MUSC
DEPARTMENT *of* PATHOLOGY
& LABORATORY MEDICINE

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2010

Pathology and Laboratory Medicine Newsletter

Inside this issue:

Letter from the Chair

Good News -- Subspecialty Sign-Out is Here!

For a long time now, MUSC's Pathologists have aligned themselves along clinical service lines, providing diagnostic consultations and subspecialty Tumor Boards and Clinical Conferences. Taking this a step further, the same pathologists are now providing subspecialty-specific diagnostic interpretations for the majority of our clinical specimens: biopsy, routine, and consultation cases. Overall, this should result in faster turn-around time, greater clinician satisfaction, better patient care, improvement in the quality of diagnostic information provided in the pathology report, and increased incorporation of tumor-specific molecular testing results directed toward prognosis and planning individualized, patient-specific treatment modalities for each malignancy.

The subspecialty sign-out services include: breast, gastrointestinal and pulmonary resections, gastrointestinal and liver biopsies, interstitial lung disease, kidney, heart, transplant pathology, bone marrow/aspirates, lymph nodes, dermatopathology, placenta, cytology/fine needle aspiration, neuropathology, muscle biopsies, head and neck (ENT), thyroid and parathyroid, and ophthalmology. Genitourinary and gynecologic pathology are currently being fully integrated, with individual pathologists already consulting on each case. We are excited about these new developments which will help us provide even better patient care!

News from Department Administration and Business Office...

Department "All Hands" Meetings

Save the Date: The next "All Hands" meeting will be January 19th at 9:30 a.m. in Hollings Cancer Center, Room 120. Please mark your calendar and plan to attend.

You're in the Spotlight!

C*ongratulations* to **Maxine Robinson**, selected and recognized as the Employee of the Quarter! A number of nominations were received for our second "All Hands" meeting.

Nomination cards can be found at each of the Department's MUSC Excellence Communication Board locations: 2nd floor Walton Research Building and 3rd Floor Children's Hospital.

2010 Annual Benefits Enrollment

October 1 - 31, 2010

The 2010 ***Insurance Advantage*** the publication for Annual Enrollment is now available in hard copy for all employees to review. You are invited to visit University Human Resources in Harborview Office Tower, Room 102, to pick up copies for your department. The publication is also available online at the University Benefits website under "2010 Annual Enrollment Changes" at www.musc.edu/hrm/benefits.
Changes become effective January 1, 2011.

CATTS Annual Compliance Training.

Once again, it is time for the Annual Compliance Training! **CATTS modules are due to be completed by December 1, 2010.** Mandatory training can be completed online by going to http://www.musc.edu/catts and using your Net ID and password for access. Please complete the assigned lessons in your Lesson Plan.

Logging in to CATTS

1. http://www.musc.edu/catts Enter your **Net ID**.
2. Enter your **Password**.
3. Click the **Log In** button.

CATTS opens at your "Personal Page." There is a menu bar across the top and a set of Quick Links on the left. Your personal page gives you easy access to all your training assignments with a direct path to what you need most frequently under Quick Links, as well as the full list of options under the tabs on the Menu Bar. If you have any questions please see the e-mail sent by Teresa Kennedy on October 8th for complete details that includes a CATTS Reference Guide.

Arrivals

*W*e are delighted to welcome the following people to the Department:

- **Jonathan McGuirt** and **Dayvia Laws** joined Dr. Makio Ogawa's and Dr. Amanda LaRue's laboratory on September 7, 2010. They each join us as a Research Specialist I.
- **Melanie Campos** joined Dr. Su-Hua Sha's laboratory on October 4, 2010 as a Research Specialist I.
- **Molli Chmielorz** joined the Laboratory Medicine Division on October 18, 2010 as an Administrative Assistant to Dr. Rick Nolte.

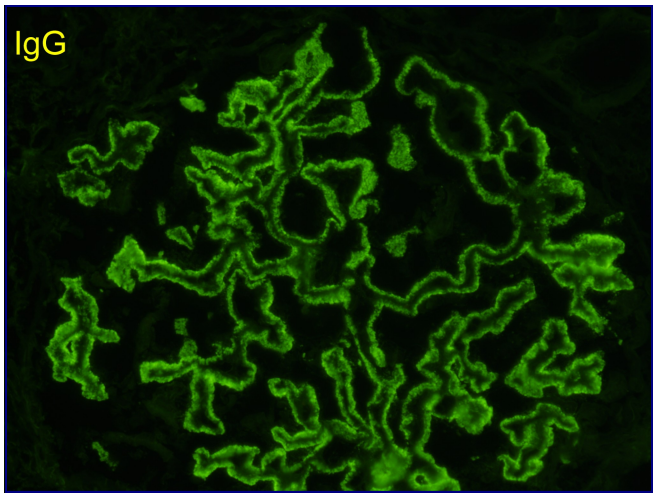
The History and Future Immunology

By: Sally Self, Professor and

Director, Diagnostic Immunology

Immunopathology is the study of immunologically-mediated diseases and the application of immunologic techniques to diagnose and investigate diseases. Immunopathology crosses many different fields of medicine and the actual work of an immunopathologist will vary from institution to institution. In the Department of Pathology and Laboratory Medicine at MUSC, the Immunopathology Section includes serology (testing of serum for autoimmune and infectious diseases), nephropathology (because many medical kidney diseases have an immunologic basis), heart and kidney transplant pathology, immunofluorescence microscopy, and flow cytometry. Immunopathology was a board certified subspecialty of the American Board of Pathology from 1983 to 1997. During that period of time, 175 immunopathologists became board certified, of whom 168 are still alive.

MUSC has a rich history in immunopathology. In the early 1960's, Dr. Rawling Pratt-Thomas, then chair of Pathology, gave John Ward, a resident in pathology, a portion of kidney from a sixteen year old girl who died with glomerulonephritis. Dr. Ward isolated rabbit antibody against immunoglobulin, and with the help of Dr. Bartow Culp in the Department of Biochemistry, conjugated it to fluorescene isothionate. He then demonstrated the presence of immune complexes in the glomeruli of the kidney by immunofluorescence, an early clinical use of this technique. Drs. Sam Spicer and Bob Phifer in 1969 and 1970 pioneered the use of immunohistochemistry using immunoperoxidase. They were able demonstrate adrenocorticotropic hormone in the cells of the pituitary. The methodology which they helped develop is now widely used in surgical pathology to aid in tumor identification and classification. Also, in the 1970's, Dr. Jim Majeski set up a clinical immunopathology laboratory which, in conjunction with the relatively new technique of kidney biopsy, brought direct immunofluorescence techniques into routine clinical care. Dr. Sterling Ainsworth came to MUSC from Harvard to run the immunopathology laboratory. He had worked with Dr. Albert Coons, who invented the technique of immunofluorescence. Here at MUSC, Dr. Mariano LaVia, in the early 1980's, was one of the pioneers in bringing flow cytometry into clinical practice. Also, he was one of the founders of the Clinical Cytometry meeting which evolved into the Clinical Cytometry Society, one of the leading clinical flow cytometry organizations in the world.



Direct immunofluorescence of a glomerulus showing IgG deposition in a case of Membranous Glomerulopathy.

Today the immunopathology division at MUSC impacts on many areas. Flow cytometry is critical in the diagnosis and classification of leukemias and lymphomas. The enumeration of CD4 lymphocytes by flow cytometry guides therapy in HIV infected patients. We count CD34 positive hematopoietic stems cells by flow cytometry, making the harvesting of hematopoietic stems cells for transplant as efficient as possible. Monitoring immunomodulatory therapy involving antibodies to T-cells and B-cells is made possible by flow cytometry. Immunofluorescence microscopy is used in the diagnosis of immunologically mediated skin diseases such as pemphigus vulgaris, bullous pemphigoid, linear IgA disease, dermatitis herpetiformis, and Henoch-Scholein purpura. The serology lab works day and night to do the

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The History and Future Immunology *(cont.)*

infectious disease testing for the organ donor program for the entire state. The renal and heart transplant programs rely heavily on biopsies read in immunopathology for the diagnosis of both cell and antibody mediated rejection. C4d complement fragment deposition in the capillaries as demonstrated by immunofluorescence is crucial for the diagnosis of antibody mediated rejection in both kidney and heart transplants. The interpretation of native renal biopsies relies heavily on immunopathology techniques. Autoimmune disease serologic testing, *in vitro* allergy testing, and serologic testing for infectious diseases are all under the auspices of immunopathology at MUSC.

What lies in the future for immunopathology? Much of the serologic testing will become more automated and as such, will migrate into the general laboratory. Many immunologic techniques may be integrated into other subspecialties, for example flow cytometry by hematopathology. Molecular diagnosis of infectious disease has replaced some serologic testing and will most likely replace more in the future. Molecular techniques involving gene expression chips will likely place a larger role in the diagnosis of transplant rejection, reducing the need for some, but almost certainly not all, heart transplant biopsies. Immunopathology will remain the mainstay in the diagnosis of medical renal disease and immunobullous skin diseases. There are areas into which immunopathology will expand. More refined and specific tests for autoimmune disease are becoming available. As novel immunomodulatory agents revolutionize transplantation and the treatment of autoimmune disease, immunopathologic techniques will be necessary to monitor these agents. The clinical use of flow cytometry will expand. Immunopathologic techniques will be crucial in the age of antibody targeted cancer therapeutics: one must verify that the target is present in the cancer cells before attempting such therapy. The skills necessary for immunopathology, for instance the use of the fluorescence microscope, are applicable in areas of molecular pathology such as fluorescence in situ hybridization (FISH).

Immunopathology has a rich history and an exciting future at the Medical University of South Carolina. The techniques of immunopathology and expertise of the clinical immunopathologist have contributed greatly to the excellence of patient care here at MUSC and will continue to do so.

Faculty Highlight

Su-Hua Sha, M.D. joined the department as an Assistant Professor on July 1st. Dr. Sha (Shasha) received her Bachelor and Master of Medicine degrees and completed her residency training in Otolaryngology at Tongji Medical School in Wuhan, China. Shasha received further training as a clinical fellow in the Department of Otolaryngology of Essex Medical School in Essex, Germany where she earned an M.D. degree. In 1994, she moved to the Kresge Research Institute at the University of Michigan as a postdoctoral fellow to further develop her interests in hearing research. Dr. Sha is a valuable addition to the auditory neuroscience program centered in the Research Division. She brings a strong background in stress-related intracellular signaling pathways and their role in cell survival and death in the auditory system. Her work is funded through an R01 grant focused on noise-induced hearing loss and a subproject on a second R01 investigating the mechanisms responsible for auditory dysfunction associated with exposure to aminoglycoside antibiotics. These projects will introduce a new *in-vitro* model useful for the study of noise-induced molecular responses and pursue a novel hypothesis with a focus on energy depletion-induced changes on the activity of small GTPases and mTOR signaling. Dr. Sha also plans additional studies on actin cytoskeleton rearrangements. As passionate as she is about basic science, she has a similar passion for teaching students and providing guidance to fellows from different backgrounds. She has taught undergraduate and graduate students, as well as provided mentorship and supervision to visiting and postdoctoral fellows. Dr. Sha is enthusiastic about all aspects of research from building hypotheses to performing experiments, adopting new technology to conduct research, collaborating with fellow investigators, and mentoring young scientists. Welcome aboard Shasha!

The Bethesda System for Reporting Thyroid Cytology Comes to MUSC

By: Mariam Alsharif, M.D.
Assistant Professor, Cytopathology

Fine needle aspiration (FNA) is efficacious for preoperative evaluation of thyroid nodules. It is a sensitive test for diagnosing malignancy when the sample is satisfactory and thus plays an essential role in choosing patients for surgery. Cytopathologists have a duty to communicate thyroid FNA results to clinicians in clear terms that are clinically helpful. However, thyroid FNA terminology has varied from one laboratory to another and the classification of thyroid lesions that are not clearly benign or malignant (i.e. "indeterminate") has, for a long time, been a source of confusion for cytopathologists and physicians alike, as such lesions are perceived, interpreted and reported differently by cytopathologists. A uniform reporting system will facilitate effective communication among cytopathologists, and other health care providers.

Inspired by the widely adopted Bethesda system for reporting cervical Papanicolaou test results, the National Cancer Institute (NCI) hosted a multidisciplinary conference in the fall of 2007 in Bethesda, Maryland, to address terminology and other issues related to FNA in the management of thyroid nodules. The conclusions from this meeting regarding uniform terminology and morphologic criteria for reporting thyroid FNA results were outlined in several papers by Baloch et al [*Diagn Cytopathol and Cytojournal* 2008*]* and also detailed and illustrated in an atlas by Ali and Cibas et al., 2010.

The Bethesda System for Reporting Thyroid Cytopathology recommends that each report begin with a general diagnostic category. There are six general diagnostic categories, summarized below. Each of the categories has an implied malignancy risk (ranging from 0% - 3% for the benign category to almost 100% for the malignant category) that links it to a rational clinical management guideline (Table) [Cibas et al AJCP 2009]. For some of the general categories, some degree of subcategorization is informative and appropriate.

Table: Bethesda System for Reporting Thyroid FNA Cytology

Diagnostic Category	Risk of Malignancy (%)	Usual Management*
Insufficient for diagnosis	1% – 4%	Repeat fine-needle aspiration with ultrasound guidance
Benign	<1%	Follow clinically
Atypical cells of undetermined significance	≈5% – 10%**	Repeat fine-needle aspiraation
Suspicious for a follicular neoplasm	15% – 30%	Lobectomy
Suspicious for a Hürthle cell neoplasm	15% – 45%	Lobectomy
Suspicious for malignancy Suspicious for papillary carcinoma Suspicious for medullar carcinoma Suspicious for lymphoma Suspicious for metastatic tumor Other	60% – 75%	Lobectomy or thyroidectomy
Malignant	97% – 99%	Thyroidectomy

*Actual management may depend on other factors besides the fine-needle aspiration result
**Estimate based on resections performed after "repeated atypical" result. (Cibas, Cytology: Diagnostic principals and clinical correlates; third edition, 2009)

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The Bethesda System for Reporting Thyroid Cytology Comes to MUSC (cont.)

Diagnostic terminology for thyroid fine-needle aspiration (FNA) interpretation with morphologic criteria:

1. Non-diagnostic / Unsatisfactory (ND/UNS)

For a thyroid FNA specimen to be adequate for evaluation (and benign), at least 6 groups of benign follicular cells are required, each group composed of at least 10 cells. Special circumstances which do not require a minimum number of follicular cells include colloid nodule with abundant colloid and no follicular cells; a sample with significant cytologic atypia that must be reported, and solid nodules with inflammation (e.g. lymphocytic thyroiditis, granulomatous thyroiditis, thyroid abscess). The following situations are considered non-diagnostic:

- The specimen is processed and examined but has limited cellularity, no follicular cells (other than the exceptions above) or poor fixation and preservation
- Cyst-fluid-only (CFO) cases. The clinical significance of this result largely depends on sonographic correlation. If the nodule is almost entirely cystic, with no worrisome sonographic features, it may be considered benign by the endocrinologist. Or, it might be clinically equivalent to an ND result if the sonographic features are worrisome and the endocrinologist is not convinced that the sample is representative. The risk of malignancy for a CFO sample was 4% in a study that segregated such cases and analyzed them separately [Renshaw et al *Am J Clin Pathol. 2001*]. The risk of malignancy for ND/UNS (not including CFO) is 1% to 4% [Renshaw et al *2001,* Yang J et al *Cancer 2007*].

A repeat aspiration is recommended for ND/UNS and clinically or sonographically worrisome CFO cases and is diagnostic in over 50% of cases, but some nodules remain persistently ND/UNS. Excision is considered for persistently ND/UNS nodules because about 10% prove to be malignant [McHenry CR et al Am Surg 1993].

2. Benign

The most commonly encountered entity in thyroid FNA (60% - 70%). Descriptive comments that follow are used to subclassify the benign interpretation. The term benign follicular nodule (includes hyperplastic/adenomatoid nodule, colloid nodule, etc) applies to an adequately cellular sample with variable amounts of colloid, and benign-appearing follicular cells arranged as macrofollicles and macrofollicle fragments (**figure 1**)

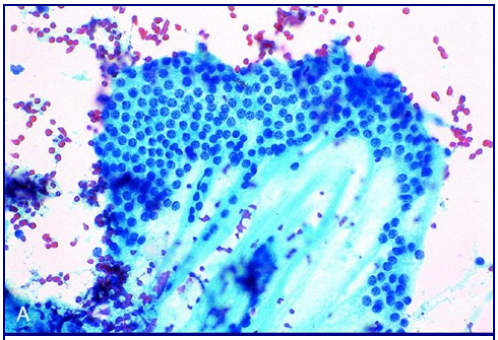

Figure 1 Benign follicular nodule

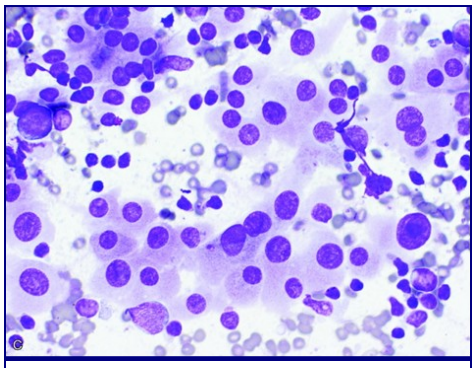

Figure 2 Lymphocytic thyroiditis

Other benign subcategories include "consistent with lymphocytic/Hashimoto's thyroiditis" (contains scant colloid, Hürthle cells, follicular cells, and lymphocytes, **figure 2**). The Hürthle cells in lymphocytic thyroiditis may display nuclear atypia and similarly follicular cells may show some chromatin clearing and nuclear grooves; however, one should refrain from interpreting these changes as malignant.

Patients with a benign nodule are followed by clinical and periodic radiologic examination and some patients may undergo repeat FNA due to increase in nodule size. There is a low risk of malignancy (0% - 3%) in this group.

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The Bethesda System for Reporting Thyroid Cytology Comes to MUSC (cont.)

3. Follicular Lesion of Undetermined Significance/Atypia of Undetermined Significance (AUS)

This is a heterogeneous category that includes cases in which the cytologic findings are not convincingly benign, yet the degree of cellular or architectural atypia is not sufficient for an interpretation of "Follicular Neoplasm" or "Suspicious for Malignancy." The most common scenarios for which an AUS interpretation is appropriate include:

- A prominent population of microfollicles in an aspirate that does not otherwise fulfill the criteria for "follicular neoplasm/suspicious for follicular neoplasm." This could be the case when a predominance of microfollicles or Hürthle cells is seen in a sparsely cellular aspirate with scant colloid.
- The interpretation of follicular cell atypia is hindered by sample preparation artifact, e.g. clotting artifact with crowding, and air-drying artifact with slight nuclear and cytoplasmic enlargement, pale or smudgy chromatin, and/or mildly irregular nuclear contours.
- A moderately or markedly cellular sample composed almost exclusively of Hürthle cells, in a clinical setting that suggests a benign Hürthle cell nodule, eg, lymphocytic thyroiditis, or multinodular goiter.
- There are focal features suggestive of papillary carcinoma, including nuclear grooves, enlarged nuclei with pale chromatin, and irregular nuclear contours in an otherwise predominantly benign-appearing sample (particularly in patients with lymphocytic thyroiditis or with abundant colloid and other benign-appearing follicular cells).
- There are cyst-lining cells that may appear atypical owing to the presence of nuclear grooves, prominent nucleoli, elongated nuclei and cytoplasm, and/or intranuclear cytoplasmic inclusions in an otherwise predominantly benign-appearing sample.
- A minor population of follicular cells show nuclear enlargement, often accompanied by prominent nucleoli, e.g. specimens from patients with a history of radioactive iodine, carbimazole, or other therapeutic agents, and repair due to cystic degeneration and/or hemorrhage
- There is an atypical lymphoid infiltrate, but the degree of atypia is insufficient for the general category "suspicious for malignancy." A repeated aspirate for flow cytometry is recommended.

This group can benefit from repeat FNA and correlation with clinical and radiologic findings. More than 50% of nodules which are non-diagnostic or indeterminate on initial cytologic diagnosis can later be placed into definite diagnostic categories with repeat FNA [Kelly et al *Diagn Cytopathol* 2006, Wang et al *Diagn Cytopathol* 2006]. When utilized, this category should ideally represent less than 7% of all thyroid FNA interpretations. The risk of malignancy is 5% - 10%.

4. Follicular-Neoplasm/Suspicious for Follicular Neoplasm (FN/SFN). **Specify if Hürthle cell type.**

This category applies to *non-papillary* follicular patterned neoplasms and Hürthle cell neoplasms. The purpose of this diagnostic category is to identify a nodule that might be a follicular carcinoma (FC) and triage it for surgical lobectomy. Most patients with this diagnosis will undergo lobectomy/hemithyroidectomy and a definite diagnosis (adenomatoid nodule vs. adenoma vs. carcinoma) is rendered on surgical pathology examination. The FNA of a follicular neoplasm or Hürthle cell neoplasm (benign and malignant) usually shows hypercellularity as compared to most aspirates of nodular goiter demonstrating a monotonous population of follicular cells or Hürthle cells with minimal or absent background colloid. In a follicular neoplasm, the cells are usually arranged in three dimensional groups and microfollicles with prominent nuclear overlapping and crowding, and some cases may show nuclear atypia; however, this is not a diagnostic criterion of malignancy, since benign nodules can also show nuclear atypia. In the Hürthle cells neoplasm the cells tend to be arranged in monolayer sheets, follicular groups or as scattered single cells **(figure 3)**. Cellular atypia is also commonly observed in Hürthle cell neoplasms; this can be seen in the form of random nuclear enlargement, multi-nucleation, cellular pleomorphism and prominent nucleoli. Intra-cytoplasmic lumens and transgressing vessels can also be seen. The term *suspicious for a follicular neoplasm* is preferred by some laboratories over *follicular neoplasm* for this category because a significant proportion of cases (up to 35%) prove not to be neoplasms, but rather hyperplastic proliferations of follicular cells, most commonly those of multinodular goiter. The majority of FN/SFN cases turn out to be follicular adenomas or adenomatoid nodules of multinodular goiter, both of which are more common than FC. About 15% to 30% of cases called FN/SFN prove to be malignant, of these, a significant proportion are follicular variants of papillary carcinoma.

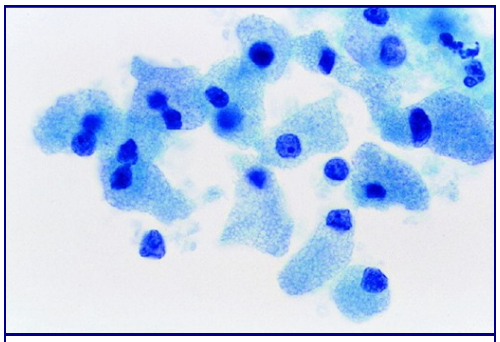

Figure 3 Suspicious for a Hürthle cell neoplasm

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The Bethesda System for Reporting Thyroid Cytology Comes to MUSC (cont.)

5. Suspicious for Malignancy

This term can be used when the nuclear and architectural features of some PTCs are subtle and focal. A majority of cases in this group (50%-75%) are found to be follicular variant of papillary carcinoma, which can be difficult to distinguish from a benign follicular nodule. This also applies to other malignancies that may be incompletely sampled and only a small number of abnormal cells are seen such as medullary carcinoma (a recommendation should be made to assay serum calcitonin levels to confirm cytologic impression), and metastatic malignancies, and lymphoma.

6. Malignant

The general category *malignant* is used whenever the cytomorphologic features are conclusive for malignancy. Descriptive comments that follow are used to sub-classify the malignancy. Papillary thyroid carcinoma (PTC) is the most common malignancy of the thyroid; it is well-differentiated and is seen in younger age group. Major cytologic diagnostic criteria of PTC are enlarged, oval and irregular nuclei, marginated micro-nucleoli, fine, pale chromatin, longitudinal intranuclear grooves and intranuclear pseudo-inclusion; minor diagnostic criteria are papillary cyto-architecture **(Figure 4)**, syncytial monolayers, dense squamoid cytoplasm, "Bubble gum" colloid, psammoma bodies, multinucleated giant cells, histiocytoid cells and cellular swirls.

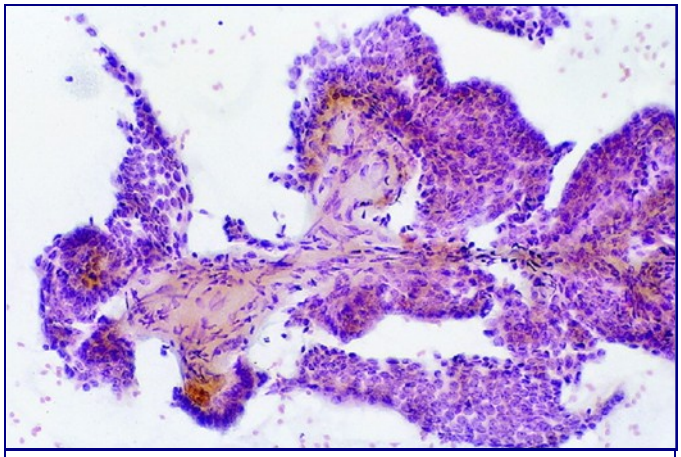


Figure 4 papillary carcinoma showing fibro-vascular cores.

Other variants of PTC include follicular variant (FV) and tall cell variant. Similar to the histologic diagnosis the cytologic interpretation of FVPTC can also be difficult. The FNA specimens of FVPTC usually show tumor cells arranged in monolayer sheets and follicular groups in a background of thin colloid. Thick colloid can also be present, however, much less as compared to classic PTC. The tumor cells show nuclear elongation, chromatin clearing and thick nuclear membranes; however, nuclear grooves and inclusions are rare.

Anaplastic carcinoma is undifferentiated, and occurs in the older age group. The aspirates can be readily classified as malignant due to extreme cellular pleomorphism and obvious malignant features.

Poorly differentiated carcinomas (PDCs), also derived from follicular cells, fall somewhere in between differentiated carcinomas (follicular, Hürthle cell, papillary) and undifferentiated (anaplastic) carcinoma based on an intermediate degree of nuclear and architectural atypia. The aspirate is very cellular and the malignant cells are arranged in well-defined nests (“insulae”) surrounded by thin fibrovascular septae. Other PDCs have a predominantly trabecular or solid growth pattern. Some microfollicles (with or without colloid) can be seen. Tumor cells are generally small to intermediate in size and uniform, with some hyperchromasia, but pleomorphism is absent or only focal. Mitoses and necrosis are present. Nuclear features of PC are common.

Medullary Thyroid Carcinoma (MTC) can show varied cytomorphologic patterns similar to that seen in surgical pathology specimens. The majority of MTC cases show a cellular aspirate consisting of round to oval cells arranged mainly as single cells or loosely cohesive groups. The individual tumor cells show abundant eosinophilic granular cytoplasm and up to 20% of cells will demonstrate fine granules in Romanowsky-stained preparations. The nuclei are usually eccentric giving rise to a plasmacytoid appearance to tumor cells. The nuclear chromatin is similar to that seen in neuroendocrine tumors; salt and pepper type with inconspicuous nucleoli. Intranuclear inclusions can also be seen. In some cases, the tumor cells are can assume a "spindle shape.” Amyloid may be observed as acellular material in the form of strings or as round to oval shaped fragments. In cytology specimens, the diagnosis can be confirmed by performing immunostains for Calcitonin. In cases with limited cellularity, it is advisable to have a patient serum Calcitonin level performed to confirm the diagnosis. Approximately 3% to 7% of thyroid FNAs have diagnostic features of malignancy and most are papillary carcinomas. Malignant nodules are usually removed by thyroidectomy, with some exceptions (e.g. metastatic tumors, non-Hodgkin lymphomas). The positive predictive value of a malignant FNA interpretation is 97% to 99%.

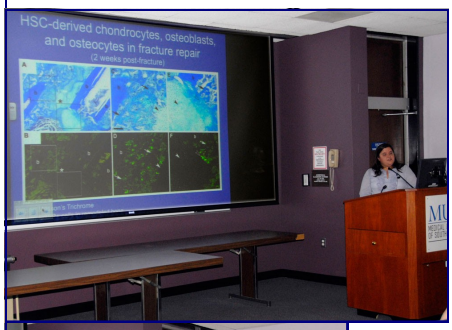
It is anticipated that this terminology proposal will be a valuable step toward uniformity and consensus in the reporting of thyroid FNA cytology.

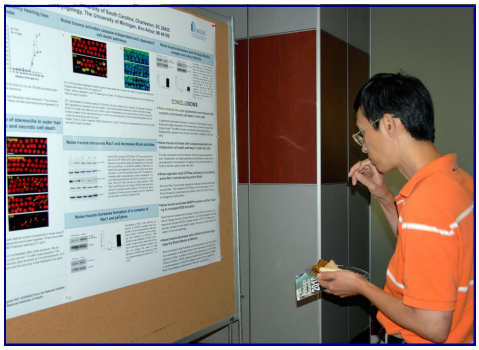
Pathology Research Day

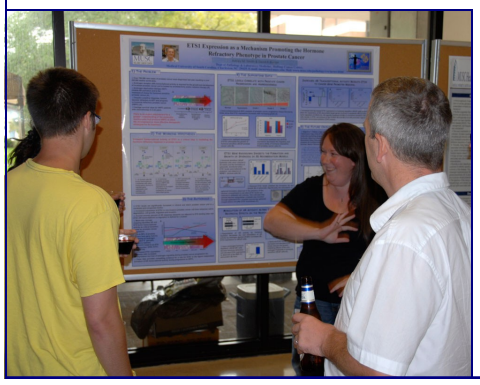
By: Lisa Cunningham, Ph.D., Assistant Professor

Our 5th Annual **Pathology Research Day** was held on August 27, 2010. This event highlights the research programs in the Pathology Department, and it also serves as our Program Exposure for the incoming class of graduate students. This year's keynote speaker was Dr. Amanda C. LaRue, who holds joint appointments as both an Assistant Professor in the Department of Pathology and Laboratory Medicine and a Research Health Scientist at the Ralph H. Johnson VA Medical Center. Dr. LaRue gave an exciting talk highlighting the plasticity of adult hematopoietic stem cells and their therapeutic potential.

Dr. LaRue's talk was followed by talks from other researchers in the Pathology Department, including Dr. Julie Woolworth, a post-doctoral fellow in Dr. Omar Moussa's laboratory. Dr. Woolworth's talk on bladder cancer emphasized the importance of a "bench-to-bedside" approach to developing therapies aimed at treating complex diseases. Shimon Francis, a Ph.D. student in Dr. Lisa Cunningham's laboratory, talked about his work to develop a co-therapy aimed at preventing hearing loss caused by a common class of antibiotics, the aminoglycosides. Shimon's approach is also "bench-to-bedside", as he is studying the protective effect of a compound that is used in traditional Chinese medicine. Dr. Mokhtar Desouki, a 4th year resident in the Pathology Department's AP/CP Residency Program, talked about his studies using PAX5 immunochemistry as a clinical marker in the difficult differential diagnosis of lymphoid neoplasms. Dr. Lisa Cunningham, Coordinator of Graduate Studies, provided an overview of the Pathology Graduate Training Program for the benefit of the incoming graduate students. These talks were followed by a poster session that featured 22 posters presented by Pathology graduate students, residents, and fellows. The poster topics also ranged from bench to bedside, including everything from development of viral-mediated gene therapy in mice to development of diagnostic assays for the clinical laboratory. The poster session generated much discussion and interest, and it is sure to foster future collaborations. Pathology Research Day could not have been a success without the contributions of Linda McCarson, Jim Nicholson, Tom O'Brien, and Jarvis Jenkins – many thanks to all of them.







Faculty Highlight : Dr. Shaoli Sun

If I had to use one word to describe me, it would be "lucky."

I just joined MUSC in September 2010. I am very excited to live in Charleston and to return to academic medicine.

Born as a second child in China with three siblings, I have had my older sister's care, and I have also learned responsibility by watching over my younger sister and brother. My mother taught me how to be an efficient woman with whatever I do, and to do it well. My father gave me a positive attitude and humor towards everything in life. By the time I finished high school, China had just restarted the formal college admission process. I was one of only two lucky graduates from 200 high school students to pass the national examination, and I was admitted to Henan Medical University. After medical school, I was eager to find a more challenging place to learn skills in fundamental research and to experience discovery in basic medical sciences. I was luckily admitted to Beijing Medical University as a neuroscience Ph.D. student. Four years later, due to family reasons, I had to stop my study and move to the United States, but I knew I would have more opportunity in this country of dreams. I took the medical boards and started my formal training in pathology at Mount Sinai Hospital in New York City, followed by a period of training with the late Dr. Rodger Haggitt at the University of Washington as a visiting GI pathologist. The time with Rodger was very precious to me. He taught me how GI pathology was both science and a form of art, and how to derive joy from the daily clinical practice. Two years later, my family then moved to Connecticut. I took a full-time position as a staff GI pathologist at Dianon Systems (now a part of LabCorp), where I routinely signed out 60-80 cases daily. This lasted for a little more than ten years.

My new position at MUSC is very different from my previous job, but in many good ways. Surrounded by brilliant and supportive pathologists, residents, clinicians and researchers, I feel fortunate to come back as an academician and work at MUSC. Having been in a commercial diagnostic laboratory for so long, I realize now how much I missed and how much I currently enjoy the close communication with other clinicians and the collaboration among a multidisciplinary team that are necessary to provide better patient care.

In my spare time, I like to read humor books. I enjoy all kinds of outdoor activities, ranging from strolling on the beach to simple picnics in the park. I am also a fan of ballroom dance. I like communicating with my children and sharing my stories of growing up with them. I value my daily chores, such as ironing clothes, cooking a good meal, and fixing a broken handle on a toilet, as accomplishments. All of those little things make me happy. I am proud that I can do something and do it well.

Faculty Highlight : Dr. Paul Eberts

I can remember as far back as fifth grade when I first thought about a career in medicine. Even then, the idea of helping people through the use of science and medicine appealed to me. I went to high school and then on to college in my hometown of Knoxville, TN with this goal in mind. In college, I majored in Microbiology with a minor in History, and then went to Graduate school in Microbiology with the intention of earning my Master's degree. I found out rather quickly, however, that basic science research was not my calling. Fortunately for me, I was accepted and began medical school the following year. I attended East Tennessee State University (Quillen College of Medicine) and became convinced that a career in Pediatrics was perfect for me. It wasn't until late in medical school that I changed plans after learning what an amazing and intellectually stimulating field is Pathology. I matched into residency at the Medical University of South Carolina where I got, in my opinion, some of the best general Anatomic and Clinical Pathology training in the country. I have since finished my residency, and I am now the Surgical Pathology Fellow here at MUSC. My current interests include general Surgical Pathology with a focus on Gastrointestinal and Liver pathology. My future plans include a GI/Liver fellowship at Vanderbilt University next year. After that, I will be looking for a career that allows me to continue to take care of patients and teach the future generations of physicians and pathologists.

Laboratory Services Highlight

Nancy Reilly Dixon, MPA is the Director of Laboratory Services. She came to MUSC in 1998 and has served in her present role since December 2009. Nancy received a Bachelor of Science degree in Medical Technology in 1980 from State University of New York at Buffalo. Since that time she has worked full time in the clinical laboratory. Her experience ranges from lab generalist to specialist, from staff technologist to laboratory administration. She is an ASCP registered medical technologist, a certified specialist in blood banking, and holds a Masters of Public Administration degree from the College of Charleston.

Nancy and the laboratory managers are currently focused on devising a plan to offer the same level of quality service Laboratory Services has always provided, but with more efficiency and less waste. The long term goal is to prepare for the future by reducing Medical Center costs by 5 percent this year and another 5 percent next year. Laboratory Services' primary focus is to look at laboratory test and blood product utilization. So far $2.99 million dollars in potential savings have been identified. Through collaboration with physician leaders, faculty and service line administrators and staff, the laboratory management team is looking at ways to use resources more wisely. The IMPROVE performance improvement model will be used to track the progress of each project. This cost reduction initiative will be an ongoing process for the foreseeable future.

New North Area Draw Site and Laboratory

By: Rick Nolte, Ph.D., Director of Clinical Laboratory and Melanie Oswald, MHS, MT(ASCP)SH

Laboratory Services opened a new laboratory and draw site this year that shares the campus with MUSC Specialty Care North on University Blvd next to Charleston Southern University at 2680 Elms Plantation Blvd., Suite 103 in North Charleston. The draw site opened for business on January 1, 2010 and the laboratory opened on April 1, 2010, as soon as we received the CLIA certificate. The lab draw site is open from 7:30 am to 5:00 pm and the laboratory from 8:30 am to 5:00 pm, Monday through Friday. The North Area Laboratory is ably staffed by a Coordinator, Melanie Oswald; two Medical Technologists, Kathryn English and Pamela Ash; and three Phlebotomists, Doris Williams, Tiya Hurst, and Deborah Willis. They can be reached at 843-876-0365/0366 (registration and phlebotomy) or 0367/0368 (laboratory). The test menu currently includes complete blood count with differential, comprehensive and basic metabolic panels, liver panel, lipid panel, magnesium, phosphorous, and uric acid. Urinalysis and sedimentation rate will be added in 2011.

The draw site and laboratory serve physicians and patients at Hollings North Area Infusion Center, Specialty Care North Clinics which include Urology, Orthopedics, Mohs Surgery, Dermatology, Cardiology, Pulmonary, GI, Allergy, Endocrinology, Rheumatology, and Otolaryngology, and MUSC Women's Health at Northwoods. In addition, the convenience of parking, short wait times, and no need to drive downtown for lab tests is appealing to many patients who live in North Charleston and Summerville, but use MUSC physicians located downtown. In fact, some patients stop by the North Area Laboratory on their way to their appointments downtown because of short wait times for phlebotomy.

In addition, our new facility also serves physicians outside the MUSC community at Trident Family Medicine and from three local pediatric practices. The North Area Laboratory joins our East Cooper Laboratory in providing laboratory services to growing number MUSC clinics throughout the Low Country. As an added benefit, laboratory services increases its outreach activities both in terms of numbers of samples and new clients.

Phlebotomist Tiya Hurst delivering samples to the chemistry DxC 600 analyzer

Research Division Update

By: Bradley Schulte, Ph.D.
Vice Chair for Research

The Division of Research has had a busy and productive time from April through August. Twenty-three grant proposals were submitted requesting $3,507,747 in total first year costs. Also, during this period, twelve grants were awarded totaling $1,944,067 over a one-year period (see table below). Congratulations and many thanks to everyone involved in obtaining these awards.

Principal Investigator	Title and Sponsor	Award Date/Amount
Mehrotra, Meenal	Hematopoietic Stem Cell Transplantation In Osteogenesis Imperfecta, 1K01AR059097-01, NIH/NIAMS	4/1/10 $69,027
Moussa, Omar	The Role of Thomboxane A2 (TP) Receptor Beta in Bladder Cancer, 5R01CA127905-02, NIH/NCI	4/1/10 $306,063
Cunningham, Lisa	Mechanisms of Sensory Hair Cell Death And Survival, 2R01DC00763-06A1, NIH/NIDCD	7/1/10 $313,438
Ogawa, Makio	Fracture Repair by Mouse and Human Hematopoietic Stem Cell (IPA), VAMC	7/1/10 $51,437
Sha, Su-Hua	Molecular Mechanisms in Noise-Induced Hearing Loss, 7R01DC009222-02, NIH/NIDCD	7/1/10 $339,243
Lazarchick, John	Evaluation of the Cascade Abrazo Analyzer And DTM Test Card Bivalirudin, POC10020abrazo, Helena	7/18/10 $17,640
Lazarchick, John	Evaluation of the Cascade Abrazo Analyzer And PT-C Test Cards, POC10060abrazo, Helena	7/23/10 $15,653
Lang, Hainan	Experimental and Clinical Studies of Presbyacusis (Project 3), 5P50DC000422-23, NIH/NIDCD	8/1/10 $392,183
Schulte, Bradley	Inner Ear Ion Transport Mechanisms, 5R01DC000713-19, NIH/NIDCD	8/1/10 $303,154
Baker, Tiffany	Heat Shock Protein-Induced Protection Against Cisplatin-Induced Hair Cell Death, 5F30DC010522-02, NIH/NIDCD	9/1/10 $34,679
Spyropoulos, Demetri	Growth and Carcinogenic Potential in the Postnatal Mammary Gland, 5R03HD0600265-02, NIH/NICHD	9/1/10 $73,750
Spyropoulos, Demetri	Role of p38 MAPK in HSC Self-Renewal and Radiation-Induced Bone Marrow Injury, 37647/R01A1080421-04, UAMS (Sub-Award)	9/1/10 $27,800

2010 Annual Service Awards

The Annual Service Awards Ceremony for the Medical University of South Carolina and the Medical University Hospital Authority was held on Thursday, September 30, 2010. Employees who have achieved a milestone of 10, 20, 30, 40, or 50 years of service between July 1, 2009 and June 30, 2010 were recognized at the ceremony. Congratulations and Thank you for your many years of service!

Name	Division	Years of Service
Rebecca Dana	Research	10
Vincent Della Speranza	Histopathology & Special Stains	10
Wanda Shotsberger-Gray	Histopathology & Special Stains	10
Tabitha A. Legare	Laboratory Medicine Business Office	10
Anne Panerosa	Diagnostic Microbiology	10
Brenda Holliday-Hinton	Fast Flow & Satellite Labs	10
Laura N. Scurry	Cytogenetics	10
Travis A. Chappie	Special Hematology & Flow Cytometry	10
Karen S. Garner	Transfusion Medicine	10
Jessica L. Francia	HLA Laboratory	10
Elise M. McPherson	HLA Laboratory	10
Carlene Brandon	Research	20
R. Howard Vaughan	Pathology Business Office	20
Doris Williams	Specialty North Blood Draw Lab	20
Joyce A. Foster	Reference & Specimen Referral	20
Patti R. Lofmark	Lab Outreach and Courier Service	20
Frances C. Donnelly	Diagnostic Microbiology	20
Joseph N. Rozier	Cytogenetics	20
Andrew D. Johnson, Jr	Transfusion Medicine	20
Eugene W. Holbert	Special Chemistry and Immunology	20
Robin R. Schrieber	Special Chemistry and Immunology	20
Patricia Wanstreet	Venipuncture	30
Rene J. Russell	Lab Outreach and Courier Service	30
Sonyra B. Johnson	Fast Flow & Satellite Labs	30
Deborah E. Gilliard	Transfusion Medicine	30

Chief Residents' Page

By: Anne Bartlett and Angie Duong, Chief Residents

Our first year residents have done a great job after setting out on their own after the July training month. Our upper level residents have also done a good job transitioning into the new surgical pathology schedule.

Everyone is working hard and many are making time for research. At the CAP 2010 meeting in Chicago, several residents had poster presentations covering a large range of topics that included:

- **Evelyn Bruner, MD**: Diffuse Bronchogenic Adenocarcinoma; A Rare Presentation of Primary Lung Cancer
- **Ben Coulter, MD**: Characterization of p16 Immunohistochemical Staining in Benign and Malignant Lipomatous neoplasms
- **Jason Hope, MD**: Recuurr resp papillomatosis: a cyto-histologic correl of a diff case
- **Ford Rogers, MD**: Infiltrative Brain Metastasis Masquerading as Primary Gliomas
- **Lin Zhang, MD, PhD**: Clinical Correlation Between Point-of-Care i-STAT Troponin I and Laboratory Centaur Troponin I Ultra Assays

Congratulations to **Evelyn Bruner, MD** for being elected to the ASCP Resident Council.

Lastly, interview season is nearly upon us again. Look for resident candidates wandering the halls starting early November. This year's recruiting efforts will be led by Drs. Ben Coulter and Roger Stone.

As always, we are always around if you need to talk to us!

Angie and Anne

Resident Spotlight

Linsheng Zhang, M.D., Ph.D., 4th year resident, received the "CAP Resident Research Grant" from College of American Pathologists (CAP) Foundation. It supports a pathology resident's research for a one-year period of time. Dr. Zhang's proposed research project is "Genome-wide Analysis of Genetic Aberrations in Multiple Myeloma using SNP Arrays." The study will provide useful information to bring SNP array into molecular pathology evaluation of multiple myeloma in the clinical laboratory. Dr. Wolff is the supervising faculty of this research project. Recently, Dr. Zhang also worked with Dr. Wolff to complete a clinical validation on the SNP array genomic profiling in chronic lymphocytic leukemia. An abstract on the SNP array genomic profiling of chronic lymphocytic leukemia has been submitted to the USCAP 2011 annual meeting, and Drs. Zhang and Wolff are working on a manuscript for publication.

Also this year, Dr. Zhang has a review article, "Mitochondrial Disorders of DNA Polymerase gamma Dysfunction: From Anatomic to Molecular Pathology Diagnosis" provisionally accepted for publication in Archives of Pathology and Laboratory Medicine. He had a poster presentation entitled "Clinical Correlation Between Point-of-Care i-STAT Troponin I and Laboratory Centaur Troponin I Ultra Assays" at the CAP10 meeting in Chicago in September. The presentation was a result of a study he completed during his clinical chemistry rotation with Dr. Zhu. In addition, a study that Dr. Zhang worked on with Dr. Self on the flow cytometry immunophenotyping of multiple myeloma to detect the minimal residual disease is also very successful. His abstract, "Detection of Minimal Residual Disease of Plasma Cell Myeloma by Five Color Flow Cytometric Immunophenotype Analysis," on the project has been accepted by American Society of Hematology (ASH) annual meeting in December this year.

Next year, Dr. Zhang will head to Emory University Hospital for Hematopathology Fellowship training.

Upcoming National Pathology and Pathology-related and Laboratory Medicine-related Meetings

October 27-31, 2010
ASCP — American Society of Clinical Pathology, Annual Meeting
San Francisco, CA

December 4-7, 2010
ASH — American Society of Hematology
Orlando, FL

December 8-12, 2010
San Antonio Breast Symposium
San Antonio, TX

February 24-March 6, 2011
USCAP — United States and Canadian Academy of Pathology
100th Annual Meeting
San Antonio, TX

Seminar in Pathology Conference Schedule

Conferences are held at 12:00 pm in CH204 unless otherwise noted

1st Semester	**Fall Course 2010-2011**
October 18, 2010	Shimon Francis Dr. Cunningham's Lab
November 1, 2010	Tiffany Baker Dr. Cunningham's Lab
November 15, 2010	Claire Hinsch Dr. Dammai's Lab
November 29, 2010	Ashley Smith Dr. Turner's Lab
December 13, 2010	Kummetha Jagadish Dr. Dammai's Lab
December 27, 2010	**NO SEMINAR** **Holidays**

2nd Semester	**Spring Course 2010-2011**
January 10, 2011	Melissa Scheiber Dr. Watson's Lab
January 24, 2011	Josh Kellner Dr. Zhou – Schulte's Lab
February 7, 2011	Venkatesababa Samanna Dr. Dammai's Lab
February 21, 2011	Elizabeth Fowler Dr. Moussa's Lab
March 7, 2011	Phil Sobolesky Dr. Moussa's Lab
March 21, 2011	Devadoss Samuvel Dr. Lang's Lab
March 28, 2011	Dr. Jochen Schacht (per Su-Hua Sha) Kresge Hearing Reseach Institute University of Michigan
April 4, 2011	Linsday McDonald Dr. LaRue's Lab
April 18, 2011	Darren Preece Dr. Watson's Lab

MUSC DEPARTMENT OF PATHOLOGY AND LABORATORY MEDICINE

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