

**INTENDED USE**

CD5-PE is a monoclonal antibody (MAb) labelled with R-phycoerythrin (PE) designed for flow cytometry use as a direct immunofluorescence reagent in the identification and enumeration of CD5 antigen-expressing cells.

**SUMMARY AND EXPLANATION**

Flow Cytometry (FC) is a powerful tool in analytical and quantitative characterization of cells which provides rapid and multiparametric analysis of heterogeneous cell populations on a cell-by-cell basis. Flow cytometry is performed on cell suspension after incubating it with fluorescent-labelled antibodies directed against specific cellular proteins. Positive cells relative fluorescence intensity indicates the amount of antibody bonded to specific cell sites providing information about antigen expression.

Human lymphocytes may be classified in three main populations according to their biological function and their cell surface antigen expression (T lymphocytes, B lymphocytes and natural killer (NK) cells).

CYT-5PE4 MAb recognizes a 67 kDa antigen expressed by a majority of thymocytes and mature T cells and a subset of B cells <sup>(1-2)</sup> CD5 is expressed at low density on thymocytes and at high density on all mature T lymphocytes. The majority of T cell malignancies express CD5, and almost 85% of T cell acute lymphoblastic leukemias are CD5 positive. Further, CD5 is expressed at low density on a small subset of mature B lymphocytes, which is expanded in several autoimmune disorders as well as in some B-cell derived lymphoproliferative disorders such as chronic lymphocytic leukemia (CLL) and centrocytic leukemia <sup>(1-4)</sup>.

**PROCEDURE PRINCIPLES**

Flow cytometry is an innovative technology that can evaluate simultaneously different characteristics for a single cell. Flow cytometers use hydrodynamic focusing to individually present cells to one or more laser beams. As cells are intercepted by light a set detectors recover signals of two different kinds: those generated by dispersed light (FSC/SSC), which mainly reflect cell size and internal complexity, and those related to fluorochromes light emission when cells are labelled. Recovered signals are then amplified by a series of linear and logarithmic amplifiers and converted in electrical signals large enough to be plotted graphically.

Fluorochrome-labelled monoclonal antibodies bind specific antigens, therefore cell populations carrying this antigen will be detected when the reagent is added to a sample and passed through a flow cytometer.

Detection of targeted populations can be hindered by erythrocytes presence. This problem can be avoided by their removal using a red blood cell lysing solution previous to sample acquisition. Quicklysis™ (CYT-QL-1) erythrocyte lysing solution without fixatives is recommended since it requires no washing steps. Quicklysis™ use minimises sample handling and avoids centrifuge processed which are usually associated to cell losses <sup>(5, 6)</sup>.

**REAGENT COMPOSITION**

The purified monoclonal CD5 antibody conjugated with R-phycoerythrin (PE) is supplied in phosphate-buffered saline (PBS) containing 0.1% sodium azide.

Clone: MCD5.

Isotype: IgG2b.

Amount per 1 ml vial: 200 tests (5 µl MAb per determination).

Reagent is considered non-sterile.

**STORAGE CONDITIONS**

The reagent is stable when stored at 2-8 °C until expiration date shown on label. The reagent should not be frozen or exposed to direct light during storage or during cell incubation. Reagent vial should be kept dry and once open stored in vertical position to avoid any possible spillage.

**WARNINGS AND RECOMMENDATIONS**

1. For research use only.
2. This product is supplied ready to use, any modification by dilution or addition of other compounds should be validated by the user.
3. The reagent is stable until its expiry date when properly stored. Do not use it after expiration date shown on label. If product is stored in conditions different from those recommended, such conditions must be validated by the user.
4. Alteration in reagent appearance, such as precipitation or discoloration indicates instability or deterioration. In such cases, the reagent should not be used.
5. It contains 0,1% sodium azide (CAS-Nr. 26628-22-8) as a preservative but care should anyway be taken to avoid microbial contamination of reagent and reduce incorrect results that can probably arise from that contamination.
  - Sodium azide (NaN<sub>3</sub>) is harmful if swallowed (R22). If swallowed, seek medical advice immediately and show this container or label (S46).
  - Wear suitable protecting clothing (S36).
  - Contact with acids liberates very toxic gas (R32).
  - On disposal, flush with large amounts of water to prevent azide build-up in metal plumbing since explosive conditions may develop.
6. All patient specimens and materials are considered biohazards and should be handled as if capable of transmitting infection <sup>(7)</sup>. Disposal should be made according to the established legal precautions. It is also recommendable the use of appropriate protective gloves and clothing when handling this product. Product use should be made by personnel qualified to perform the described procedures. Avoid sample contact with skin or mucous membranes. Wash immediately with abundant water if skin contact has occurred.
7. Reagent use with incubation times or temperatures different from those recommended may cause erroneous results. Any changes in procedure must be validated by the user.

## **PROCEDURE**

### **Material included**

CD5-PE can be used for 200 determinations (5 µl MAb per determination).

### **Material required but not included**

- 488 nm ion argon laser-equipped flow cytometer and appropriate computer hardware and software.
- Test tubes suitable for the used flow cytometer. Usually 6 mL tubes (12x 75 mm) with a rounded bottom are used.
- Automatic pipette (100µL) and tips.
- Micropipette and tips.
- Chronometer.
- Vortex Mixer.
- Isotypic control reagent.
- Quicklysis™ lysing solution.
- Wash buffer (phosphate buffered saline (PBS) containing 0.1% sodium azide).

### **Preparation**

Whole blood sample must be taken aseptically by venipuncture<sup>(8, 9)</sup> in a sterilized tube containing an appropriate anticoagulant (use of EDTA is recommended). Flow cytometry analysis require one hundred (100) µL whole blood sample per tube, assuming a normal range of approximately 4 to 10 x 10<sup>3</sup> leucocytes per µL. Samples with high white blood cell count should be diluted with PBS to obtain an approximate cell concentration of 1 x 10<sup>4</sup> cells/µL. Store blood samples at 18-22°C until they are to be tested. It is advisable to test blood samples within 24 hours after their extraction. Samples with suspended cell aggregates or haemolysed should be rejected.

1. Mix 100µL of peripheral blood with 5µL of CD5-PE. In case of working with other body fluids with fewer cells, such as cerebrospinal fluid, bronchoalveolar lavage, gastric lavage, etc., start with an initial volume of 200 µL.  
To evaluate non-specific binding of the antibody, an appropriated isotype control tube can be prepared.
2. Incubate in the dark at room temperature for 10 minutes.
3. Add 2 mL of Quicklysis™ erythrocyte lysing solution and incubate sample in the dark at room temperature for 10 minutes.
4. Acquisition in the flow cytometer should be performed within the first four hours after sample preparation. If samples are not acquired immediately after preparation, they should be stored in the dark at 2-8°C. Instrument calibration must be done according to manufacturers' advice. Before acquiring samples, adjust threshold or discriminator to minimise debris and ensure that populations of interest are included. Also, previous to acquisition samples should be mixed on a vortex (low speed) to reduce cell aggregation.

\*Note: The use of other lysing solutions may require elimination of lysed red blood cells. Follow lysing solution manufacturer recommended protocol.

### **Flow cytometry analysis**

Confirm that the cytometer is correctly aligned and standardised for light dispersion and fluorescent intensity. Compensation should be set following cytometer manufacturer instructions.

Inspect the CD5 vs. SSC dot plot. T cells and a subset of B cells (CD5+) should appear as a compact CD5+ cluster with low SSC.

Results are commonly reported as a percentage of sample total lymphocyte or leucocyte count present.

### **LIMITATIONS**

- Blood samples should be stored at 18-22°C and tested within 24 hours after they were obtained.
- It is advisable to acquire stained samples as soon as possible to optimise results. Non-viable cells may show unspecific staining. Prolonged exposure of whole blood samples to lytic reagents may cause white cell destruction and targeted population cell loss.
- When using whole blood procedures some red blood cells may not lyse, for instance if there are nucleated red blood cells or if abnormal protein concentration and haemoglobinopathies are observed. This may cause misleading results since unlysed red blood cells are counted as leucocytes.
- Results obtained by flow cytometry may be erroneous if cytometer laser is misaligned or if gates are incorrectly set.
- Each laboratory should establish a normal range for CD5+ cells using its own test conditions.
- Certain patients may present special problems due to altered or very low number of a certain cellular population.
- Cells separated from whole blood by means of density gradients may not have the same relative concentration as in whole blood. This may be relatively insignificant in individuals with normal white blood cell counts. In leucopenic patients, the selective loss of specific subsets may affect determination accuracy.
- Knowledge of antigen normal expression pattern and its relation to other relevant antigens is paramount to carry out an adequate analysis<sup>(11-14)</sup>.
- Abnormal states of health are not always represented by abnormal percentages of certain leucocyte populations. An individual in an abnormal state of health may show the same leucocyte percentage as a healthy person.

### **EXPECTED VALUES**

Each laboratory should establish their own normal reference ranges for CD5+ cells counts since those values may be influenced by age, sex and race<sup>(10-12)</sup>.

### **QUALITY CONTROL**

- Pipettes precision and cytometer calibration should be verified to obtain optimal results.
- In multicolour panels, fluorochromes emit in wavelengths that can show certain spectral overlap which must be corrected by electronic compensation. Optimal compensation levels can be established by analysing cells from healthy individuals stained with mutually exclusive monoclonal antibodies conjugated with appropriate fluorochromes.
- Non-specific binding of the antibody can be evaluated using an appropriated isotype control tube.

### **REFERENCES**







1. Engleman EG et al. Studies of a human T lymphocyte antigen recognized by a monoclonal antibody. Proc Natl Acad Sci USA 78:1791-1795 (1981).
2. Gadol N and Ault KA. Phenotypic and functional characterization of human Leu-1 (CD5) B cells. Immunol. Rev. 93: 23 (1986).

3. Jennings CD, Foon KA. Recent advances in flow cytometry: application to the diagnosis of hematologic malignancy. Blood 90(8): 2863-2892 (1997).
4. Rosenberg SA. Classification of lymphoid neoplasms. Blood 5,84: 2863-2892 (1994).
5. Menéndez P, et al. Comparison between a lyse-and-then-wash method and a lyse-non-wash technique for the enumeration of CD34+ hematopoietic progenitor cells. Cytometry (Comm. Clin. Cytometry) 34: 264-271 (1998).
6. Gratama JW, Menéndez P, Kraan J, Orfao A. Loss of CD34+ hematopoietic progenitor cells due to washing can be reduced by the use of fixative-free erythrocyte lysing reagents. J Immunol. Methods 239: 13-23 (2000).
7. Protection of Laboratory Workers from occupationally acquired infections. Second edition; approved guideline (2001). Villanova PA: National Committee for Clinical Laboratory Standards; Document M29-A2.
8. Procedures for the collection of diagnostic blood specimens by venipuncture- approved standard; Fifth edition (2003). Wayne PA: National Committee for Clinical Laboratory Standards; Document H3-A5.
9. Clinical applications of flow cytometry: Quality assurance and immunophenotyping of lymphocytes; approved guideline (1998). Wayne PA: National Committee for Clinical Laboratory Standards; Document H42-A.
10. Reichert et al. Lymphocyte subset reference ranges in adult Caucasians. Clin Immunol Immunopathol 60:190-208 (1991).
11. Prince HK et al. Influence of racial background on the distribution of T-cell subsets and Leu-11 positive lymphocytes in healthy blood donors. Diagn Immunol. 3: 33-39 (1985).
12. Kotylo PK et al. Reference ranges for lymphocyte subsets in pediatric patients. Am J Clin Pathol 100:111-5 (1993).

#### **WARRANTY**

This product is warranted only to conform to quantity and label specifications. There are no warranties that extend beyond the description on product label. Cytognos' sole liability is limited to either product replacement or refund of the purchase price.

#### **EXPLANATION OF SYMBOLS**

	Use by (use by YYYY-MM)
	Storage temperature limitation
	Consult instruction for use
<b>RUO</b>	For research use only
	Batch code
	Code number
	Manufacturer

#### **PRODUCED BY**

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