# Test Definition: NMHR1

N-Methylhistamine, Random, Urine
(Non-Orderable)

## Overview

### Useful For

**Only orderable as part of a profile**. For more information see NMHR / *N*-Methylhistamine, Random, Urine.

Screening for and monitoring of mastocytosis and disorders of systemic mast-cell activation, such as anaphylaxis and other forms of severe systemic allergic reactions as a part of a random urine collection profile

Monitoring therapeutic progress in conditions that are associated with secondary, localized, low-grade persistent, mast-cell proliferation and activation such as interstitial cystitis

### Method Name

Only orderable as part of a profile. For more information see NMHR / *N*-Methylhistamine, Random, Urine.

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

### NY State Available

Yes

## Specimen

### Specimen Type

Urine

### Ordering Guidance

Patients with chronic mast cell activation often have chronically elevated N-methylhistamine (NMH) levels and will sometimes have intermittent NMH elevations. In these cases, a 24-hour urine collection is preferred. See NMH24 / *N*-Methylhistamine, 24 Hour, Urine.

### Specimen Required

Only orderable as part of a profile. For more information see NMHR / *N*-Methylhistamine, Random, Urine.

**Patient Preparation:** Patients taking monoamine oxidase inhibitors (MAOIs) may have increased levels of *N*-methylhistamine. If medically feasible, for 2 weeks before specimen collection, patient **should not** take MAOIs.
**Supplies:** Sarstedt Aliquot Tube, 5 mL (T914)
**Container/Tube:** Plastic, 5-mL tube
**Specimen Volume:** 5 mL
**Collection Instructions:**
1. Within a few hours of symptom onset, collect a random urine specimen.
2. No preservative.

### Specimen Minimum Volume
3 mL

### Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Urine | Refrigerated (preferred) | 28 days | |
| | Ambient | 14 days | |
| | Frozen | 28 days | |

## Clinical & Interpretive

### Clinical Information
*N*-methylhistamine (NMH) is the major metabolite of histamine, which is produced by mast cells. Increased histamine production is seen in conditions associated with increased mast-cell activity, such as allergic reactions, but also in mast-cell proliferation disorders, in particular mastocytosis.

Mastocytosis is a rare disease. Its most common form, urticaria pigmentosa (UP), affects the skin and is characterized by multiple persistent small reddish-brown lesions that result from infiltration of the skin by mast cells. Systemic mastocytosis is caused by the accumulation of mast cells in other tissues and can affect organs such as the liver, spleen, bone marrow, and small intestine. The mast-cell proliferation in systemic mastocytosis can be either benign or malignant. In children, benign systemic mastocytosis tends to resolve over time, while in most but not all adults, the disease is progressive. Systemic mastocytosis may or may not be accompanied by UP.(1,3) Patients with UP or systemic mastocytosis can have symptoms ranging from itching, gastrointestinal distress, bone pain, and headaches; to flushing and anaphylactic shock.

Definitive diagnosis of mastocytosis is made by bone marrow biopsy; however, patients with systemic mastocytosis usually exhibit elevated levels of NMH.(1-5) Other biochemical markers include 11-beta prostaglandin F(2) alpha, a metabolite of prostaglandin D2 (23BPR / 2,3-Dinor 11 Beta-Prostaglandin F2 Alpha, Random, Urine), and alpha or beta tryptase (TRYPT / Tryptase, Serum).

### Reference Values
Only orderable as part of a profile. For more information see NMHR / *N*-Methylhistamine, Random, Urine.

0-5 years: 85-369 mcg/g creatinine
6-16 years: 48-238 mcg/g creatinine
>16 years: 19-143 mcg/g creatinine

### Interpretation
Increased concentrations of urinary *N*-methylhistamine (NMH) are consistent with urticaria pigmentosa (UP), systemic mastocytosis, or mast-cell activation. Because of its longer half-life, urinary NMH measurements have superior sensitivity and specificity than histamine, the parent compound. However, not all patients with systemic mastocytosis or anaphylaxis will exhibit concentrations outside the reference range and healthy individuals may occasionally exhibit

values just above the upper limit of normal.

The extent of the observed increase in urinary NMH excretion is correlated with the magnitude of mast-cell proliferation and activation, UP patients, or patients with other localized mast-cell proliferation and activation, show usually only mild elevations, while systemic mastocytosis and anaphylaxis tend to be associated with more significant rises in NMH excretion (2-fold or more). There is, however, significant overlap in values between UP and systemic mastocytosis, and urinary NMH measurements should not be relied upon alone in distinguishing localized from systemic disease.

Up to 25% variability in random-urine excreted levels may be observed, making 24-hour urine collections preferable for cases with borderline results.

Children have higher NMH levels than adults. By the age of 16, adult levels have been reached.

## Cautions

While an average North American diet has no effect on urinary *N*-methylhistamine (NMH) levels, mild elevations (around 30%) may be observed on very histamine-rich diets. This problem is more pronounced in random-urine specimens especially when it is collected following a histamine-rich meal.

NMH levels may be depressed in individuals who have an alteration in the histamine-N-methyltransferase gene (*HNMT*), which encodes the enzyme that catalyzes NMH formation. This alternation results in an amino acid change that decreases the rate of NMH synthesis.

*N*-methylhistamine levels may be decreased in individuals who are receiving drugs that inhibit diamine oxidase.

When N-acetylcysteine is administered at levels sufficient to act as an antidote for the treatment of acetaminophen overdose, it may lead to falsely decreased creatinine results.

Patients taking monoamine oxidase inhibitors (MAOIs) may have increased levels of NMH. If medically feasible, for 2 weeks before specimen collection, MAOIs should not be taken.

## Clinical Reference

1. Roberts LJ II, Oates JA. Disorders of vasodilator hormones: the carcinoid syndrome and mastocytosis. In: Wilson JD, Foster DW, eds. Williams Textbook of Endocrinology. 8th ed. WB Saunders Company;1992:1625-1634
2. Akin C, Metcalfe DD. Mastocytosis. In: Leung DYM, Greaves MW, eds. Allergic Skin Disease: A Multidisciplinary Approach. Marcel Dekker, Inc. 2000:337-352
3. Keyzer JJ, de Monchy JG, van Doormaal JJ, van Voorst Vader PC. Improved diagnosis of mastocytosis by measurement of urinary histamine metabolites. N Engl J Med. 1983;309(26):1603-1605
4. Heide R, Riezebos P, van Toorenbergen AW, Mulder PGH, Tank B, Oranje AP. Abstract 347: Predictive value of urinary N-methylhistamine for bone marrow involvement in mastocytosis. J Invest Dermatol. 2000;115(3):587
5. Van Gysel D, Oranje AP, Vermeiden I, de Lijster de Raadt J, Mulder PG, van Toorenenbergen AW. Value of urinary N-methylhistamine measurements in childhood mastocytosis. J Am Acad Dermatol. 1996;35(4):556-558
6. Divekar R, Butterfield J. Urinary 11b-PGF2a and N-methyl histamine correlate with bone marrow biopsy findings in mast cell disorders. Allergy. 2015;70(10):1230-1238. doi:10.1111/all.12668
7. Butterfield J, Weiler CR. The utility of measuring urinary metabolites of mast cell mediators in systemic mastocytosis

and mast cell activation syndrome. J Allergy Clin Immunol Pract. 2020;8(8):2533-2541. doi:10.1016/j.jaip.2020.02.021

## Performance

### Method Description
Isotopically labeled *N*-methylhistamine (NMH) is added to the sample as an internal standard (IS). NMH and IS are then purified from urine using solid phase extraction. The eluate is analyzed using liquid chromatography-tandem mass spectrometry.(Unpublished Mayo method)

### PDF Report
No

### Day(s) Performed
Monday, Wednesday, Friday

### Report Available
3 to 7 days

### Specimen Retention Time
14 days

### 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
82542

### LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|

# Test Definition: NMHR1

N-Methylhistamine, Random, Urine
(Non-Orderable)

| | | |
|---|---|---|
| NMHR1 | N-Methylhistamine, Random | 13781-0 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| 605015 | N-Methylhistamine, Random, U | 13781-0 |