

Matthew B. Renfrow

Assistant Professor
Department of Biochemistry and Molecular Genetics
Director, UAB Biomedical FT-ICR Mass Spectrometry Laboratory
570 McCallum Basic Health Sciences Building
University of Alabama at Birmingham
Birmingham, Alabama 35294-0005
Phone: (205) 996-4681 Lab: (205) 996-7562 FT-lab: (205) 996-5396
renfrow@uab.edu



Research Interests

Principal research interests involve advanced mass spectrometry techniques for structural analysis of biomolecules; specifically, the use of high resolution Fourier transform-mass spectrometry (FT-MS) in the analysis of clustered sites of *O*-glycosylation of IgA1 and other proteins; application of proteomics and mass spectrometry-based structural biology to nuclear receptors (RXR) and their protein-protein and protein-DNA interactions.

Education

2002.11 - 2004.11	Post Doctorate	National High Magnetic Field Laboratory, Ion Cyclotron Resonance Program, Florida State University, Tallahassee, FL USA Mentor: Alan G. Marshall (Co-Inventor of FT-ICR MS)
1996.08 - 2002.12	PhD Biochemistry	University of Georgia, Athens, GA USA Dissertation: “ <i>Analysis of Protein-DNA Interactions Within the Transcription Preinitiation Complex of Pyrococcus Furiosus</i> ” Mentor: Robert A. Scott
1992.08 - 1996.05	B.S. Biochemistry B.S. Recombinant Genetics	Western Kentucky University, Bowling Green, KY USA <i>Cum Laude</i>

Professional Experience

2008.05 -	Associate Scientist , Comprehensive Cancer Center, University of Alabama at Birmingham.
2005.08 -	Director , UAB Biomedical FT-ICR MS Laboratory
2004.12 -	Assistant Professor , Department of Biochemistry and Molecular Genetics, University of Alabama at Birmingham, Birmingham, AL USA

Honors and Awards

2010.05 - 2011.04	Pilot Award , Alabama Drug Discovery Association, UAB Comprehensive Cancer Center
2008.03 - 2009.09	Career Development Award , NIH UAB SPORE in Breast Cancer
1996.08 - 1998.07	NSF predoctoral traineeship , Center for Metalloenzyme Studies, University of Georgia
1996.05	Outstanding Chemistry Major, Hypercube Award , Department of Chemistry, Western Kentucky University
1992.08 - 1996.05	Regents Scholar , Western Kentucky University

Professional Memberships

American Society for Mass Spectrometry.
US Human Proteome Organization

Publications

Research Articles

24. Boerma, L.J., Gang, X., Cox, B., Muccio, D.D., **Renfrow, M.B.**, “Structural and functional analysis of anti-cancer rexinoids” *manuscript in preparation*.
23. Smith, A.D, IV, Bowersock, G., Rose, K., Busby, J., Barnes, S.B., Mobley, J.A., **Renfrow, M.B.**, “Cross Platform analysis of standard protein mixtures” *manuscript in preparation*.
22. Takahashi, K., Smith, A.D., IV, Julian, B.A., Mestecky, J., Novak, J., **Renfrow, M.B.**, “Identification of Native Structural Isomers in IgA1 Hinge-region *O*-Glycosylation Using High-resolution Mass Spectrometry” (2010) *manuscript in preparation*.
21. Gang, X,* Boerma, L.J.*, Kang, S., **Renfrow, M.B.#**, Muccio, D.D.#, “Structure, Energetics, and Dynamics of Binding Coactivator Peptide to Human Retinoid X Receptor Alpha Ligand Binding Domain Complex with 9-cis-Retinoic Acid” (2010) *submitted to Biochemistry; under revision*. *co-first authors, #co-corresponding authors.
20. Takahashi, K., Wall, S.B., Suzuki, H., Hall, S. Smith, A.D.,IV, Poulsen, K., Kilian, M., Julian, B.A., Mestecky, J., Novak, J., **Renfrow, M.B.**, “Clustered *O*-glycans of IgA1: Defining macro- and micro- heterogeneity by use of electron capture/transfer dissociation” (2010), *Mol. Cell. Proteomics* Epub Sep 7.
19. Raska, M.#, Takahashi, K., Hall, S., Moldoveanu, Z., Elliot, Wilson, L., Brown, R., Barnes, S., Tomana, M., Smith, Mestecky, J., **Renfrow, M.B.#**, Novak, J#. “Glycosylation pattern of HIV-1 gp120 is cell specific and affects binding of neutralizing antibodies. (2010) *J. Biol. Chem.* Jul 2;285:20860-9. #co-corresponding authors.
18. Stella, D.R., Floyd, K.A., Grey, A.C., **Renfrow, M.B.**, Schey, K.L., and Barnes S., “Tissue localization and biophysical properties of α -crystallin and its numerous truncation products in the cataractous ICR/f rat lens.” (2010) *Invest. Ophthalmol Vis Sci.* Oct; 51:5153-61.
17. Zhang, Y., Smith, A.D., IV, **Renfrow M.B.**, Schneider, D.A. “The Paf1 complex directly increases the elongation rate of RNA polymerase I and is required for efficient regulation of rRNA synthesis” (2010), *J. Biol. Chem.* May 7;285:14152-9.
16. Wada, Y., Dell, A., Haslam, S.M., Tissot, B., Canis, K., Azadi, P., Backstrom, M., Costello, C.E., Hansson, G.C., Hiki, Y., Ishihara, M., Ito, H., Kakehi, K., Karlsson, N., Koichi, K., Kawasaki, N., Khoo, K.-H., Kobayashi, K., Kolarich, D., Kondo, A., Lebrilla, C., Nakano, M., narimatsu, H., Novak, J., Novotny, M.V., Packer, N.H., **Renfrow, M.B.**, Tajiri, M., Thomsson, K.A., Yu, S.-Y., Taniguchi, N., “Comparison of methods for profiling *O*-glycosylation: HUPO Human Disease Glycomics/Proteome Initiative multi-institutional study of IgA1” (2010) *Mol Cell. Proteomics.* Apr 9(4):719-27.
15. Singh, A., Crossman, D.K., Mai, D., Guidry, L., Voskull, M.I., **Renfrow, M.B.**, Steyn, A.J., “Mycobacterium tuberculosis WhiB3 maintains redox homeostasis by regulating virulence lipid anabolism to modulate macrophage response.” (2009), *PLoS Pathog.* Aug 5(8):e1000545. Epub 2009 Aug 14.
14. Huijbregts, R.P.H., Anton, S., Balasov, M., Stinnett, M.W., **Renfrow, M.B.**, Chesnokov, I. “Drosophila Orc6 facilitates GTPase activity and filament formation of septin complexes” (2009) *Mol. Biol. Cell.*, Jan;20(1):270-81.
13. Gomes, M. M., Wall, S.B., Novak, J., **Renfrow, M.B.#**, Herr, A.B#. “Analysis of IgA1 *N*-glycosylation and its contribution to Fc α RI binding.” (2008) *Biochemistry*, Oct. 28; 47(43):11285-99. #co-corresponding authors
12. Barnes, S., Shonsey, E.M., Eliuk, S.M., Stella, D., Barrett, K., Kim, H., **Renfrow, M. B.**, “High-resolution mass spectrometry of protein oxidations and resultant loss of function” (2008) *Biochemical Society Transactions*, Oct. 36(5):1037-44.
11. Isbell, T.S., Sun, C.-W., Wu, L.-C., Teng, X., Vitturi, D.A., Branch, B.G., Kevil, C.G., Ambalavanan, N., Schiebert, L., Ren, J., Pawlik, K.M., **Renfrow, M.B.**, Patel, R.P., Townes, T.M. “Role of SNO-Hemoglobin in Normal Development and Physiology” (2008) *Nature Medicine.* Jul 14(7); 773-7

10. Kang, S., Poliakov, A., Sexton, J., **Renfrow, M.B.**, Prevelige, P.E., Jr. "Probing Conserved Helical Modules of Portal Complexes by Mass Spectrometry based Hydrogen/Deuterium Exchange." (2008) *Journal of Molecular. Biology*, 381: 772-84.
9. Peng, L., Wang, D., Lucas, J., Oparil, S., Xing, D., Cau, X., Novak, L., **Renfrow, M.B.**, Chen, Y.-F., "ANP Inhibits TFG- β -Induced Signaling and Myofibroblast Transformation in Mouse Cardiac Fibroblasts" (2008) *Circulation Research*, 102:185-92.
8. Shonsey, E.M., Eliuk, S.M., Kirk, M.C. Barnes, S., Falany, C.N., **Renfrow, M.B.** "Inactivation of Human Liver Bile Acid CoA:Amino Acid N-acyltransferase by the Reactive Aldehyde, 4-Hydroxynonenal." (2008) *Journal of Lipid Research*, 49:282-294.
7. **Renfrow, M.B.**, MacKay, C.L., Chalmers, M.J., Julian, B.A., Mestecky, J., Kilian, M., Poulsen, K., Emmett, M.R., Marshall, A.G., Novak, J. "Analysis of O-glycan Heterogeneity in IgA1 Myeloma Proteins by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry: Implications for IgA Nephropathy." (2007) *Analytical and Bioanalytical Chemistry*, 389:1397-407.
6. Eliuk, S.M., **Renfrow, M.B.**, Shonsey, E.M., Barnes, S., Kim, H. "Active Site Modifications of Creatine Kinase Brain Isoform by 4-Hydroxy-2-Nonenal Correlate with Reduced Enzyme Activity; Mapping of Modified Sites by Fourier Transform-Ion Cyclotron Resonance Mass Spectrometry." (2007) *Chemical Research in Toxicology*, 20:1260-1268.
5. Zürbig, P., ***Renfrow, M.B.**, Schiffer, E., Novak, J., Walden M., Wittke, S., Matthias Pelzing, M., Neusüß, C., Theodorescu, D., Root, K.E., Ross, M.M., Mischak, H. "CE-MS and CE-MS/MS as a Powerful Platform in Clinical Diagnosis and Biomarker Discovery." (2006) *Electrophoresis*, June; 27, 2111-2125.
4. **Renfrow, M.B.**, Cooper, H.J., Kulhavy, R., Tomana, M., Emmett, M.R., Mestecky, J., Marshall, A.G., Novak, J. "Determination of aberrant O-glycosylation in the IgA1 hinge region by electron capture dissociation fourier transform-ion cyclotron resonance mass spectrometry" (2005) *Journal of Biological Chemistry*, 280:19136-45.
3. Abbott, K.L.; **Renfrow, M.B.**; Chalmers, M.J.; Nguyen, B.D.; Marshall, A.G.; Legault, P.; Omichinski, J.G. "Enhanced Binding of RNAP II CTD Phosphatase FCP1 to RAP74 following CK2 phosphorylation" (2005) *Biochemistry*, 44:2732-45.
2. **Renfrow, M.B.**, Naryshkin, N.A., Lewis, L.M., Chen, H.-T., Ebright, R.H., Scott, R.A. "Transcription Factor B Contacts Promoter DNA Near the Transcription Start Site of the Archaeal Transcription Initiation Complex" (2004) *Journal of Biological Chemistry*, 279(4), pp. 2825-2831.
1. **Renfrow, M.B.**, Riley, J.M., Jr., Riley, J.T. "ICP Analysis of Aqueous Slurries of Solids," (1997) *Microchemical J.*, 56, 30-39.

* Co-First Author

Co-Corresponding Author

Book Chapters

Novak, J., Moldoveanu, Z., **Renfrow, M.B.**, Yanagihara, T., Suzuki, H., Raska, M., Hall, S., Brown, R., Huang, W.-Q., Goepfert, A., Kilian, M., Poulsen, K., Tomana, M., Wyatt, R.J., Julian, B.A., Mestecky, J. IgA Nephropathy and Henoch-Schoenlein Purpura Nephritis: Aberrant Glycosylation of IgA1, Formation of IgA1-Containing Immune Complexes, and Activation of Mesangial Cells. (2007) In: IgA Nephropathy Today, (Tomino Y., ed.) Contributions to Nephrology, Vol. 157, Karger Corporation, Basel, pp 134–138.

Review Articles

1. Mestecky, J., Tomana, M., Moldoveanu, Z., Julian, B.A, Suzuki, H., Matousovic, K., **Renfrow, M.B.**, Novak, L., Wyatt, R.J., Novak, J., "Role of aberrant glycosylation of IgA1 molecules in the pathogenesis of IgA Nephropathy." (2008) *Kidney & Blood Pressure Research*, 31;29-37.

Selected Published Abstracts

- *Archer D. Smith IV; Philip J. Webber; Andrew B. West; Matthew B. Renfrow; James Mobley, "Hyper auto-phosphorylation in the GTPase domain of the Parkinson's disease associated protein LRRK2." 58th Annual ASMS meeting, Salt Lake City, UA, May 23-27, **2010**.
- *Stella, D.R., Floyd, K.A., Grey, A.C., Renfrow, M.B., Schey, K.L., Barnes, S., "The distribution of the alphaA-crystallin protein and its truncation products in tissue sections from a rodent model of cataracts." 58th Annual ASMS meeting, Salt Lake City, UA, May 23-27, **2010**.
- #Boerma, L.J., Xia, G., Cox, B., Muccio, D.D., Renfrow, M.B., "Screening for unique RXR α -rexinoid interactions by Automated Hydrogen/Deuterium Exchange" 58th Annual ASMS meeting, Salt Lake City, UA, May 23-27, **2010**.
- #Takahashi, K., Hall, S., Smith, A.D., IV, Poulsen, K., Kilian, M., Julian, B.A., Mestecky, J., Novak, J., and Renfrow, M.B., "Characterization of Isomeric O-glycopeptides From Human IgA1 by Activated Ion-electron Capture Dissociation" 58th Annual ASMS meeting, Salt Lake City, UA, May 23-27, **2010**.
- #Smith, A.D., IV, Bowersock, G.J., Wilson, L., Moore, R., II, Busby, J., Barnes, S., Mobley, J.A., Renfrow, M.B., "Cross platform evaluation of a static and dynamic range proteomic mixture comparing search engines and parameters." 57th Annual ASMS meeting, Philadelphia, PA, May 31-June 4, **2009**.
- *Boerma, L.J., Xia, G., Qui, C., Muccio, D.D., Renfrow, M.B., "Hydrogen/Deuterium Exchange analysis of RXR-rexinoid interactions in the presence and absence of coactivator GRIP-1" 57th Annual ASMS meeting, Philadelphia, PA, May 31-June 4, **2009**.
- *Takahashi, K., Wall, S.B., Smith, A.D., IV, Suzuki, H., Hall, S., Mestecky, J., Julian, B.A., Novak, J., Renfrow, M.B., "Defining IgA1 O-glycan Heterogeneity by use of ECD and IgA1 Specific Proteases" 57th Annual ASMS meeting, Philadelphia, PA, May 31-June 4, **2009**.
- *Renfrow, M.B., Wall, S.B., High, A., Chitta, R.A., Mobley, J.A., Novak, J., "ECD vs. ETD; Observations from an O-glycosylated Peptide." 56th Annual ASMS meeting, Denver, CO, June 1-5, **2008**.
- *Wall, S. B., Gomes, M.M., Novak, J., Herr, A.B., Renfrow, M.B., "Analysis of IgA1 N-glycans Towards Understanding their Role in Binding Fc receptor Fc α RI." 56th Annual ASMS meeting, Denver, CO, June 1-5, **2008**.
- *Boerma, L.J., Xia, G., Kang, S., Muccio, D.D., Renfrow, M.B., "Development of a Structure Based Assay for Characterization of Synthetic Rexinoids by use of Hydrogen Deuterium Exchange Mass Spectrometry." 56th Annual ASMS meeting, Denver, CO, June 1-5, **2008**.
- #Shonsey, E.M., Barnes, S., Renfrow, M.B., "Substrate Binding Inhibits Chemical Modification of Human Bile Acid CoA:Amino Acid N-acyltransferase (hBAT)" 56th Annual ASMS meeting, Denver, CO, June 1-5, **2008**.
- #Eliuk, S.M., Renfrow, M.B., Barnes, S., Kim, H. "Increased Sequence Coverage of Low Abundance Protein by LC-ESI LTQ FT-ICR MS and MS/MS with Gas Phase Fractionation." 56th Annual ASMS meeting, Denver, CO, June 1-5, **2008**.
- Jones, L.M., Nemecek, D., Renfrow, M.B., Thomas, G.J., Jr., Prevelige, P.E., Jr., "Identification of the Oligomerization Surface of the gp3 Subunit of the Bacteriophage P22 Using Hydrogen Exchange." 56th Annual ASMS meeting, Denver, CO, June 1-5, **2008**.
- Renfrow, M.B., Lai, T.-S., Stinnett, M.W., Boerma, L.J., Chang, C.-W., Bowersock, G., Townes, T.M., "FT-ICR MS Proteomic Analysis of Endogenous TAP-tagged CTCF Transcription Factor Complexes." 55th Annual ASMS meeting, Indianapolis, Indiana, June 3-7, **2007**.

*Wall, S.B., Hall, S., Julian, B.A., Mestecky, J., Novak, J., Renfrow, M.B. “FT-ICR MS Accurate Mass Profiles of IgA1 Hinge Region O-Glycosylation Isoforms.” 55th Annual ASMS meeting, Indianapolis, Indiana, June 3-7, **2007**.

*Shonsey E.M., Eliuk, S.M., Kirk, M.C., Kim, H., Renfrow, M.B., and Barnes, S. “Comprehensive Analysis of Aldehyde Modifications by LC-ESI-LTQ-FTMS.” 54th annual ASMS meeting, Seattle, Washington, May 28-June 1, **2006**.

*Eliuk, S.M., Shonsey, E.M., Renfrow, M.B., Kirk, M.C., Barnes, S., Kim, H., “Rapid Screening of 4HNE Adducts on Creatine Kinase Brain Isoform by Direct Infusion LTQ-FT MS and MS/MS” 54th annual ASMS meeting, Seattle, Washington May 28-June 1 **2006**.

*Kang, S., Poliakov, A., Sexton, J., Renfrow, M.B., & Prevelige, P.E., Jr. “Probing Conserved Helical Modules of Portal Complexes by Mass Spectrometry based Hydrogen/deuterium Exchange” FASEB meeting **2006**.

*Kang, S., Poliakov, A., Renfrow, M.B., Prevelige, P.E., Jr. “Characterization of Inter-subunit Interactions in Bacteriophage P22 Portal Complexes using Mass Spectrometry based Hydrogen/deuterium Exchange” Sanibel Conference on Mass Spectrometry, Sanibel Island, Florida January 20-23, **2006**.

*Renfrow, M.B.; Hall, S.; Brown, R.; Tomana, M.; Julian, B.A.; Mestecky, J.; Emmett, M.R.; Novak, J.; and Marshall, A.G. “Human IgA1 Hinge Region O-glycan Profiling by FT-ICR MS” 53rd American Society for Mass Spectrometry Conference, San Antonio, TX, June 5-9, **2005**.

Hendrickson, C. L.; Blakney, G. T.; Chalmers, M. J.; Emmett, M. R.; Mackay, C. L.; McFarland, M. A.; Nilsson, C. L.; Quinn, J. P.; Renfrow, M. B.; Marshall, A. G. "Fourier Transform Ion Cyclotron Resonance for Proteomics: High Resolution, Accurate Mass, MS/MS, and Speed," 31st FACSS Mtg., Portland, OR, 3-7 Oct **2004**.

*Renfrow, M.B.; Novak, J.; Kulhavy, R.; Tomana, M.; Mestecky, J.; Emmett, M.R.; Marshall, A.G. “Human IgA1 Hinge Region O-glycosylation Characterized by FT-ICR Mass Spectrometry” 52nd ASMS Conference on Mass Spectrometry and Allied Topics. **2004**. Nashville, Tennessee.

Hendrickson, C.L.; Blakney, G.T.; Chalmers, M.J.; Mackay, C.L.; McFarland, M.A.; Quinn, J.P.; Renfrow, M.B.; Marshall, A.G. “Instrumental Developments in Fourier Transform Ion Cyclotron Resonance MS/MS of Biomolecules” 52nd ASMS Conference on Mass Spectrometry and Allied Topics. **2004**. Nashville, Tennessee.

*Novak, J.; Renfrow, M.B.; Cooper, H. J.; Tomana, M.; Wilson, L.; Kirk, M.; Kulhavy, R.; Kilian, M.; Poulsen, K.; Hiki, Y.; Toma, K.; Julian, B.A.; Barnes, S.; Emmett, M.R.; Marshall A. G.; Mestecky, J. “Analysis of IgA1 O-linked glycans: implications for IgA nephropathy (IgAN)” 10th International Symposium on IgA Nephropathy, Saint-Etienne, France, March 26-27, **2004**. Oral presentation and poster.

* Data later published in peer-reviewed article

Manuscript in preparation with presented data

Invited Presentations

2009.02.25 “Glycoproteomics of IgA1”, US Human Proteome Organization 5th Annual US HUPO Conference, San Diego, California

2008.08.17 “Aberrant O-glycosylation of IgA1 and the Pathogenesis of IgA Nephropathy” August 17, **2008**, Human Glycomics Project Initiative workshop at the 7th HUPO world congress, Amsterdam, NE.

Invited Seminars

2006.10.10 “Analysis of IgA1 O-glycans in IgA Nephropathy” Department of Chemistry, University of Georgia.

2005.11.17 “FT-ICR MS as a Diagnostic Tool for IgA Nephropathy” Department of Chemistry, University of Alabama at Birmingham.

2004.08.22 “Analysis of Biomolecular Structures and Interactions by FT-ICR MS” Mass Spectrometry Shared Resource Facility, University of Alabama at Birmingham.

2004.03.09 “FT-ICR MS/MS of Post-Translational Modifications (PTMs), IgA Nephropathy Group, Department of Microbiology, University of Alabama at Birmingham.

Current Renfrow Lab Members

- **LeeAnn J. Boerma, B.S.**, 5th year CMB graduate student
- **Archer D. Smith IV, PhD.** Postdoctoral Associate
- **Kazuo Takahashi, M.D.**, visiting scholar in collaboration with Jan Novak and Yoshiyuki Hiki
- **Monica W. Stinnett, B.S.**, Research Assistant

Current FT-ICR MS Trainees

- **David Stella**, 5th year CMB graduate student in Stephen Barnes group
- **Eric Monroe**, Postdoctoral Associate in Peter Prevelige group

Former Undergraduate Students

- **Stephanie Wall**, B.S. Chemistry with honors, UAB, current position: graduate student, IBS program, UAB

Former FT-ICR MS Trainees

- **Erin Shonsey**, Ph.D. Pharmacology, UAB 2008, graduate student in Stephen Barnes group. Current position: Director of Research, Alabama Department of Forensics. Adjunct Assistant Professor, UAB Department of Chemistry, Fall 2010
- **Shannon Eliuk**, Ph.D. Pharmacology, UAB 2008, graduate student in Helen Kim group, Postdoctoral associate stint in Alma Burlingame's group UCSF, San Francisco, CA. Currently an Applications Scientist Thermo Fisher Scientific in San Jose, CA since May of 2010.
- **Lisa Jones**, Postdoctoral Associate 2006-2008 in Peter Prevelige group, Current position: Postdoctoral Associate in Michael Gross Laboratory, Univ. of Washington, St. Louis, MO. Applying for academic positions.
- **Sebyung Kang**, Ph.D., Biochemistry, UAB 2007, graduate student and Postdoctoral Associate in Peter Prevelige group. Current position: Assistant Professor, School of Nano-Biotechnology & Chemical Engineering, Ulsan National Institute of Science & Technology, Ulsan, Korea.

Funding

Current Funding

Alabama Drug Discovery Alliance Pilot Grant 05/01/10-04/30/2010

Completion of the UAB Retinoid Discovery Platform by Hydrogen Deuterium Exchange Analysis of RXR-drug Candidate Interactions.

The goal of this project are to implement automated HDX MS and ITC analysis in the evaluation of RXR-ligand interactions to complete a drug development pipeline for the identification of novel UAB developed retinoids for therapeutic use in cancer and other diseases.

Role: P.I.

1 R01 DK 71802-01A1 (Herr, P.I.) 09/01/06 - 05/31/11 2.04 CY

NIH/NIDDK \$225,000 (\$30,000, Subcontract)

IgA1 Glycosylation and Receptor Interactions in IgA Nephropathy

The goals of this project are to better understand the molecular basis for IgA nephropathy, with the following specific aims: 1) purify IgA1 immunoglobulin from IgAN patient serum and matched healthy controls, 2) characterize the polymerization state and glycosylation pattern of these IgA1 molecules, and 3) analyze the binding kinetics and affinity between these patient-derived IgA1 molecules and the IgA-specific receptors Fc α RI and TfR.

Role: Subcontract P.I.

R21 DK75868 (Novak, P.I.) 08/01/09 – 07/31/11 2.4 CY

NIH \$150,000

Urinary Polypeptide Biomarkers of IgA Nephropathy

The specific goal of the studies proposed in this application is to identify urinary polypeptides that can be used as biomarkers of IgAN.

Role: Co-Investigator.

RO1 DK073391-01A2 (Townes, Tim P.I.) 4/01/2007-3/31/2012 2.4 CY
NIH \$ 299,855

Erythroid Kruppel-Like Factor Complexes Defined in TAP-Tagged Knockin Mice

The overall objective of this project is to characterize transcription complexes isolated from TAP-tagged EKLF knock-in mice transcription factor immunoprecipitations (IP) to identify transcription regulatory elements responsible for globin switching. This involves the identification of IP isolated proteins as well as quantitative analysis by FT-ICR mass spectrometry.

Role: Co-Investigator

1 R01 DK78244-01 (Novak, P.I.) 06/01/07 – 03/31/12 1.2 CY
NIH/NIDDK \$175,000

Molecular Basis of Pathogenicity of IgA1-containing Immune Complexes

The goal is to provide an improved understanding of the pathogenesis of IgAN and provide a basis for the development of a clinically applicable, high-throughput assay for noninvasive diagnosis of IgAN, and monitoring of the disease course or response to therapy.

Role: Co-investigator

R01 GM081489-01 (Wang, H. P.I.) 04/01/08 - 03/31/13 0.96 CY
NIH \$ 225,000

Role of Ubp-M and H2A deubiquitination in chromatin and cellular function

The proposed studies will examine the role of histone H2A deubiquitination by Ubp-M in gene silencing in mammalian cells. This includes investigating the functional domains of Ubp-M, determining the role of phosphorylation in regulating Ubp-M function, and the identification of Ubp-M interacting proteins.

Role: Co-Investigator

R01 AI44626 (Prevelige, Jr., Peter, PI) 12/01/05 – 11/30/10 0.6 CY
NIAID

Biophysical Studies of HIV Assembly and Maturation

The objective of this proposal is to use a mass spectrometry based hydrogen/deuterium exchange and crosslinking approach to study the structural rearrangements that accompany maturation at the molecular level in order to 1) determine whether CA exists in a domain swapped configuration in either the immature or mature virion, 2) obtain a detailed understanding of the process of HIV maturation at the molecular level, and 3) assemble stable hexamers of HIV-1 CA and perform a detailed biophysical and structural analysis to fully characterize the N-terminal domain/C-terminal domain interaction that is formed upon maturation.

Role: Co-Investigator.

Pending Grant proposals:

1R01GM088361-01A2 (Renfrow, Matthew, PI.)

NIH

Defining Structure Activity Relationships of Clinically Relevant Reginoids

The overall goal of this proposal is to apply hydrogen deuterium exchange mass spectrometry to the analysis of RXR – retinoid interactions towards establishment of structure activity relationships of anti-cancer rexinoids

Role: PI

Submitted: A2 submission 11/5/2010

NIH

R01 (Renfrow, Matthew, PI)

Analytical tools for the analysis of clustered *O*-glycans in clinical samples

The goal of this proposal is to develop tools for the analysis of proteins with clustered sites of *O*-glycosylation in clinical samples. This includes the analysis of a large cohort of samples related to IgA nephropathy, a series of biophysical experiments to define the binding specificity of lectins, and development of quantitative strategies for the analysis of clustered *O*-glycoforms.

Role: PI

Submitted: 10/05/2010

NIH

U24 (Mobley, James A., PI)

Comprehensive Proteomic Technologies for the Detection of Early Cancer Biomarkers

This application seeks to provide comprehensive proteomic analysis as part of the Clinical Proteomic Technologies for Cancer Initiative (CPTC): Proteome Characterization Centers. The proposal has the goal of analyzing a series of CPTC provided samples for global proteome and glycoproteomics analysis to identify candidate biomarkers that can be validated and developed into immuno-assays for the early detection of cancer. The proposal is divided into three parts: Administration, Discovery, and Validation

Role: Discovery Unit, Glycoproteomics Co-leader.

Submitted: 9/28/2010

Completed Research Support:

R21 DK077279-01A2 (Renfrow, P.I.)

08/15/08 – 07/31/10

NIH/NIDDK

\$ 150,000

Accurate Profiles of IgA1 *O*-glycan heterogeneity in IgA nephropathy

The goal is to use novel mass spectrometry techniques to define the sites of aberrant serum IgA1 *O*-glycosylation in patients with IgA nephropathy (IgAN). This can only be done in context of understanding the sites of IgA1 *O*-glycosylation in normal healthy controls. The results will provide insights into the pathology of the IgAN and may provide a non-invasive method of diagnosing the disease.

Role: PI

SPORE in Breast Cancer Career Development Award (Renfrow, P.I.) 03/01/08-09/30/09

UAB/NIH

\$ 100,000

Structural Mapping and Proteomic Analysis of Clinically Relevant REXINoids

This award provides pilot funds for the development of FT-ICR mass spectrometry methods for the analysis of RXR mediated signaling in breast cancer. This includes the analysis of RXR-rexinoid interactions by use of hydrogen deuterium exchange and the isolation and identification of rexinoid-induced RXR protein complexes in the RK3E epithelial model system.

Role: Principle investigator

R21 (Novak, P.I.)

12/01/07-11/30/2009

0.6 CY

NIH/NIDDK

\$ 150,000

IgA1-secreting B cell lines: a novel tool for studies of IgA nephropathy.

Role: Co-investigator

Technical Expertise

- Fourier transform-ion cyclotron resonance (FT-ICR) mass spectrometry

- LTQ Orbitrap Velos Mass Spectrometry
- Electron Capture/Transfer Dissociation (ECD and ETD) of heavily modified proteins.
- Protein *O*-glycosylation analysis.
- Liquid chromatography-MS analysis
- Mass spectrometry based protein biochemistry
- Mass spectrometry based hydrogen deuterium exchange
- Immobilized DNA template assays for analysis of protein-DNA interactions.
- Protein purification and protein biochemistry.
- Molecular biology techniques.

Other Employment

1994 - 1996 Research Technician, Coal and Fuel Laboratory, Western Kentucky University, Bowling Green, KY

1992 - 1994 Holland's Pharmacy, Pharmacy Technician, Bowling Green, KY

1987 - 1992 Wimpee's Welding, Metal working and construction, Bowling Green, KY

1984 - 1992 Ashley Circle Pharmacy, Part time: whatever Dad told me to do. Bowling Green, KY