

PROMOTION AND TENURE FILE FOR:

Curriculum Vitae  
10/31/2005-10/31/2006

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**EDUCATION:**

Ph.D.	Syracuse University, Syracuse, New York Major: Molecular Virology Minor: Microbiology	1969
M.S.	Syracuse University, Syracuse, New York Major: Microbiology Minor: Bacteriology	1967
B.S.	Norwich University, Northfield, Vermont Major: Biology	1964

**APPOINTMENTS:**

Professor, Department of Pathology WVU School of Medicine	1990-present
Senior Microbiology Consultant and Antibiotic Outcome Director	2005-present
Director, Biofilm Research Laboratory for Translational Studies in Medicine, Dentistry and Industry	2005-present
Adjunct Professor, Department of Microbiology WVU School of Medicine	2001-present
Adjunct Professor WVU School of Pharmacy	2001-present
Clinical Professor, Director of Periodontics WVU School of Dentistry	1997-present
Graduate Faculty, Department of Medical Technology WVU	1990-present
Director, Microbiology/Virology Laboratories, WVUH	1990-2005

**I. HONORS/AWARDS/NOTEWORTHY ENDEAVORS**

2006 was the year of international travel and recognition of the Ventilator Endotrach Lung (VEL) Model. Recently, significant focus has been recognized on the emerging connection of oral and systemic diseases, specifically diabetes, atherosclerosis, adverse pregnancy outcomes (low birth

weight babes and PROM), and pulmonary (ventilator associated pneumonia). The 6 nation, 9 symposiums, Asia-Pacific Educational Tour (sponsored by Pfizer) was extraordinary, as was the corresponding recognition in the United Kingdom with a potential sabbatical at Cardiff University, Wales (my heritage). Our subsequent development of an International Advisory Board to focus on international oral health was a key ingredient of our co-biofilm studies (dental-systemic) in the VEL Model.

- *Alumni Association Achievement Award 2006.*  
West Virginia University School of Dentistry
- *Award for Student Research Development 2006*  
West Virginia University School of Dentistry
- Received 40 year pin, American Society of Microbiology
- August 1, 2006, FDA Approved for RCT (Randomized Clinical Trial of Silver containing ETT (endotrach tube), following 3 year study of Ventilator-Endotrach-Lung (VEL) Model  
Tyco Healthcare Nellcor Division
- Appointed Waksman Foundation for Microbiology Lectures (ASM).
- Invited Keynote Speaker for Pfizer Asia-Pacific Educational Tour of 14 lectures through 6 countries spanning 29,000 miles in 21 days.
- WVU School of Dentistry  
1<sup>st</sup> Place-Mentor for 3<sup>rd</sup> Year Student Research Day Project  
3<sup>rd</sup> Place-Mentor for 3<sup>rd</sup> Year Student Research Day Project

## II. PROFESSIONAL SOCIETIES

American Society for Hospital Pharmacists (ASHP)	1999-present
American Association for Dental Research	1998-present
American Anaerobic Bacteriology Society	1992-present
Pan American Society for Rapid Viral Diagnosis	1990-present
Infectious Disease Society of America	1989-present
American Association of BioAnalyst	1987-present
South Central Association for Clinical Microbiology	1978-present
Area Director-Northern Ohio 1982, 1989	1982,1989
Area Director-Northern West Virginia 1996-1998	1996-1998
South Eastern Association for Clinical Microbiology	1978-present
American Society for Microbiology (40 Year Member)	1966-present
American Association for the Advancement of Science	1964-present
N. Y. Academy of Sciences	1964-present
Tissue Culture Association	1964-present

## III. SCHOLARALY ACTIVITIES/PUBLICATIONS/INVITED PRESENTATIONS/ABSTRACTS

Publications reflected a growing awareness of the cost of biofilm associated diseases, particularly oral-pulmonary, and the need for new strategies recognizing chronic infections and anti-Koch postulates.

## 1. Textbooks

- Thomas, J., Nakaishi, L., Corum, L. “Antimicrobial Anti-infective Coated Medical Devices: Costs and Consequences of Biofilms” in “Disinfection and Decontamination: Principles, Applications, and Related Issues. CRC Press. 2007.
- Thomas, J., Thomas, J. and Rector, N. Chapter 7 Antibiofilm/Preventative Surveillance: A Continuum of Data Collection, Analysis and Presentation.
- Textbook of Diagnostic Microbiology, 3<sup>rd</sup> Edition. Mahon, C.R., Lehman, D.C. and Manuselius, G. Eds. “Biofilms: Architects of Disease.” Chapter 31. 2007.
- Thomas, J., Lynton, I., Rinde, H. Economic Impact of Biofilms on Treatment Costs. *Biofilm Infect Antimicrob Therapy*. 2005;21-37

## 2. Manuscripts

- Thomas, J. and Nakaishi, L. Managing the Complexity of a Dynamic Biofilm (Article in Importance of Antiseptic Mouthrinses in the Daily Oral Care Regimen Supplement). *JADA* November 2006.
- Ramadan, H., Sanclement, J., Thomas, J. Chronic Rhinosinusitis and Biofilms. *Otolaryngology Head Neck Surg* 2005;132:414-7.
- Sanclement, J., Webster, P., Thomas, J., and Ramadan, H. Bacterial Biofilms in Surgical Specimens of Patients with Chronic Rhinosinusitis. *Laryngoscope* 1994;115:578-582.
- Thomas, J. Biofilms. *APIC Epidemiology*. 2005;96:1-13.
- Livengood, R. and Thomas, J. A Unique Fungal Infection requiring Mold MIC's. *Clinical Microbiology Newsletter*. 2006.
- Thomas, J., Parsons, J., and Canfield, P. The Changing Culture in Infectious Disease. *Advance Magazine for Administrators*. June 2005.
- Thomas, J. Anaerobic Infections. *Advance Magazine for Administrators*. September 2005.
- Thomas, J. Antibiotic Resistance and the Clinical Laboratory. *Advance Magazine for Administrators*. July 2005.
- Thomas, J. Review for Microbiology. *Advance Magazine for Administrators*. December 2005.
- Thomas, J. Biofilm Update: Importance to Clinical Microbiology Laboratory. Review in *Medical Microbiology*. G. Hall Ed. (Lippencott, Williams, and Wilkens) (Accepted)
- Thomas, J. Chemical Constituents and Antimicrobial Activity of a Traditional Herbal Medicine Containing Garlic and Black Cumin. *African Journal of Traditional, Complementary and Alternative Medicines*. *Afr. J. Trad. CAM* 2006;3.
- Thomas, J. The Year 2006 for Microbiology: Changing Paradigms. *ADVANCE for Administrators in Laboratory*. 2007.

## 3. Abstracts/Posters Presented in 2005/2006

- Thomas, J.G., Carpenter, J., Martens, P., Gray, D., and Nakaishi, L. Imaging luminal location of the ETT accretions by CT Topographical radiography. ICACC 2006 San Francisco
- Thomas, J.G., Martens, P., Gray, D., Nakaishi, L., and Ortiz, M. Impact of ETT accretions on airway resistance in mechanically ventilated patients. ICACC 2006 San Francisco.
- Thomas, J., Sokos, LG., Canfield, P., Gray, D. Linking Adverse Outcome of Fungemic Patient to Organism Resistant Phenotype: BEC<sub>50</sub> : MIC. ASM 2006 Orlando
- Thomas, J., Martens, P., Gray, D., Nakaishi, L., Thomas, K. The Impact of Silver Ions Upon Oral/Dental flora Co-Biofilm Colonization in Endotrach (ETT) ASM 2006 Orlando
- Sessa, A., Thomas, J., Myers, A., Schwegler-Berry, D. Anti-biofilm Effect on Oral Rinses on an Engineered Tooth Model. IADR 2006 Orlando.
- Thomas, J., Gray, D., Nakaishi, L., Crout, R., McNeil, D., Weyant, R., Marazita, M. 3 Species Oral Microbial Signature from two Rural Populations. IADR 2006 Orlando.
- Thomas, J., Kepner, D., Styers, D. Unmasking Significant Periodontal Antibiotic Resistance. IADR 2006 Orlando.
- Vest, D., Ngan, P., Thomas, J., Crout, R., and Eckley, B. Microbiological Assessment of Orthodontic Patients after Removal of Orthodontic Appliances. IADR 2006 Orlando.

#### **Submitted for 2007**

- Thomas, J.G., Cannon, D.S., Harris, G.V., and Vaughan, W.D. Strategizing a dental-medical co-oral evaluation for the vented patient. IADR 2007 New Orleans.
- Thomas, J.G., Nakaishi, L.A., Ellis, J.S., and Kepner, D. Enterococcus faecalis-resistance endodontic pathogen not found in oral cultures. IADR 2007 New Orleans.
- Thomas, J.G., Gray, D.M, Crout, R., and Marazita, M. Unmasking Candida albicans as an emerging oral microbial signature. IADR 2007 New Orleans.
- Thomas, J.G., Parson, J., Nakaishi, L.A. Endotracheal Tube (ETT) Dental-Systemic Co-biofilm. IADR 2007 New Orleans.

#### **4. Invited Presentations/Workshops/Symposiums/Speaking Engagements**

##### **National**

Presentations reflected the maturity of our VEL Co-Biofilm model and its contribution to unraveling very expensive diseases, both morbidity and mortality wise.

- Dentsply Endodontics Seminar. Keynote Speaker. Oral Biofilms Links to Disease: Head to Toe. Steamboat, CO. February 4, 2006.
- West Virginia University School of Dentistry. Oral Biofilms Links to Disease: Head to Toe. WVU Dental Research Day. February 7, 2006.
- HOST for the West Virginia University Center for Immunopathology and Microbial Pathogenesis lecture on “Biofilms (Microbial Communities).” March 23, 2006
- Mon Valley Dental Society. Oral Biofilms Links to Disease-Head to Toe. Bridgeport, WV. May 2006.
- Bio-Merieux-ASM. Measuring Microbiology’s Value in a Pay-4-Performance Environment. Orlando, FL. May 2006.
- Ortho-McNeil (Levo)-ASM. Antibiotics and Collateral Damage. Orlando, FL. May 2006

- Strategies for Minimizing Antimicrobial Resistance: Improving the Process. Pittsburgh, PA. June 2006.
- American Society for Clinical Laboratory Science Annual Meeting. Biofilms: Architects of Chronic Diseases. Chicago, IL. July 2006.
- American Society for Clinical Laboratory Science. Clinical Rounding—How we make it work in Microbiology. Chicago, IL. July 2006.
- Pathology Grand Grounds West Virginia University School of Medicine. Biofilm Scandals in the Oral Cavity: Architects of Disease. Morgantown, WV. August 2006.
- Dentsply. Today's Standards for Root Canal Cleansing. National Web-cast. Morgantown, WV 2006.
- Allegheny General Hospital. Biofilm Scandals in the Ventilated Patient: Links to Pulmonary Infections via Up-Regulation. Pittsburgh, PA. August 2006.
- Virginia Dental Society. Oral Biofilms Links to Diseases-Head to Toe. Roanoke, VA. September 2006.
- Tyco Healthcare Nellcor. Biofilm Scandals in the Ventilated Patient: Links to Pulmonary Infection Via Up-Regulation and Colonization with Dental Flora. Pleasanton, CA. September 2006.
- Tulsa-Dentsply. Bio-Pure Webcast. Tulsa, OK. September 2006.
- Infectious Diseases Epidemiology and Surveillance (IDEAS). Biofilms: The Scourge of Infection Control. Harrisburg, PA. October 2006.
- AB BioDisk. When "S" Does Not Mean Success. Pittsburgh, PA. October 2006.
- American Institute of Oral Biology. Biofilm Scandals in the Oral Cavity. Palm Springs, CA. October 2006.
- American Institute of Oral Biology (AIOB). Links to Systemic Infections: Head to Toe. Palm Springs, CA. October 2006.
- WVU Department of Obstetrics and Gynecology Grand Rounds. Scandals in OB/GYN Microbial Pathogenesis: Anti-Koch and Biofilms. Morgantown, WV. October 2006.

### **International**

- Established International recognition and created an Asia-Pacific Advisory Committee for Oral Health Awareness
- Asia Pacific Educational Tour. Biofilms: Oral and Systemic Diseases
  - Thai Periodontal Society. Plaque Biofilm and Oral Health. Bangkok, Thailand. April 5, 2006.
  - Thai Society for Public Health Dentistry. Relationship of Oral Health to General Health—Myth or Truth AND Prevention of Periodontal Diseases in ANC Clinic. Bangkok, Thailand. April 5, 2006.
  - International Dental Exhibition and Meeting (IDEM) Symposium on Minimal Intervention. Oral Biofilms: Architects of Disease, Head to Toe. Singapore. April 7, 2006.
  - Global Expert Panel Meeting. Mouthrinses: Impact on Oral Health. Singapore. April 8, 2006.
  - National University of Singapore Faculty of Dentistry Lecture. Changing Paradigms in Oral Microbiology: Its Growing Significance in Systemic Diseases. Singapore. April 10, 2006.

- University of Hong Kong. Biofilm Management and Control AND Strategies for Combating the Bacterial Plaque Biofilm. Hong Kong. April 11, 2006.
- Malaysia Dental Association Lecture. Oral Biofilms: Architects of Disease, Head to Toe AND Mouthrinses: Impact on Oral Health. Kula Lumpur, Malaysia. Thursday, April 13, 2006.
- FDI World Dental Federation Lectures. Biofilm and Oral Diseases AND Strategies for Combating the Bacterial Plaque Biofilm AND Biofilms and Implants. Taichung, Taiwan. April 15, 2006.
- Peking University School of Dentistry lecture. Strategies for Combating the Bacterial Plaque Biofilm. Beijing, China. April 17, 2006.
- Pfizer Round Table. Biofilm Scandals in the Oral Cavity: Architects of Disease. London, England July 2006.

#### **IV. TEACHING/EDUCATION/MENTORING/PRECEPTORSHIPS/FACULTY VISITATIONS**

Teaching continued to be the best part of my academic career. Students also provided laboratory support and outstanding research. The mix of dental, medical, pharmacy, undergraduate, and post-doc students, provided a unique depth. We also implemented the first dental-medical protocol for evaluating the oral health status of intubated patients.

##### **1. Teaching/Courses/WVU**

*Contact HRS 40hrs*

- Micro Immuno (Medical) 721 (9 lectures)
- Micro Immuno (Dental) 701 (6 lectures and 4 laboratories)
- Dental Hygiene with Dr. Wanker (1 lecture)
- Periodontics (3<sup>rd</sup> Year) Course (1 lecture) Dr. Crout
- 761T (Course Director, Special Microbial Problems in Endodontics, 4 credit hours) Spring (25 lectures, 6 labs)
- Pathology 751 (2<sup>nd</sup> Year Medical Students) (9 lectures)
- Tropical Medicine Course: Infectious Disease (3 lectures).

##### **2. Mentoring**

###### **A. Dental (3<sup>rd</sup> Year Dental Student Research)**

*Contact HRS 100hrs*

- Kolin Weaver: “An *In Vitro* Study of the Affinity of Oral Flora for Orthodontic Anchorage Implants.” 3<sup>rd</sup> Place at the WVU Dental Research Day
- Mark Knott: Phase II “*In Vitro* Anti-biofilm Effect on Er:YAG Laser, Carbide Bur, and Chlorohexidine on Pit and Fissures.”
- Dan Cannon, Billy Vaughan, Greg Harris: “Assessing Oral Hygiene as a Risk Factor for Ventilator Associated Pneumonia.”
- Cody Lockhart, Tony Smallwood: “Anti-Infective Synergy.”
- Carly Lemely, Scott Seago: “Comparative Study of Anti-infective Mouthrinses using the Engineered Tooth Biofilm Model.”
- John Pyle: “Synergy of Oral-Systemic Isolates”

- Misty Short: “The Potential Use of Silver-Impregnated Bristles in a Toothbrush.”
- B. Undergraduate** (WVU Pre-Dental)  
*Contact HRS 20 hrs*
- Adam Myers: “Anti-Biofilm Effect of Oral Rinses on an Engineered Tooth Model.”
  - Jason Ellis: “MTAD Effectiveness using ZOI Assay in Periodontal Disease”
- C. Dental Post-Doctoral**  
*Contact HRS 20 hrs*
- Devan Vest, D.D.S. Phase II: “Microbial Assessment Post-Orthodontic Removal.
  - Lindsay Jackfert D.D.S: “An *In Vitro* Study of the Affinity of Oral Flora for Orthodontic Anchorage Implants”
  - Kent McBride D.D.S: “A Micro CT Pilot Study Evaluating the Ability to Two Irrigants to Remove Endodontic Biofilm”
- D. Medical/Post-Doctoral Research** (3 month rotation)  
*Contact Hours 100 hrs*
- Scott Oxley, M.D.—Ear, Nose and Throat: “Response of Tympanostomy Tube Biofilms to Otological Medications”
  - Jeremy Parsons, 4<sup>th</sup> Medical Student: “Endotracheal Tube (ETT) Dental-Systemic Co-Biofilm and the Effect of Azithromycin” (Supported by Pfizer)

**V. SERVICE ACTIVITIES (WVUH CLINICAL LABORATORIES)/ADMINISTRATION (COMMITTEES)**

Service activities reflected a shift in emphasis from Director of Microbiology to Translational Research, although biofilm related activities were emphasized in WVUH. The major activity was the development and implementation of the Antibiotic Therapy Guide, 2<sup>nd</sup> Edition, in concert with WVUH Pharmacy.

**1. Committees**

**A. International**

- Member of the Microbiology Faculty of the Council for Appropriate and Rational Antibiotic Therapy (C.A.R.A.T) (Supported by Ortho-McNeil)
- International Dental Exhibition and Meeting (IDEM) Advisor for Asia-Pacific Committee on Antiseptic Oral Mouthrinses (Supported by Pfizer)

**B. National**

- **Nebraska Safety Board of CMTs (Clinically Modified Tetracycline)**

Member, NIH Data and Monitoring Board, National Institutes of Health (1 RO1 DE12872-01A2) Low Dose Doxycycline Affects on Osteopenic Bone Loss, Principal Investigator, Dr. Jeffery Payne, University of Nebraska, 2001-2006.

**B. WVUH**

- International Health Institute (IHI) (Line Sepsis)
- International Health Institute (IHI) Ventilator Associated Pneumonia
- Infection Control Committee
- Pharmacy and Therapeutics Committee

**C. WVU School of Medicine**

- Center for Immunopathology and Microbial Pathogenesis (CIpMP) Coordinating Committee

**D. WVU School of Dentistry**

- Research Committee
- Admission Committee

**E. Laboratory Activities (WVUH)**

- Developed Biofilm MBEC (Minimal Biofilm Elimination Concentration) for: Systemic (BSI), Urinary, Pulmonary, Dental, and Fungal Diseases.
- Published unique signature for BSI by 6 WVUH service areas
- Modified and updated the Multi-Disease Risk Assessment (MDRA) to reflect newer ICU patient criteria
- Developed Pharmacy and Therapeutics new anti-infective card 2006  
Microbiology consultant for the WVUH Pharmacy Antimicrobial Rotation: ICU/BMTU
- MERCK STAR Program: Strategies for Reducing Antimicrobial Resistance
- Mountain State Oral-Facial Microbiology Laboratory  
Update on report results and newest antibiotic therapy and dosing.

**VI. TRANSLATIONAL RESEARCH LABORATORY/EXTRAMURAL BIOMEDICAL GRANT SUPPORT/CONTRACT WORK/CONSULTATION (DENTISTRY/MEDICINE)**

On August 1, 2006, the FDA tentatively approved a Random Clinical Trial (RCT) for the Guardian ETT in a multi-center, international study. This included new the new Work of Breathing (WOB)/Pressure Drop data and the use of imaging to address the accretion of accumulation and increased airway resistance.

2005/2006 also saw the implementation of the WVU Center for Immunopathology and Microbial Pathogenesis (CIpMP), one of the 5 Centers recognized by WVU School of Medicine. Our Biofilm Laboratory for Translational Studies became a key ingredient and was instrumental in

designing/implementing the Quarterly CIPMP Symposium. Its focus was to create a University-wide awareness of microbial communities.

Creation of Biofilm Research Center for Translational Studies in Medicine, Dentistry, and Industry. Linked to 14 WVU sections including national resources. Hired 4 researchers, including one Ph.D. with \$410,000 in support from US Surgical, Tyco/Nellcor, and Pfizer, which pay 90% of salary and provide ventilators valued at \$400,000.

This was also the time for international collaboration and allowed us to integrate with several universities of Asia-Pacific, driven by a common goal of standardizing oral care. This was based on the “Minimal Intervention” concept. It was connected to our studies of a dental-systemic co-biofilm and the importance of *Strep. mutans* yeast and *Pseudomonas* spp. in the ETT lumenal biofilm.

## **1. Current Biomedical Support**

### **A. Tyco Healthcare, Nellcor Division**

#### Assessment of Antigen Coated Endotrachs of Biofilm Formation (“Guardian”)

- Principal Investigator: John G. Thomas (\$136,000). Three research fellowships. Expanded to 6 workstations (\$380,000) supporting additional graduate student and lead technologist. Supports, 50% of PI Salary and one full-time technologist .
  - An industry based study investigating biofilms on a silver anti-biofilm endotrach tube (ETT) and prevention of VAP (ventilator associated pneumonia).

#### “Guardian” ETT Pressure Drop Study

- Principal Investigator: John G. Thomas
  - A prospective, multi-center, controlled study to evaluate the safety and the effect of the Guardian on the extubated endotracheal tube’s Pressure Drop from intubated subjects who require more than 24 hours of mechanical ventilation.

### **B. Center for Oral Health in Rural Appalachia (COHRA)**

#### Genetic Factors Contributing to Oral Heath Disparities in Appalachia NIDCR 1-R01-DEO14899 (2002-2009)

- Principal Investigator: R. Crout , J Thomas, Support 15% of salary and full-time technologist (\$224,993).
  - NIH Grant, in conjunction with The University of Pittsburg, investigating oral health disparities in rural West Virginia and Pennsylvania.

#### Awarded new Microbiology Supplemental Grant. NIDCR 1-R01-DEO14899-S1 (2006-2009)

- Principal Investigator: J. Thomas, Supports 50% of PI salary and 60% of technologist salary (\$224,000).
  - NIH Grant, in conjunction with the University of Pittsburg, which investigates the Oral Microbial Signature (OMS).

**C. Tyco Healthcare, US Surgical Division**

Anti-infective Suture Polymer

- Principal Investigator: J. Thomas, Support of 25% of PI salary, 3 technologists and one Ph.D. (\$430,000)
  - Study evaluating methods of preventing Biofilm formation on anti-infective polymer sutures.
  - Introduced non-culture methods: BacTiter Glo and PNA-FISH.

**D. PFIZER (Phase II)**

Immune Modulator, Azithromycin and Endotrach Intra-Luminal Biofilms

- Principal Investigator: J. Thomas Phase II (\$12,000)
  - Study to determine effect of AZ on luminal biofilm development, when administered at different times.

**E. West Virginia University Eberly College of Arts and Sciences**

- Principal Investigators: G. O'Doherty and J. Thomas. (\$40,000)
  - Study to measure synthetic polypeptides on biofilms in VAP.

**2. Potential Biomedical Support-Ongoing Preliminary Studies**

**A. Key Bay Pharmaceuticals, Pittsburgh, PA**

Use of Polypeptides as Anti-infectives in Endodontic Infections

- Principal Investigator: J Thomas. Would Support 40% overhead and one full time Ph.D. Post-Doc (\$\$\$\$)

**B. Tulsa/Dentsply/Endodontic**

Evaluation of New Anti-Biofilm Anti-Infective Polypeptide in Endodontic Infections

- Principal Investigator: J. Thomas. Would Support 40% overhead and one full time Ph.D. Post-Doc (\$\$\$\$)

The Use of BioPure MTAD as an Anti-Biofilm Irrigation in Endodontic Infections

- Principal Investigator: J. Thomas. Would Support 40% overhead and one full time Ph.D. Post-Doc (\$\$\$\$)

**C. James Ge**

New B-lactam antibiotics

- Principal Investigator: J. Thomas

**D. DRG (Drug Related Group) (WVU)**

Investigation of DRGs and Costs

- Principal Investigators: J. Thomas and J. Olson.

**VII. OUTREACH/DISTANT LEARNING (WEB-BASED LEARNING)/COMMUNITY SERVICES**

Outreach activities expanded considerable with international collaboration established during the Asia Pacific Educational Tour with China continuing to use the MDRA form.

- Thomas et al. 17<sup>th</sup> Annual Microbiology One Day Symposium. Stonewall Jackson Resort, West Virginia. September 24-25, 2006.
- Updated online Multi-Disease Risk Assessment (MDRA) form for clinic use in China: <http://www.hsc.wvu.edu/som/pathology/thomas/clinicalTools/>
- Created new WVU website for “Clinical Tools” and “Educational Resources.”