## Table 1a.
## Immunophenotyping of B-cell lymphomas

| Neoplasm | Marker | Bcl-2 | Bcl-6 | CD5 | CD 10 | CD 20 | CD 23 | Cyclin D1 | CD 138 | clg | Other useful antibodies |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chronic lymphocytic leukaemia | | + | - (1) | + (2) | - (1) | + (3) | + (4) | - (5) | - | - (6) | CD43+; CD11c(7); ZAP-70(8) ; Ki67 |
| B-cell prolymphocytic leukaemia | | + | - | -/+ (9) | - | + | -/+ (9) | - | - | - | ZAP-70+/CD38+(10) |
| Splenic marginal zone lymphoma | | + | - | - | - | + | - | - | - | - | CD43-; ANXA-1-; CD103-; |
| Hairy cell leukaemia | | + | - | - (11) | - (11) | + | - | +/- (12) | - | - | ANXA-1+; CD11c+; CD25-; CD103-; TRAP+/DBA.44+; |
| Splenic lymphoma/leukaemia unclassifiable | | + | - | - | - | + | - | - | - | - | ANXA-1-; CD11c-; CD25+; CD103+; |
| Lymphoplasmacytic lymphoma | | + | - | - | - | + | - | - | -/+ (13) | + | CD25+/-; CD38+/- |
| Plasma cell neoplasms | | - | - | - | - | -/+ | - | -/+ (14) | + | + | Aberrant expression (15); CD56+/-; |
| MALT lymphoma | | + | - | - | - | + | - | - | - | +/- | CD43+/-; CD11c+/-(7) |
| Nodal marginal zone lymphoma | | + | - | - (16) | - (17) | + | - | - | - | -/+ | IgD-; |
| Follicular lymphoma | | +/- (18) | + (22) | - | + | + | -/+ (19) | - | - | - | CD43-; MUM1-; Ki-67(20) |
| Primary cutaneous follicle centre lymphoma | | -/+ (21) | + | - | -/+ (23) | + | - | - | - | - | CD43-; MUM1- |
| Mantle cell lymphoma | | + | - | + (24) | - | + | - | + (25) | - | -/+ | - |

**Explanations: + >90% positive; +/- 50-90% positive; - /+ 10-50% positive; - < 10% positive**

# Comments to Table 1a.
# Immunophenotyping of B-cell lymphomas

Treatment with anti-CD20 antibodies leads to transitional negativity for CD20 due to down regulation of the protein expression both in neoplastic and normal cells. Use CD79a or PAX5 for confirmation of B-cell differentiation.

1. Useful for identification of residual follicles.
2. Some cases may be negative.
3. Often weaker staining than normal B-cells.
4. Some negative cases may be seen; FDC of residual follicles may be also seen.
5. Some reactivity particularly in proliferation centres may be seen.
6. Few cases (5%) may be positive (plasmacytoid differentiation).
7. Few cases may show weak reactivity.
8. Together with CD38 still used for differentiation between unmutated and mutated subtypes.
9. Only 10-30% cases may be positive.
10. Positive in about 50% cases but not related to Ig gene mutation status.
11. CD5+ or CD10+ cases may be seen.
12. Usually weak diffuse nuclear expression.
13. Expressed only by cells with plasmacytoid differentiation.
14. Cases with t(11; 14) translocation are positive for Cyclin D1, CD20 and PAX5.
15. Aberrant expression of CD117, CD52, CD10 and other antigens may be seen.
16. Infrequent cases may be positive.
17. Some cases (grade 3B) may lack CD10. Staining for CD10 is usually weaker/absent in interfollicular areas and areas with marginal zone differentiation.
18. Bcl-2 is positive in 85-90% of cases. Majority of negative cases (mostly grade IIIb and extranodal cases) harbour different translocation than t(24;18). About 20% of Bcl-2 negative cases may be due to mutations of BCL-2 gene where BCL-2 protein may be detected by antibodies directed to different epitopes.
19. Meshwork of CD23+/CD21+ FDC is seen in follicular areas. Reactivity for CD23 is found in 20-30% of cases on tumour cells also.
20. Ki-67 is an adjunct to morphological grading.
21. Bcl-2 staining is negative or weaker than admixed T-cells in most cases.
22. Bcl-6 staining may be occasionally lost especially in cases undergoing transformation to high grade lymphomas.
23. CD10 is often positive in areas with follicular growth pattern but negative in cases with diffuse growth pattern.
24. Rare phenotypes with CD5- or CD10+/Bcl-6+ are reported but all are Cyclin D1+.
25. Exceptional cases with CD5+/Cyclin D1- phenotype do not show t(11;14) but gene expression profile is similar to MCL and positivity for Cyclin D2 or Cyclin D3 is found. Some of these cases show t(2;12) fusing Cyclin D2 to kappa light chain locus.

## Table 1b.
## Immunophenotyping of B-cell lymphomas (cont.)

| Neoplasm / Marker | Bcl2 | Bcl6 | CD5 | CD 10 | CD 21 | CD 30 | MUM 1 | CD 138 | clg | Other useful antibodies |
|---|---|---|---|---|---|---|---|---|---|---|
| Diffuse large B-cell lymphoma, NOS | +/- (26) | +/- (27) | -/+ (28) | -/+ (29) | - (30) | -/+ (31) | -/+ (32) | - | -/+ | Ki-57 (33); p53 (34) |
| T-cell/histiocyte rich large B-cell lymphoma | -/+ | + | - | - | - | - | -/+ | - | - | EMA-/+; EBV- |
| Primary DLBCL of CNS | +/- (35) | + (36) | - | -/+ (37) | - | - | + (38) | - | - | EBV- |
| Primary cutaneous DLBCL, leg type | + | +/- | - | - | - | - | + | - | - | EBV -; FOXP1+ |
| EBV+ DLBCL of elderly | +/- | - | - | - | - | -/+ | + | - | - | EBV+ (39); CD20+(40) |
| DLBCL associated with chronic inflammation | | - | - | - | - | -/+ | + | -/+ | -/+ | (41) ; EBV+; |
| Lymphomatoid granulomatosis | | - | - | - | - | -/+ | -/+ | - | -/+ | EBV+ |
| Primary mediastinal (thymic) large B-cell lymphoma | +/- | +/- | - | -/+ | - | +/- | +/- | - | - | CD15-/+ (42) |
| Intravascular B-cell lymphoma | | - | +/- | +/- | - | - | +/- | - | -/+ | |
| ALK+ large B-cell lymphoma | | - | - | - | - | - | -/+ | + | + | ALK+; CD20-; CD45-; Cytokeratin-/+ (43) |
| Plasmablastic lymphoma | | - | - | - | - | +/- | + | + | +/- | CD20-; CD45-; PAX5-; CD79a+/-; CD56-; EMA+/-; Ki-67(44); EBV+/-(45) |
| Large B-cell lymphoma arising in HHV-8 associated multicentric Castleman disease | | - | - | - | - | - | - | - | + | LANA-1+; CD79a-; CD20+/-, EBV-; |
| Primary effusion lymphoma | | - | - | - | - | +/- | + | +/- | - | CD45+; CD20-; CD79a-; EMA+/-; LANA-1+; EBER+/LMP1-; (46) |
| Burkitt lymphoma | - (47) | + | - | + | - (49) | - | - | - | -/+ | CD43+; Ki-67(48) |
| B-cell lymphoma, unclassifiable intermediate DLBCL/Burkitt | +/- | + | - | + | - | - | - | - | -/+ | Ki-67(48) |
| B-cell lymphoma, unclassifiable intermediate DLBCL/Hodgkin lymphoma | | -/+ | - | - | | +/- | | - | - | CD45+; CD15+/-; EBV+; CD20+/-; CD79a+/-; PAX5+; BOB1+/OCT2+ |

**Explanations: + >90% positive; +/- 50-90% positive; -/+ 10-50% positive; - < 10% positive**

## Comments to Table 1b.
## Immunophenotyping of B-cell lymphomas (cont.)

26. Bcl-2 is seen in about 50% of cases – may correlate with prognosis.
27. Bcl-6 positivity is reported in 50-90% of cases. In 50% is seen together with co-expression of MUM-1.
28. CD5 positivity is seen in about 10% of cases. No correlation with transformation from CLL/SLL seen and Cyclin D1 is absent.
29. CD10 is found in 30-60% of cases.
30. CD21 positivity is rare.
31. CD30 may be found especially in anaplastic variant.
32. MUM-1 is seen in 35-65% of cases.
33. Ki-67 is usually much more than 40%.
34. p53 is found in 20-60% of cases.
35. Bcl-2 expression is frequent and not related to t(14;18).
36. Bcl-6 expression found in 60-80% of cases.
37. CD10 positivity is seen in 10-20% of cases.
38. MUM1 is strong seen in 90% of cases.
39. LMP-1 is positive in >90% but EBNA-2 only in <30%.
40. Cases with immunoblastic/plasmablastic morphology may be CD20-.
41. Occasional cases may show expression of one or more T-cell antigens.
42. May occasionally be positive.
43. Cytokeratin staining may be seen. Aberrant positivity for CD4, CD57, CD43 and perforin is reported. EMA+/CD45-(weak+) may lead to the mistaken diagnosis of carcinoma.
44. Ki-67 is usually very high (>90%).
45. EBER is positive in 70% of cases but expression of LMP1 is rare.
46. Aberrant expression of T-cell markers may occur.
47. Bcl-2 negative (80%) or weakly positive (20%).
48. Ki-67 fraction is nearly 100%.
49. Endemic cases are often positive.