Overview

Useful For
Diagnosing risk factors for patients with calcium kidney stones
Monitoring results of therapy in patients with calcium stones or renal tubular acidosis

Special Instructions
- Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens

Method Name
Enzymatic

NY State Available
Yes

Specimen

Specimen Type
Urine

Necessary Information
Patient's age and 24-hour volume are required.

Specimen Required

Patient Preparation: Any drug that causes alkalemia or acidemia may be expected to alter citrate excretion and should be avoided, if possible.

Supplies: Diazolidinyl Urea (Germall) 5.0 mL (T822)

Container/Tube: Plastic, 5-mL tube (T465)

Specimen Volume: 4 mL

Collection Instructions:
1. Add 5 mL of diazolidinyl urea as preservative at start of collection or refrigerate specimen during and after collection.
2. Collect urine for 24 hours.
3. Mix well before taking 4-mL aliquot.

Additional Information: See Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens in Special Instructions for multiple collections.

Forms
If not ordering electronically, complete, print, and send a Renal Diagnostics Test Request (T830) with the specimen.
Urine Preservative Collection Options

**Note:** The addition of preservative or application of temperature controls **must occur within 4 hours of completion** of the collection.

<table>
<thead>
<tr>
<th>Preservative</th>
<th>Acceptable Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient</td>
<td>No</td>
</tr>
<tr>
<td>Refrigerate</td>
<td>OK</td>
</tr>
<tr>
<td>Frozen</td>
<td>OK</td>
</tr>
<tr>
<td>50% Acetic Acid</td>
<td>No</td>
</tr>
<tr>
<td>Boric Acid</td>
<td>OK</td>
</tr>
<tr>
<td>Diazolidinyl Urea</td>
<td>Preferred</td>
</tr>
<tr>
<td>6M Hydrochloric Acid</td>
<td>No</td>
</tr>
<tr>
<td>6M Nitric Acid</td>
<td>No</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>No</td>
</tr>
<tr>
<td>Thymol</td>
<td>OK</td>
</tr>
<tr>
<td>Toluene</td>
<td>No</td>
</tr>
</tbody>
</table>

Specimen Minimum Volume

1 mL

**Reject Due To**

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine</td>
<td>Refrigerated (preferred)</td>
<td>14 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frozen</td>
<td>14 days</td>
<td></td>
</tr>
</tbody>
</table>

Clinical and Interpretive

**Clinical Information**

Urinary citrate is a major inhibitor of kidney stone formation due in part to binding of calcium in urine. Low urine citrate levels are considered a risk for kidney stone formation.

Several metabolic disorders are associated with low urine citrate. Any condition that lowers renal tubular pH or intracellular pH may decrease citrate (eg, metabolic acidosis, increased acid ingestion, hypokalemia, or hypomagnesemia).

Low urinary citrate promotes kidney stone formation and growth, and is subject to therapy by correcting acidosis,
hypokalemia, or hypomagnesemia by altering diet or using drugs such as citrate and potassium.

**Reference Values**

0-19 years: not established

20 years: 150-1,191 mg/24 hours
21 years: 157-1,191 mg/24 hours
22 years: 164-1,191 mg/24 hours
23 years: 171-1,191 mg/24 hours
24 years: 178-1,191 mg/24 hours
25 years: 186-1,191 mg/24 hours
26 years: 193-1,191 mg/24 hours
27 years: 200-1,191 mg/24 hours
28 years: 207-1,191 mg/24 hours
29 years: 214-1,191 mg/24 hours
30 years: 221-1,191 mg/24 hours
31 years: 228-1,191 mg/24 hours
32 years: 235-1,191 mg/24 hours
33 years: 242-1,191 mg/24 hours
34 years: 250-1,191 mg/24 hours
35 years: 257-1,191 mg/24 hours
36 years: 264-1,191 mg/24 hours
37 years: 271-1,191 mg/24 hours
38 years: 278-1,191 mg/24 hours
39 years: 285-1,191 mg/24 hours
40 years: 292-1,191 mg/24 hours
41 years: 299-1,191 mg/24 hours
42 years: 306-1,191 mg/24 hours
43 years: 314-1,191 mg/24 hours
44 years: 321-1,191 mg/24 hours
45 years: 328-1,191 mg/24 hours
46 years: 335-1,191 mg/24 hours
47 years: 342-1,191 mg/24 hours
48 years: 349-1,191 mg/24 hours
49 years: 356-1,191 mg/24 hours
50 years: 363-1,191 mg/24 hours
51 years: 370-1,191 mg/24 hours
52 years: 378-1,191 mg/24 hours
53 years: 385-1,191 mg/24 hours
54 years: 392-1,191 mg/24 hours
55 years: 399-1,191 mg/24 hours
56 years: 406-1,191 mg/24 hours
57 years: 413-1,191 mg/24 hours
58 years: 420-1,191 mg/24 hours
59 years: 427-1,191 mg/24 hours
60 years: 434-1,191 mg/24 hours
>60 years: not established

**Interpretation**

Any value less than the mean for 24 hours represents a potential risk for kidney stone formation and growth. Patients with low urinary citrate, and new or growing stone formation, may benefit from adjustments in therapy known to increase urinary citrate excretion. (See Clinical Information)

Very low levels (<150 mg/24 hours) suggest investigation for the possible diagnosis of metabolic acidosis (eg, renal tubular acidosis).

**Cautions**

Drugs that lower systemic pH, potassium, and/or magnesium, lower urine citrate and are to be avoided in patients with a tendency to form calcium stones.

Conversely, drugs that raise systemic pH, potassium, and/or magnesium, may raise urine citrate and should be considered in treating patients or interpreting results.

**Clinical Reference**
**Test Definition: CITR**
Citrate Excretion, U


**Performance**

**Method Description**
Citric acid in the presence of Zn(++) at pH 8.2 is catalyzed to oxaloacetate by the enzyme, citrate lyase. Oxaloacetate in the presence of malate dehydrogenase and reduced nicotinamide adenine dinucleotide (NADH) is reduced to malate (II). By measuring the disappearance of the light-absorbing NADH, the citric acid concentration in the reaction mixture can be determined. By correcting this concentration for dilution and 24-hour volume, the amount of citric acid excreted per 24 hours is obtained. (Nielsen TT: A method for enzymatic determination of citrate in serum and urine. Scand J Clin Lab Invest 1976;36:513-519)

**PDF Report**
No

**Day(s) and Time(s) Test Performed**
Monday through Saturday; 8 a.m.-4 p.m.

**Analytic Time**
Same day/1 day

**Maximum Laboratory Time**
3 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**
82507

**LOINC® Information**

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<thead>
<tr>
<th>Test ID</th>
<th>Test Order Name</th>
<th>Order LOINC Value</th>
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<tbody>
<tr>
<td>CITR</td>
<td>Citrate Excretion, U</td>
<td>6687-8</td>
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<tr>
<td>Result ID</td>
<td>Test Result Name</td>
<td>Result LOINC Value</td>
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<td>--------------------------</td>
<td>--------------------</td>
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<tr>
<td>CITRT</td>
<td>Citrate Excretion, U</td>
<td>6687-8</td>
</tr>
<tr>
<td>TM51</td>
<td>Collection Duration</td>
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<tr>
<td>VL49</td>
<td>Urine Volume</td>
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<td>CITC1</td>
<td>Citrate Concentration</td>
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