

Overview

Useful For

Serial monitoring of CD4 T cell count in HIV-positive patients

Useful for follow-up and diagnostic evaluation of primary cellular immunodeficiencies, including severe combined immunodeficiency

T-cell immune monitoring following immunosuppressive therapy for transplantation, autoimmunity, and other immunological conditions where such treatment is utilized

Assessment of T-cell immune reconstitution post hematopoietic cell transplantation

Early screening of gross quantitative anomalies in T cells in infection or malignancies

Method Name

FlowCytometry,SinglePlatform(CD3,CD4,CD8,CD45)

NY State Available

Yes

Specimen

Specimen Type

Whole Blood EDTA

Shipping Instructions

It is recommended that specimens arrive within 24 hours of draw. Draw and package specimen as close to shipping time as possible.

Necessary Information

Date of draw is required.

Specimen Required

For serial monitoring, we recommend that specimen draws be performed at the same time of day.

Container/Tube: 4 mL Lavender top (EDTA)

Specimen Volume: 3 mL

Collection Instructions: Send specimen in original tube. **Do not aliquot.**

Specimen Minimum Volume

0.2 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole Blood EDTA	Ambient	72 hours	PURPLE OR PINK TOP/EDTA

Clinical and Interpretive

Clinical Information

Lymphocytes in peripheral blood (circulation) are heterogeneous and can be broadly classified into T cells, B cells, and natural killer cells. There are various subsets of each of these individual populations with specific cell-surface markers and function. This assay provides absolute (cells/mL) and relative (%) quantitation for total T cells and CD4+ and CD8+ T-cell subsets, in addition to a total lymphocyte count (CD45+). Each of these lymphocyte subpopulations have distinct effector and regulatory functions and are maintained in homeostasis under normal physiological conditions. Each of these lymphocyte subsets can be identified by a combination of 1 or more cell surface markers. The CD3 antigen is a pan-T cell marker, and T cells can be further divided into 2 broad categories, based on the expression of CD4 or CD8 co-receptors.

The absolute counts of lymphocyte subsets are known to be influenced by a variety of biological factors, including hormones, the environment, and temperature. The studies on diurnal (circadian) variation in lymphocyte counts have demonstrated progressive increase in CD4 T-cell count throughout the day, while CD8 T cells increase between 8:30 a.m. and noon with no change between noon and afternoon.(1) Circadian variations in circulating T-cell counts have been shown to be negatively correlated with plasma cortisol concentration.(2-4) In fact, cortisol and catecholamine concentrations control distribution and, therefore, numbers of naive versus effector CD4 and CD8 T cells.(2) It is generally accepted that lower CD4 T-cell counts are seen in the morning compared to the evening(5) and during summer compared to winter.(6)

These data, therefore, indicate that timing and consistency in timing of blood collection is critical when serially monitoring patients for lymphocyte subsets.

Abnormalities in the number and percent of CD3, CD4, and CD8 T cells have been described in a number of different disease conditions. In patients who are infected with HIV, the CD4 count is measured for AIDS diagnosis and for initiation of antiviral therapy. The progressive loss of CD4 T-lymphocytes in patients infected with HIV is associated with increased infections and complications. The Public Health Service has recommended that all HIV-positive patients be tested every 3 to 6 months for the level of CD4 T-lymphocytes.

Basic T-cell subset quantitation is also very useful in the evaluation of patients with primary cellular immunodeficiencies of all ages, including follow-up for newborn screening for severe combined immunodeficiency and immune monitoring following immunosuppressive therapy for transplantation, autoimmunity, or any other relevant clinical condition where immunomodulatory treatment is used, and the T-cell compartment is specifically affected.

It is also helpful as a preliminary screening assay for gross quantitative anomalies in T cells, whether related to malignancies or infection.

Reference Values

The appropriate age-related reference values will be provided on the report.

Interpretation

HIV treatment guidelines from the US Department of Health and Human Services and the International Antiviral Society USA Panel recommend antiviral treatment in all patients with HIV infection, regardless of CD4 T-cell count.(7,8) Additionally, antibiotic prophylaxis for *Pneumocystis jiroveci* infection and other opportunistic infections is recommended for patients with CD4 counts below 200 cells/mcL.

Cautions

[T-cell counts should be appropriately interpreted in context of the clinical presentation and other immunological parameters and relevant laboratory test results.](#)

For serial monitoring of T-cell numbers it is recommended that the patient be evaluated at the same time of the day to account for diurnal variation.

For follow-up of infants identified by newborn screening for severe combined immunodeficiency (SCID) and severe T-cell lymphopenia, SCID should be considered as a potential diagnosis in infants with fewer than 300 autologous CD3 T cells/mcL. Infants with 300 to 1,500 autologous CD3 T cells/mcL may have leaky SCID, Omenn syndrome, or variant SCID, depending on other clinical and molecular features.

T-cell lymphopenia in infants identified by newborn screening for SCID is defined as having up to 1,500 autologous CD3T cells/mcL.

This assay should not be used for diagnosing T-lymphocytic malignancies or evaluation of T-cell lymphocytosis of unknown etiology, though the latter may be identified through this assay in a screening assessment. In such cases, test LCMS / Leukemia/Lymphoma Immunophenotyping, Flow Cytometry, Varies will be recommended, which includes a hematopathology review.

Also, when diagnostically assessing lymphocyte subsets (quantitatively) in any of the above clinical contexts, it may be more useful to order the T-cell, B-cell and natural killer cell quantitation assay rather than the T-cell subset quantitation alone, as it excludes B-and natural killer-cell counts.

Clinical Reference

1. Carmichael KF, Abayomi A: Analysis of diurnal variation of lymphocyte subsets in healthy subjects and its implication in HIV monitoring and treatment. 15th Intl Conference on AIDS, Bangkok, Thailand, 2004, Abstract B11052
2. Dimitrov S, Benedict C, Heutling D, et al: Cortisol and epinephrine control opposing circadian rhythms in T-cell subsets. *Blood* 2009;113:5134-5143
3. Dimitrov S, Lange T, Nohroudi K, Born J: Number and function of circulating antigen presenting cells regulated by sleep. *Sleep* 2007;30:401-411
4. Kronfol Z, Nair M, Zhang Q, et al: Circadian immune measures in healthy volunteers: relationship to hypothalamic-pituitary-adrenal axis hormones and sympathetic neurotransmitters. *Psychosom Med* 1997;59:42-50
5. Malone JL, Simms TE, Gray GC, et al: Sources of variability in repeated T-helper lymphocyte counts from HIV 1-infected patients: total lymphocyte count fluctuations and diurnal cycle are important. *J AIDS* 1990;3:144-151
6. Paglieroni TG, Holland PV: Circannual variation in lymphocyte subsets, revisited. *Transfusion* 1994;34:512-516
7. US Department of Health and Human Services: Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Available at <http://aidsinfo.nih.gov/guidelines>

8. Thompson MA, Aberg JA, Hoy JF, et al: Antiretroviral treatment of adult HIV infection: 2012 recommendations of the International Antiviral Society-USA panel. JAMA 2012;308:387-402

Performance

Method Description

The T cell surface marker assay uses monoclonal antibodies to identify the various membrane antigens, and flow cytometry to enumerate the number of cells expressing these differentiation antigens. CD14 is used to exclude monocytes, thereby improving accuracy and enhancing the purity of the lymphocyte population. The results are reported as the percent of lymphocytes that are total T cells (CD3+), CD3+CD4+ T cells, and CD3+CD8+ T cells, along with the absolute number of each cell type per microliter of blood. The assay is a 5-color, no-wash procedure and the absolute counts are calculated from internal bead standards. The total CD45+ lymphocyte count (reported as thousand cells per microliter) and the CD4:CD8 ratio are also reported. (Hoffman RA, Kung PC, Hansen WP, Goedstien G: Simple and rapid measurement of human T lymphocytes and their subclasses in peripheral blood. Proc Natl Acad Sci USA 1980;77:4914-4917; US Department of Health and Human Services: Guidelines for performance of CD4+ T-cell determinations in persons with human immunodeficiency virus infection. MMWR 46 no. RR-2:1997, pp1-29)

PDF Report

No

Day(s) and Time(s) Test Performed

Monday through Sunday

Analytic Time

Same day/1 day

Maximum Laboratory Time

2 days

Specimen Retention Time

4 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 using an analyte specific reagent. Its performance characteristics were 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

86359-T cells, total count

86360-Absolute CD4/CD8 count with ratio

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
TCD4	CD4 T-Cell Count	80721-4

Result ID	Test Result Name	Result LOINC Value
3321	CD45 Total Lymph Count	27071-0
3316	% CD3 (T Cells)	8124-0
3322	CD3 (T Cells)	8122-4
3319	% CD4 (T Cells)	8123-2
3325	CD4 (T Cells)	24467-3
3320	% CD8 (T Cells)	8101-8
3326	CD8 (T Cells)	14135-8
3327	4/8 Ratio	54218-3
CMTTC	Comment	69052-9