MAYO CLINIC LABORATORIES

# Test Definition: HALO

Haloperidol, Serum

## Overview

### Useful For

Optimizing haloperidol dosage

Monitoring patient compliance

Assessing toxicity

### Method Name

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

### NY State Available

Yes

## Specimen

### Specimen Type

Serum Red

### 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:** 1 mL
**Collection Instructions:**
1. Draw blood immediately before next scheduled dose.
2. 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

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

Haloperidol (Haldol) is a member of the butyrophenone class of neuroleptic drugs used to treat psychotic disorders (eg, schizophrenia). It is also used to control the tics and verbal utterances associated with Tourette syndrome and in the management of children who are intensely hyperexcitable and fail to respond to other treatment modalities.

The daily recommended oral dose for patients with moderate symptoms is 0.5 to 2 mg; for patients with severe symptoms, 3 to 5 mg may be used. However, some patients will respond only at significantly higher doses.

Haloperidol is metabolized in the liver to reduced haloperidol, its major metabolite.(1,2)

Use of haloperidol is associated with significant toxic side effects, the most serious of which include tardive dyskinesia, which can be irreversible, extrapyramidal reactions with Parkinson-like symptoms, and neuroleptic malignant syndrome. Less serious side effects can include hypotension, anticholinergic effects (blurred vision, dry mouth, constipation, urinary retention), and sedation. The risk of developing serious, irreversible side effects seems to increase with increasing cumulative doses over time.(1,3)

### Reference Values

Haloperidol:
5-17 ng/mL

Reduced Haloperidol:
10-80 ng/mL

### Interpretation

Studies show a strong relationship between dose and serum concentration(4); however, there is a modest relationship of clinical response or risk of developing long-term side effects to either dose or serum concentration.

A therapeutic window exists for haloperidol, but some patients may respond to concentrations outside of this range. Patients who respond at serum concentrations between 5 ng/mL and 17 ng/mL show no additional improvement at concentrations between 18 ng/mL and 20 ng/mL.(3,5) Some patients may respond at concentrations less than 5 ng/mL, and others may require concentrations significantly greater than 20 ng/mL before an adequate response is attained.

Due to interindividual variation, the serum concentration should only be used as one factor in determining the appropriate dose and must be interpreted in conjunction with the clinical status.

Although the metabolite, reduced haloperidol, has minimal pharmacologic activity, evidence has been presented suggesting that an elevated ratio of reduced haloperidol-to-haloperidol (ie, >5) is predictive of a poor clinical response.(3,6) A reduced haloperidol-to-haloperidol ratio of less than 0.5 indicates noncompliance; the metabolite does not accumulate except during steady-state conditions.

### Cautions

Potentially interfering drugs include hydroxyzine (interferes with haloperidol), tiagabine (interferes with reduced haloperidol), and quetiapine (interferes with internal standard resulting in artificially low haloperidol).

### Clinical Reference

1. Lawson GM. Monitoring of serum haloperidol. Mayo Clin Proc. 1994;69(2):189-190
2. Ereshefsky L, Davis CM, Harrington CA, et al. Haloperidol and reduced haloperidol plasma levels in selected schizophrenic patients. J Clin Psychopharmacol. 1984;4(3):138-142
3. Volavka J, Cooper TB. Review of haloperidol blood level and clinical response: looking through the window. J Clin Psychopharmacol. 1987;7(1):25-30
4. Moulin MA, Davy JP, Debruyne D, et al. Serum level monitoring and therapeutic effect of haloperidol in schizophrenic patients. Psychopharmacology (Berl). 1982;76(4):346-350
5. Van Putten T, Marder SR, Mintz J, Poland RE. Haloperidol plasma levels and clinical response: a therapeutic window relationship. Am J Psychiatry. 1992;149 (4):500-505
6. Shostak M, Perel JM, Stiller RL, Wyman W, Curran S. Plasma haloperidol and clinical response: a role for reduced haloperidol in antipsychotic activity?. J Clin Psychopharmacol. 1987;7(6):394-400
7. Hiemke C, Bergemann N, Clement HW, et al. Consensus guidelines for therapeutic drug monitoring in neuropsychopharmacology: Update 2017. Pharmacopsychiatry. 2018;51(1-02):9-62. doi:10.1055/s-0043-116492
8. Milone MC, Shaw LM. Therapeutic drugs and their management. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:420-453

## Performance

### Method Description

Haloperidol and reduced haloperidol, its major metabolite, are extracted from serum utilizing protein precipitation and diluted by the addition of internal standard (haloperidol-d4 and reduced haloperidol-d4). Analysis of the supernatant is performed on a liquid chromatography tandem mass spectrometry system.(Unpublished Mayo method)

### PDF Report

No

### Day(s) Performed

Tuesday

### Report Available

2 to 8 days

### Specimen Retention Time

14 days

# Test Definition: HALO

Haloperidol, Serum

### 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

80173

### LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| HALO | Haloperidol, S | 87550-0 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| 80339 | Haloperidol, S | 3669-9 |
| 169 | Reduced Haloperidol | 38364-6 |