

**Overview****Useful For**

Monitoring whole blood cyclosporine concentration during therapy, particularly in individuals coadministered CYP3A4 substrates, inhibitors, or inducers

Adjusting dose to optimize immunosuppression while minimizing toxicity

Evaluating patient compliance

**Method Name**

High-Performance Liquid Chromatography-Tandem Mass Spectrometry (HPLC-MS/MS)

**NY State Available**

Yes

**Specimen****Specimen Type**

Whole Blood EDTA

**Specimen Required**

**Container/Tube:** Lavender top (EDTA)

**Specimen Volume:** 3 mL

**Collection Instructions:**

1. Draw specimen immediately before a scheduled dose.
2. Do not centrifuge.
3. Send specimen in original tube.

**Additional Information:** Therapeutic range applies to trough specimens drawn immediately prior to a.m. dose.

**Forms**

If not ordering electronically, complete, print, and send 1 of the following forms with the specimen:

[-Renal Diagnostics Test Request](#) (T830)

[-Therapeutics Test Request](#) (T831)

**Specimen Minimum Volume**

1 mL

**Reject Due To**

|                 |    |
|-----------------|----|
| Gross hemolysis | OK |
| Gross lipemia   | OK |

|               |    |
|---------------|----|
| Gross icterus | OK |
|---------------|----|

### Specimen Stability Information

| Specimen Type    | Temperature              | Time    | Special Container |
|------------------|--------------------------|---------|-------------------|
| Whole Blood EDTA | Refrigerated (preferred) | 14 days |                   |
|                  | Ambient                  | 14 days |                   |
|                  | Frozen                   | 14 days |                   |

### Clinical and Interpretive

#### Clinical Information

Cyclosporine is a lipophilic polypeptide used to prevent rejection after solid organ transplantation; it suppresses T-cell activation by inhibiting calcineurin to decrease interleukin-2 (IL-2) production. There is substantial interpatient variability in absorption, half-life, and other pharmacokinetic parameters. Cyclosporine is extensively metabolized by CYP3A4 to at least 30 less-active metabolites, many of which are detected by immunoassays. Cyclosporine is known for many drug interactions, including increased neuro- and nephrotoxicity when coadministered with antibiotics, antifungals, or other immunosuppressants. Cyclosporine has a narrow therapeutic range with frequent adverse effects making therapeutic drug monitoring essential.

With 80% of cyclosporine sequestered in erythrocytes, whole blood is the preferred specimen for analysis. Dose is adjusted initially (up to 2 months posttransplant) to maintain concentrations generally between 150 and 400 ng/mL. Target trough concentrations vary according to clinical protocol and depend on type of allograft, risk of rejection, concomitant immunosuppressive drugs, and toxicity. After the first 2 postoperative months, the target range is generally lower, between 75 and 300 ng/mL. Conversion between formulations is generally done at the same dose but with drug monitoring.

#### Reference Values

100-400 ng/mL (Trough)

Target steady-state trough concentrations vary depending on the type of transplant, concomitant immunosuppression, clinical/institutional protocols, and time post-transplant. Results should be interpreted in conjunction with this clinical information and any physical signs/symptoms of rejection/toxicity.

#### Interpretation

Most individuals display optimal response to cyclosporine with trough whole blood levels 100 to 400 ng/mL. Preferred therapeutic ranges may vary by transplant type, protocol, and comedication. Therapeutic ranges are based on specimens drawn at trough (ie, immediately before the next scheduled dose). Blood drawn at other times will yield higher results. This test may also be used to analyze cyclosporine levels 2 hours after dosing (C2 concentrations); trough therapeutic ranges do not apply to C2 specimens.

The assay is specific for cyclosporine; it does not cross-react with cyclosporine metabolites, sirolimus, sirolimus metabolites, tacrolimus, or tacrolimus metabolites. Results by liquid chromatography with detection by tandem mass spectrometry are approximately 30% less than by immunoassay.

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**Cautions**

The recommended therapeutic ranges described above apply to trough specimens drawn just before a dose. Blood drawn at other times will yield higher results.

**Clinical Reference**

1. Moyer TP, Post GR, Sterioff S, et al: Cyclosporine nephrotoxicity is minimized by adjusting dosage on the basis of drug concentration in blood. Mayo Clin Proc 1988 March;63(3):241-247
2. Kahan BD, Keown P, Levy GA, et al: Therapeutic drug monitoring of immunosuppressant drugs in clinical practice. Clin Ther 2002 March; 24(3):330-350
3. Dunn CJ, Wagstaff AJ, Perry CM, et al: Cyclosporin: an updated review of the pharmacokinetic properties, clinical efficacy, and tolerability of a microemulsion-based formulation (Neoral) 1 in organ transplantation. Drugs 2001;61(13):1957-2016

**Performance****Method Description**

Blood specimens are subjected to protein precipitation. The resulting supernatant is analyzed by liquid chromatography-tandem mass spectrometry.(Charlson JC, Moyer TP. In Tietz Textbook of Clinical Chemistry. Fourth edition. Edited by CA Burtis, ER Ashwood, DE Bruns. New York, WB Saunders Company, 2004)

**PDF Report**

No

**Day(s) and Time(s) Test Performed**

Monday through Friday; Continuous until 3 p.m.

Saturday, Sunday; Continuous until 1 p.m.

**Analytic Time**

Same day/1 day

**Maximum Laboratory Time**

1 day

**Specimen Retention Time**

14 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](#).

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**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**

80158

**LOINC® Information**

| Test ID | Test Order Name | Order LOINC Value |
|---------|-----------------|-------------------|
| CYSPR   | Cyclosporine, B | 3520-4            |

| Result ID | Test Result Name | Result LOINC Value |
|-----------|------------------|--------------------|
| 35143     | Cyclosporine, B  | 3520-4             |