MAYO CLINIC LABORATORIES

# Test Definition: CYSPR

Cyclosporine, Blood

## Overview

### Useful For

Monitoring whole blood cyclosporine concentration during therapy, particularly in individuals coadministered cytochrome P450 (CYP) 3A4 substrates, inhibitors, or inducers

Adjusting dose to optimize immunosuppression while minimizing toxicity

Evaluating patient compliance

### Method Name

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

### NY State Available

No

## Specimen

### Specimen Type

Whole Blood EDTA

### Specimen Required

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

**Specimen Volume:** 3 mL

**Collection Instructions:**

1. Collect specimen immediately before a scheduled dose.

**2. Do not centrifuge.**

3. Send whole blood specimen in original tube. **Do not aliquot.**

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

### Forms

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

-Therapeutics Test Request (T831)

-Kidney Transplant Test Request

### Specimen Minimum Volume

1 mL

### Reject Due To

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

| | |
|---|---|
| Gross lipemia | OK |
| Gross icterus | OK |
| Clotted specimens | Reject |

### Specimen Stability Information

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

## Clinical & 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 cytochrome P450 (CYP) 3A4 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 posttransplant. 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 comedications.

Therapeutic ranges are based on specimens collected at trough (ie, immediately before the next scheduled dose). Higher results will be obtained when the blood is drawn at other times.

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.

### Cautions

Results by liquid chromatography with detection by tandem mass spectrometry are approximately 30% less than by immunoassay.

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

### Clinical Reference

1. Moyer TP, Post GR, Sterioff S, Anderson CF. Cyclosporine nephrotoxicity is minimized by adjusting dosage on the basis of drug concentration in blood. Mayo Clin Proc. 1988;63(3):241-247
2. Kahan BD, Keown P, Levy GA, Johnston A. Therapeutic drug monitoring of immunosuppressant drugs in clinical practice. Clin Ther. 2002;24(3):330-350
3. Dunn CJ, Wagstaff AJ, Perry CM, Plosker GL, Goa KL. 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
4. Milone MC, Shaw LM. Therapeutic drugs and their management. In: Rifai N, Chiu RWK, Young I, Burnham CAD, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:420-453

## Performance

### Method Description

Blood specimens are subjected to protein precipitation. The resulting supernatant is analyzed by liquid chromatography tandem mass spectrometry.(Bjergum MW, Jannetto PJ, Langman LJ. Simultaneous determination of tacrolimus and cyclosporine A in whole blood by ultrafast LC-MS/MS. Methods Mol Biol. 2019;1872:111-118. doi:10.1007/978-1-4939-8823-5_11)

### PDF Report

No

### Day(s) Performed

Monday through Sunday

### Report Available

Same day/1 day

### Specimen Retention Time

14 days

**Performing Laboratory Location**
Mayo Clinic Jacksonville Clinical Lab

## 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

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 |