

## PAX-5

April 2007

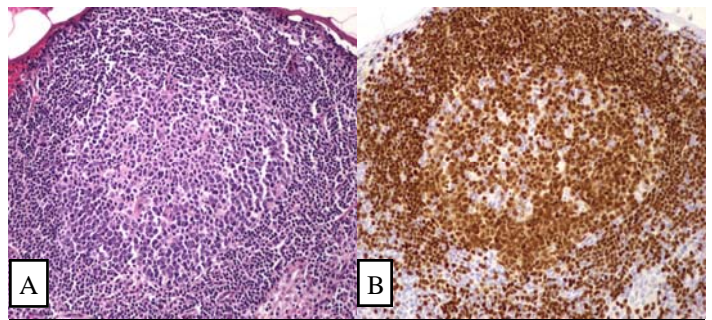
by Cary J. Buresh, M.D., Division of Immunohistochemistry

**A**nti-PAX-5 is a B-cell antibody that has been available at PROPATH for several years, and one that has been a very useful tool for us in the evaluation of a variety of lymphoid and non-lymphoid tissues. In this issue of the *FOCUS* on Immunohistochemistry, this antibody will be described, and its application will be discussed.

**PAX-5**, also known as B-cell-specific activator protein (BSAP), is a transcription factor which plays a vital role in B-cell development, activation, and differentiation. *PAX-5* gene transcription is initiated in pro-B cells and is detectable at the pre-B- and mature B-cell stages, but is largely absent in terminally differentiated plasma cells.

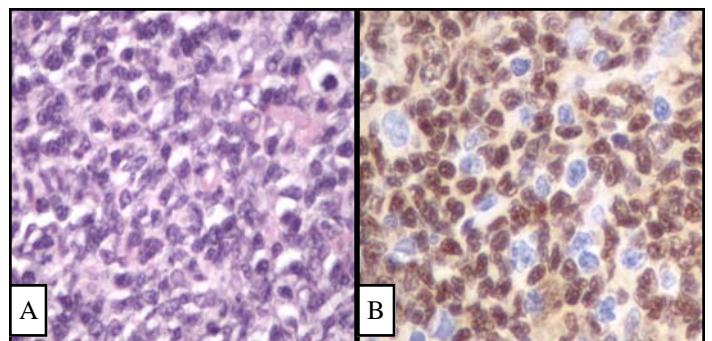
**PAX-5** is widely expressed by B-cells, and since it is a transcription factor, the nuclear pattern of staining lends itself to relative ease in interpretation, especially in small biopsies, cytologic samples, and peripheral blood smears. Also, the similar appearance of **PAX-5** to Ki-67 (both are nuclear stains) allows for more rapid identification of tumor when assessing the Ki-67 proliferative fraction of B-cell lymphomas.

Not only can **PAX-5** be used to assess the intact overall low-power B-cell architecture in an unusual but reactive lymph node or an exuberant mucosal or cutaneous lymphoid infiltrate, **PAX-5** is expressed by the vast majority of B-cell neoplasms, including the well-differentiated small B-cell neoplasms, B-cell small lymphocytic lymphoma/CLL, follicular lymphoma, and marginal zone B-cell lymphoma (and their morphologic variants), hairy cell leukemia, mantle cell lymphoma, diffuse large B-cell lymphoma, and Burkitt lymphoma.



Secondary follicle in reactive lymph node. A) H&E, 200x, B) PAX-5, 200x

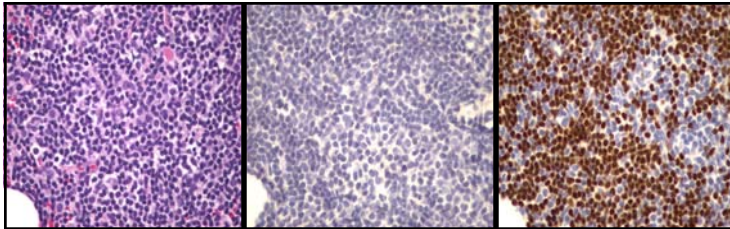
**PAX-5** also stains the L&H cells of nodular lymphocyte predominant Hodgkin lymphoma and the Hodgkin cells or Reed-Sternberg cells of classical Hodgkin lymphoma.



Follicular lymphoma. A) H&E, 800x B) PAX-5, 800x

**PAX-5** is also expressed by precursor B lymphoblastic leukemia/lymphoblastic lymphoma (precursor B-cell acute lymphoblastic leukemia), a tumor which is frequently negative with CD20.

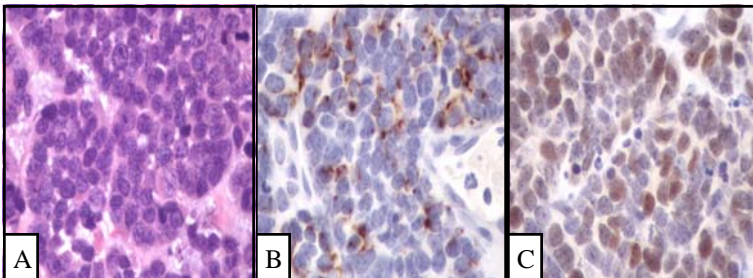
Reportedly, approximately 20% of patients with B-cell lymphoma treated with rituximab (Rituxan; a monoclonal antibody against the CD20 B-cell antigen) will experience relapse with CD20-negative tumor. Staining with **PAX-5** is a sensitive method of identifying tumor in this situation.



Bone marrow with small lymphocytic lymphoma, status-post rituximab therapy. A) H&E, 400x B) CD20, 400x C) PAX-5, 400x

In our experience, plasma cells and plasma cell neoplasms are typically negative or weak with **PAX-5**, and its expression seems to be limited to those few plasma cell neoplasms that also express CD20.

It is now well-known that **PAX-5** is not entirely specific for B-cells, as it has been reported to stain some carcinomas - neuroendocrine carcinomas, including Merkel cell carcinoma and small cell carcinoma (but not carcinoid tumors), as well as rare bladder carcinomas.



Merkel cell carcinoma. A) H&E, 800x B) Cytokeratin 20, 800x C) PAX-5, 800x



Skin. PAX-5, 100x  
  
(Note cytoplasmic staining of germinative epithelial cells)

We have also observed nuclear reactivity in splenic endothelial cells and histiocytes, and we have seen cytoplasmic reactivity with **PAX-5** in basal layers of the epidermis as well as in metaplastic respiratory epithelium.

**PAX-5** is a pan-B-cell marker that is very useful in the evaluation of lymphoid lesions, particularly in small biopsies and in cases where CD20 is negative. Although unusual in epithelial malignancies, **PAX-5** is expressed in a subset of neuroendocrine carcinomas.

**References:**

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