hours. Heavy tobacco users who abstain from tobacco for 2 weeks exhibit serum nicotine values less than 3.0 ng/mL and cotinine less than 3.0 ng/mL.

Passive exposure to tobacco smoke can cause accumulation of nicotine metabolites in nontobacco users. Serum cotinine has been observed to accumulate up to 8 ng/mL from passive exposure.

Tobacco users engaged in programs to abstain from tobacco require support in the form of counseling, pharmacotherapy, and continuous encouragement. Occasionally, counselors may elect to monitor abstinence by biochemical measurement of nicotine and metabolites in serum to verify abstinence. If results of biologic testing indicate the patient is actively using a tobacco product during therapy, additional counseling or intervention may be appropriate.

Reference Values

NICOTINE
<3.0 ng/mL

COTININE
<3.0 ng/mL

Interpretation

Serum nicotine concentration in the range of 30 to 50 ng/mL with cotinine in the range of 200 to 800 ng/mL indicates the subject is either actively using a tobacco product or on nicotine replacement therapy.

To discriminate if a patient on nicotine replacement therapy is also actively using tobacco products, see NICOU / Nicotine and Metabolites, Random, Urine analysis; the presence of anabasine in urine, a tobacco alkaloid not present in nicotine replacement products, indicates recent tobacco use.

Typical findings are as follows:

While using a tobacco product:
-Peak nicotine concentration: 30 to 50 ng/mL
-Peak cotinine concentration: 200 to 800 ng/mL*
*Higher values may be seen in subjects with high cytochrome P450 2D6 activity

Tobacco user after 2 weeks complete abstinence:
-Nicotine concentration: <3.0 ng/mL
-Cotinine concentration: <3.0 ng/mL

Nontobacco user with passive exposure:
-Nicotine concentration: <3.0 ng/mL
-Cotinine concentration: <8.0 ng/mL

Nontobacco user with no passive exposure:
-Nicotine concentration: <3.0 ng/mL
-Cotinine concentration: <3.0 ng/mL

Cautions

No significant cautionary statements

Clinical Reference

1. Moyer TP, Charlson JR, Enger RJ, et al. Simultaneous analysis of nicotine, nicotine metabolites, and tobacco alkaloids in serum or urine by tandem mass spectrometry, with clinically relevant metabolic profiles. Clin Chem. 2002;48:(9)1460-1471.
2. Hurt RD, Lauger GG, Offord KP, et al. Nicotine replacement therapy with use of a transdermal patch – a randomized double-blind placebo-controlled trial. Mayo Clin Proc 1990;65(12):1529-1537
3. Dale LC, Hurt RD, Offord KP, et al. High-dose nicotine patch therapy: percentage of replacement and smoking cessation. JAMA. 1995;274(17):1353-1358
4. Lawson GM, Hurt RD, Dale LC, et al. Application of serum nicotine and cotinine excretion rates to assess nicotine replacement in light, moderate, and heavy smokers undergoing transdermal therapy. J Clin Pharmacol. 1998;38(6):502-509
5. Lawson GM, Hurt RD, Dale LC, et al. Application of urine nicotine and cotinine excretion rates to assess nicotine replacement in light, moderate, and heavy smokers undergoing transdermal therapy. J Clin Pharmacol 1998;38(6):510-516
6. Hurt RD, Dale LC, Offord KP, et al. Serum nicotine and cotinine levels during nicotine-patch therapy. Clin Pharmacol

Ther. 1993;54(1):98-106
7. Benowitz NL, Jacob III PJ. Nicotine and cotinine eliminatory pharmacokinetics in smokers and nonsmokers. Clin Pharmacol Ther. 1993;53(3):316-323
8. Dale LC, Hurt RD, Hays JT. Drug therapy to aid in smoking cessation. Tips on maximizing patients chances for success. Postgrad Med. 1998;104:75(6):75-84
9. Hurt RD, Robertson CR. Prying open the door to the tobacco industry's secrets about nicotine. The Minnesota tobacco trial. JAMA. 1998;280(13):1173-1181
10. Machacek DA, Jiang N-S. Quantification of cotinine in plasma and Oral fluid by liquid chromatography. Clin Chem. 1986;32(6):979-982
11. Russell MA, Jarvis M, Iyer R, Feyerabend C. Relation of nicotine yield of cigarettes to blood nicotine concentrations in smokers. Br Med J. 1980;280(6219):972-976

Performance

Method Description
Nicotine and cotinine are extracted from serum. The extract is quantified by high-performance liquid chromatography-tandem mass spectrometry.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Monday through Sunday

Report Available
7 days

Specimen Retention Time
2 weeks

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

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

CPT Code Information

G0480

80323 (if appropriate for select payers)

Clinical Toxicology CPT Code Client Guidance

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
NCSRY	Nicotine Survey, S	90226-2

Result ID	Test Result Name	Result LOINC® Value
21313	Nicotine	3853-9
21314	Cotinine	10365-5