B Cell Maturation Panel

General information

Assay Principles: This test is usually done in conjunction with lymphocyte subsets surface markers (ID), in which case a separate sample is not required. Abnormalities may be found mainly in patients with common variable immunodeficiency (CVID). This assay can aid in the classification of CVID and the prediction of its prognosis.

By measuring the levels of IgD and CD27 markers on the surface of CD19 positive B cells the following B cell subsets can be identified: “Switched, memory B cells”, “non-switched, memory B cells” and “non-switched, naïve B cells”. The full panel of identified B cell subsets in this test is included in the table below.

Assay interferences: Samples that contain very low numbers or no B (CD19 positive) lymphocytes (≤2%) are not analysed. Older samples may exhibit loss of surface antigens and therefore the sample should be as fresh as possible.

Frequency of analysis: Once at diagnosis

Laboratory information

Analyte: B Cell Maturation Panel

Units: % (as percentage of all CD19+ B cells)

Specimen type: Peripheral blood - EDTA

Turnaround times: 1-2 routine working days, Assay run daily Monday to Friday 09:00-15:00

Additional/special requirements: Note that samples should be received in the laboratory no later than 3pm on a Friday. Samples should be kept at room temperature.

Specimen transport: At room temperature

Method: Flow Cytometry

Participation in EQA scheme: No formal scheme available. We perform a clinical review of abnormal results against other laboratory data and clinical information to assure results fit with the clinical diagnosis.

Clinical information

Interpretation: Use of B cell phenotyping in the investigation/monitoring of immunodeficiency should be discussed with the appropriate Consultant Immunologist (adult or paediatric).

The B cell subsets that are reported are detailed in the below table. Reference ranges are not available for most of these cells groups and any results should be discussed with a consultant immunologist.

B cell subset	Immunophenotype	Clinical comments
Naïve	IgM+ IgD+ CD27-	
Unswitched memory	IgM+ IgD+ CD27+	Reduced in CVID Reduction may be associated with granulomatous disease
Switched memory	IgM- IgD- CD27+ *also see reference range below	Inverse correlates with serum IgA and IgG levels Reduced in CVID Severe reduction associated with granulomatous disease < 2% CSM classifies as SmB- (EUROCLASS) - Associated with low IgG and IgA at time of diagnosis; low absolute numbers of marginal zone B-cells and low absolute and relative numbers of plasmablasts - increased association with splenomegaly and granulomatous disease
Transitional	IgD+ IgM+ CD27- CD24+ CD38+	Expansion associated with lymphadenopathy
CD 21 low	CD21- CD38-	Increased in autoimmune (AI) disease and immunodeficiencies Rare in healthy controls but found in AI disease (EUROCLASS) Increased numbers associated with splenomegaly and granulomatous disease in CVID
Plasmablasts	IgD-IgM-CD24-CD27+CD38^{hi}	Expanded in IgG4 Related Disease, low in healthy controls. Elevated counts may also be seen in other immune conditions Serum IgG4 levels do not correlate with disease activity or treatment Reduced in numbers in CVID

Reference range: CD 27+/IgD- expression on switched memory B cell range is age-dependent[1]. The frequency of ≥ 2% switched memory B cells proposed as cut-off values in Wehr et al[2] can be applied to individuals ≥ 4 years of age but not to younger individuals.

Age dependent CD27+ IgD- Reference ranges suggested by H Morbach et al (2010)[1]**							
Age (years)	0-1	2-3	4-5	6-10	11-18	19-25	26-50
Median (% of all CD19+ B cell)	1	2.6	5.6	6.5	5.4	9.4	13.2
Interquartile ranges (25th and 75th percentile)	0.1-1.9	1.5-4.1	3.3-7.4	5.2-12.1	3.3-9.6	7.2-12.7	9.2-18.9
** Mobarch H et al (2010): This was a study done on 221 healthy individuals aged 1 month to 50 years in Germany.							

References:

1. Morbach, H., Eichhorn, E.M., Liese, J.G. and Girschick, H.J. (2010). Reference values for B cell subpopulations from infancy to adulthood. *Clinical and Experimental Immunology*, [online] 162(2), pp.271–279. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996594/

2. Wehr, C., Kivioja, T., Schmitt, C., Ferry, B., Witte, T., Eren, E., Vlkova, M., Hernandez, M., Detkova, D., Bos, P.R., Poerksen, G., von Bernuth, H., Baumann, U., Goldacker, S., Gutenberger, S., Schlesier, M., Bergeron-van der Cruyssen, F., Le Garff, M., Debré, P. and Jacobs, R. (2008). The EUROclass trial: defining subgroups in common variable immunodeficiency. *Blood*, [online] 111(1), pp.77–85. Available at: https://pubmed.ncbi.nlm.nih.gov/17898316/.

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