WV-INBRE NEWSLETTER

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Spring, 2015

WV-INBRE Provides Biomedical Research Opportunities to HSTA Scholars and WV High School Science Educators

The partnership between WV-INBRE and the Health Sciences & Technology Academy (HSTA) program is focused on encouraging undergraduate students, who have demonstrated an interest in biomedical research through their participation in the HSTA program while in high school, to continue to develop this interest in biomedical research once they enroll at West Virginia University, Marshall University or one of the PUIs.

During the 2014-2015 academic year, 11 HSTA scholars participated in this program with 5 interns at the one of the PUIs, 4 interns at Marshall University, and 2 interns at West Virginia University. These students were: at Alderson-Broaddus University, Malcolm Lee worked with Dr. Yi Charlie Chen; at Bluefield State College, Kaitlyn Thompson worked with Dr. Tesfaye Belay; at Shepherd University, Tina Nguyen worked with Dr. Qing Wang; and at West Liberty University, Jesse Hall and Jenna Ingram worked with Dr. Joseph Horzempa; at Marshall University, Gabrielle Worley and Emily Fedukovich worked with Dr. Hongwei Yu, Janae Jackson worked with Dr. Nalini Santanam, Ibrahim Mohammed worked with Dr. Lawrence Grover; and at West Virginia University,

Melissa Ashman worked with Dr. Paul Chantler and Whitney Poling worked with Dr. Jefferson Frisbee. All interns will present their research at the 14th Annual WV-INBRE Summer Research Symposium in Huntington WV on July 27, 2015.

Another component of this joint program is to provide opportunities for high school science educators to participate in biomedical research for up to nine weeks during the summer with a mentor at West Virginia University, Marshall University, or one of the WV-INBRE funded PUI laboratories. Participation is open to high school science educators who teach in the state of West Virginia during the previous academic school year. The goal of this part of the program is to provide research opportunities to interested science teachers with the expectation they will take their research experience back into their classrooms and inspire their students to pursue biomedical research opportunities once they enter college. Additionally, it is anticipated that the techniques they learn from the research will enhance the scientific teaching experience in the classroom.

For summer 2015, 5 high school science educators have been awarded 7 to 9-week research internships: Jeremiah Miller from Martinsburg High School and Eric Goff from Keyser High School will work with Dr. Qing Wang at Shepherd University; Olivia Boskovic from Huntington High School will work with Dr. Pier Paolo Claudio at Marshall University; Jason Graser from North Marion High School will work with Dr. Julie Brefczynski-Lewis and Samantha Simon from University High School will work with Dr. Timothy Nurkiewicz, both at West Virginia University. All interns will present their research at the 14th Annual WV-INBRE Summer Research Symposium in Huntington WV on July 27, 2015.

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Network Partners of the WV-INBRE

Lead Universities

Marshall University
West Virginia University

Predominantly Undergraduate Institutions (PUIs)

Alderson-Broaddus College
Bethany College
Bluefield State College
Concord University
Davis & Elkins College
Fairmont State University
Glenville State College
Salem International University
Shepherd University
University of Charleston
West Liberty University
West Virginia State University
West Virginia Wesleyan College
Wheeling Jesuit University

Message from the WV-INBRE Principal Investigator
- Gary O. Rankin, Ph.D. -

As I write this message, I am visiting another of the INBRE states – Alaska. I'm taking a short break from work and following my favorite hobby of birding. Last year, I was also in Alaska in May and early June, spending a week birding on an island in the Bering Sea and staying in a native village. As I talked to folks about the lifestyle and health issues that Alaskans experience, I was struck by the similarities to the rural lifestyle and health issues we face in West Virginia.

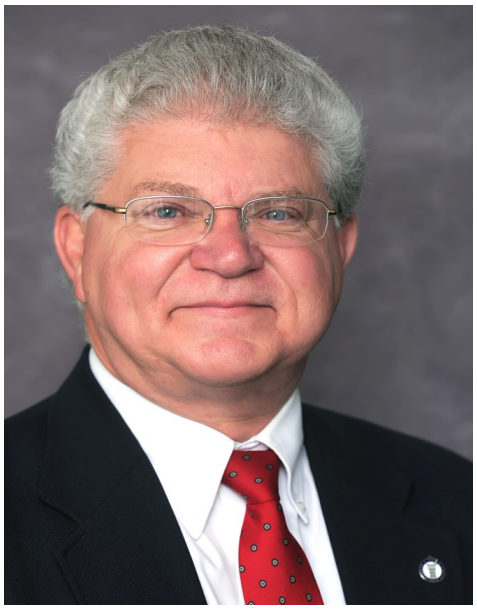
Cardiovascular disease, cancer, obesity and diabetes are major health issues in both our states, and hopefully the work we are accomplishing in the IDeA program will help lessen the incidence of these devastating diseases and conditions.

We are nearing the end of the first year of Phase III of WV-INBRE. Our shortened year (10 months rather than 12 months) has created some minor problems with getting all the developmental grant programs going; this didn't leave as much time as we would have liked for our investigators to complete their projects. But even so, we were able to fund 18 developmental research projects in Y14.

This year we have three major PUI research awards at Alderson Broaddus University (Yi Chen), Shepherd University (Qing Wang) and West Liberty University (Joseph Horzempa). Seven Faculty Research Development Awards were funded at Bethany College (Jennifer Franko), Bluefield State College (Tesfaye Belay, James Walters), Fairmont State University (Albert Magro), West Virginia State University (Gerald Hankins, Micheal Fultz), and West Virginia Wesleyan College (Luke Huggins). The Genomics Core funded three Next Generation Sequencing projects at Bethany College (Jennifer Franko), Marshall University (Weiping Zeng) and West Virginia University (Peter Stoilov), and the Center for Natural Products had five research projects funded at Bluefield State College (Tesfaye Belay), West Liberty University (Melinda Kreisberg, Theunis van Aardt) and West Virginia State University (Gerald Hankins, Padma Nimmakayala). It is exciting that several of these investigators are new to WV-INBRE funding, which speaks to the possibilities for the future.

At this time, we are conducting competitions for funding for several of these developmental research programs for our next funding cycle, Y15. Genomics Core Next Generation Sequencing grant applications for Y15 have already been received and are being reviewed. Calls for applications for the major PUI Research Awards, Faculty Research Development Awards and the Center for Natural Product Pilot Grant Awards have already been issued. Please check the WV-INBRE website (www.wv-inbre.net), under Research, for details and deadlines.

We are also looking forward to the Summer Research Program which will start on May 26, 2015 and end with the Summer Research Symposium at Marshall University on July 27, 2015. This year the program will consist of 28 partner institution undergraduate students, one faculty fellow and five high school science teachers.



Our Summer Symposium keynote speaker will be Dr. Gabriel Navar, Tulane University School of Medicine. Dr. Navar is a COBRE principal investigator and an expert on the physiology of hypertension. I have heard Dr. Navar speak in the past, and everyone is in for a real treat. So, it should be a great summer!

I appreciate everything that our WV-INBRE family does to help make our program as successful as it is. Through your hard work and dedication, we are doing a lot to benefit our students, faculty, institutions and West Virginia. Keep up the good work!

* * * * *

Interns Selected for 2015 Summer Research Program

Twenty-eight undergraduate student interns have been selected to participate in the 2015 WV-INBRE Summer Research Program at West Virginia University and Marshall University. Ten interns will work at Marshall University and eighteen will conduct their 9-week internship at WVU. Forty-three applications were reviewed to fill the twenty-eight positions. Interns come from eleven of the thirteen Primarily Undergraduate Institutions (PUI) in the WV-INBRE network.

The Summer Research Program will run from May 26 till July 27. Interns will conduct biomedical research projects under the direction of faculty mentors and present the results at their research at the Summer Research Symposium, which is scheduled for July 27 at Marshall University. The morning session of the symposium will consist of oral presentations by participants and a keynote lecture. Poster presentations will be held in the afternoon.

WV-INBRE Summer Research Program Participants at West Virginia University

Interns	Mentors
Rebekah Honce - West Virginia Wesleyan College	Dr. Stephen Alway
Shruthi Sreekumar – Shepherd University	Dr. John Hollander
Leah Figurski – West Liberty University	Dr. Linda Vona-Davis
Loren McDaniel – West Virginia Wesleyan College	Dr. Taura Barr
Jonathan Hanson– University of Charleston	Dr. Zhongxin Wu
Danielle Nehilla – West Virginia Wesleyan College	Dr. Paul Chantler
Brandon Wisman – Alderson Broaddus University	Dr. Stan Hileman
Catherine Rainey - Alderson Broaddus University	Dr. Stan Hileman
Zachary Ransom - Alderson Broaddus University	Dr. Stephanie Frisbee
Paige Rutter – West Virginia Wesleyan College	Dr. Bingyun Li
Brett Szeligo – Wheeling Jesuit University	Dr. Bob Goodman
Brandon Trinh - Bethany College	Dr. Alexey Ivanov
Ryan Kidwiler – Shepherd University	Dr. Heath Damron
Bobby Jesmer – Fairmont State University	Dr. Mark Olfert
Caitlin Mulvihill – Shepherd University	Dr. Paul Lockman
Jonathan Hardy – Shepherd University	Dr. David Klinke
Lindsey Bent – Shepherd University	Dr. David Klinke

WV-INBRE Summer Research Program Participants at Marshall University

Interns	Mentors
Ana Maria Pena—University of Charleston	Dr. Philippe Georgel
Madison Crank—Davis & Elkins College	Dr. Travis Salisbury
Ankita Khunt—University of Charleston	Dr. Richard Egleton
Natalia Skilioutovskaya-Lopez—University of Charleston	Dr. Monica Valentovic
Seth Deskins—University of Charleston	Dr. Vincent Sollars
Alexandria Carter—University of Charleston	Dr. Hongwei Yu
Jordan Tate—West Virginia Wesleyan College	Dr. Gary Rankin
Sarah Marshall—Davis and Elkins College	Dr. Nalini Santanam
Christina Hess—Shepherd University	Dr. Larry Grover
Megann Boone—West Virginia Wesleyan College	Dr. Monica Valentovic

Center for Natural Products Research Investigators Visit Ole Miss

With a growing emphasis on natural product research among WV-INBRE investigators, the WV-INBRE Center for Natural Products Research was formed during INBRE Phase II. Investigators from several West Virginia colleges and universities have received pilot grant funding to help get this initiative started. In an effort to help advance the Center for Natural Products Research, Dr. Gary O. Rankin, WV-INBRE principal Investigator, hosted a trip to the National Center for Natural Products Research. This Center is located on the University of Mississippi campus in Oxford, MS. Nine West Virginia biomedical researchers with an interest in natural products research went on this trip on January 15-17, 2015. The West Virginia faculty members making this trip with Dr. Rankin were: Drs. Piyali Dasgupta and Monica Valentovic (Marshall University), Yi Chen (Alderson Broaddus University), Tesfaye Belay (Bluefield State College), Darrell Crick (Concord University), Qing Wang (Shepherd University), Joseph Horzempa (West Liberty University), Gerald Hankins (West Virginia State University), and Luke Huggins (West Virginia Wesleyan College).

The West Virginia researchers were hosted by Dr. Stephen J. Cutler, Chair of the Department of BioMolecular Sciences, COBRE Principal Investigator and a member of the WV-INBRE External Advisory Committee. During the visit to the Center, West Virginia scientists met with the Center director (Dr. Larry Walker) and many of the researchers in the Center and Dr. Cutler's COBRE to discuss opportunities for collaboration and the availability of resources. A tour of the Maynard W. Quimby Medicinal Plant Garden was provided, as well as a drive by of the famous research marijuana field. From this visit, several research collaborations have developed between the University of Mississippi and WV-INBRE researchers. A special thanks goes to Dr. Cutler for making this visit possible. Next year, Dr. Cutler and some of the Center and/or COBRE personnel will visit West Virginia to keep the initiative and potential collaborations going and growing.

WV-INBRE Announces 3 Faculty Research Development Awards

The WV-INBRE Faculty Research Development Award (FRDA) Program provides significant funding to faculty at predominantly undergraduate institutions (PUIs) to enable them to develop biomedical research projects at their home institutions. The FRDA's are especially designated to encourage participation of undergraduate students in hand-on research at their home institution throughout the academic year.

For this year three awards, of $30,000 each, were made to faculty at three different undergraduate institutions:

Dr. Luke Huggins, of West Virginia Wesleyan College received funding for his project: "Isolation of antibacterial and cytotoxic compounds from Tyrol knapweed";

Dr. Jennifer Franko of Bethany College was funded for her project: "Mechanisms of triclosan-mediated allergic sensitization";

Dr. James Walters of Bluefield State College was chosen to receive funding for his project: "Determining the regulation of cholesterol absorption in vertebrate intestine".

WV-INBRE Next Generation Sequencing Small Grant Program

The WV-INBRE program supports biomedical research which relies on Next Generation Sequencing (NGS) technology. NGS enables the rapid and relatively inexpensive high throughput sequencing of whole genomes, whole exomes, whole mRNA transcriptomes (via RNA-Seq) and the genomes of complex microbial communities known as microbiomes. These analyses can enable the discovery of disease susceptibility variants, metabolic or signal transduction pathways, and changing composition of microbiomes.

In each year of phase III, WV-INBRE will solicit NGS research applications through a request for applications. The solicitations are open to investigators at West Virginia University, Marshall University and WV primarily undergraduate institutions (PUIs) that are part of the WV-INBRE network.

The intent of the program to allow investigators to gather preliminary data for NIH grant applications. Current Y14 applications were accepted in May 2014, ranked by external reviewers and approved by the WV-INBRE Administrative Core and the NIGMS.

In Y14, WV-INBRE was able to make NGS awards to three network investigators:

(1) Jennifer Franko, PhD, of the Department of Biology, Bethany College: "The role of microbiome diversity in sexually dimorphic immune responses".

(2) Peter Stoilov, PhD,, of the Department of Biochemistry, West Virginia University: "Photoreceptor specific gene expression and alternative splicing profiles". and

(3) Wei-ping Zeng, PhD, of the Department of Biochemistry and Microbiology, Marshall University: "RNA-Seq analysis of genes for Treg cell mediated immune suppression in vivo".

WV-INBRE issued a subsequent request for applications (posted at http://www.wv-inbre.net/funding.asp) in January 2015 and increased the award amount from $10,000 to $15,000. We anticipate making seven awards in early Y15. The next RFA will be released in January 2016.

Prior to the initiation of any NGS research project, WV-INBRE investigators must meet with the directors of the Genomics and Bioinformatics Cores (Don Primerano, Mary Davis and Jim Denvir) to discuss experimental design, expectations and cost.

These analyses require sophisticated analytical tools - some of which are commercial products, while others are publically available. WV-INBRE network has acquired Partek Genomics Suite and Ingenuity Pathway Analysis (IPA) and shares these tools with network investigators.

WV-INBRE Hosts Network-Wide Bioinformatics Workshop

The WV-INBRE Bioinformatics Core recently hosted a bioinformatics workshop called, "Applications of Next Gen Sequencing for Microbiome Analysis and Expression Profiling" at the West Virginia University Health Sciences Center (WVUHSC) in Morgantown, WV. Originally scheduled for March 6th, the workshop was rescheduled to April 3 due to a significant blizzard and closing of WVU for two days.

Attendees included faculty and students from undergraduate institutions (7), the National Institute for Occupational Safety and Health (Morgantown, 3) and WVU (9). All presentations were recorded and are available on the WV-INBRE website.

Dr. Andrew Cockburn, West Virginia University, discussed the fundamentals of using Nex-Gen Sequencing (NGS) analysis to determine the bacterial species present in samples. "Quantitative Insights Into Microbial Ecology (QIME)" is an open source software used to identify species and present those results. QIIME clusters sequences into Operation Taxonomic Units (OTUs); those that have 97% homology are considered to belong to a species.

To determine abundance of known species, reads are clustered by comparison to known OTUs. This approach can be used to compare relative abundances of different organisms among samples - such as the same site in different individuals, different sites in the same individual, or one site in an individual over time. *De novo* clustering, done without comparison to known OTUs, can identify novel species, but it involves more computation and so is slower.

Dr. Jim Denvir, Marshall University, reviewed the steps of NGS analysis. RNA is first extracted from the sample; adapters and possibly bar code sample identifiers are then attached to the RNA before running the actual sequencing. The color signals from the sequencing dyes are imaged and processed, yielding a massive number of reads. The reads are separated by sample, based on the barcode, into separate files; the sample tag is removed, and low quality reads are trimmed.

Quality assessment is done, and further trimming is performed if needed. The reads are aligned, or mapped, to the reference genome. The reads associated with each genomic feature (i.e. genes, rRNA, tRNA, and miRNA) are counted and normalized for both the length of the gene and total number of reads. The normalized data are then used for determining differential expression between samples and for functional and pathway analysis.

Dr. Mary Davis, West Virginia University, discussed pathway enrichment analysis. Ingenuity Pathway Analysis, while powerful, has annotations for only human, mouse and rat. Kyoto Encyclopedia of Genes and Genomes (KEGG), however, supports analysis for hundreds of eukaryotes and thousands of bacteria. For organisms that are not well annotated (this includes most organisms) function is predicted by orthology, based on similarity to known genes.

KEGG has "wiring diagram"-type pathways for metabolism, processing of genetic and environmental information, cellular processes, and organismal systems. Partek Genomics Suite software is subsequently used to determine gene expression or differential expression, and pathway enrichment analysis for KEGG pathways. This analysis identifies those pathways which are overrepresented compared to chance; the pathway maps can then be colored by expression of genes on the pathway.

After lunch, the workshop concluded with groups of investigators meeting with the presenters and Dr. Don Primerano, Marshall University, for open discussion of specific projects.

Topics included experimental design, number of replicates needed for meaningful and significant results, combining samples into a single run (using barcodes), advantages and weaknesses of various sample preparation techniques, and read-depth needed (which influences cost).

New WV-INBRE Mentoring Core Established

With the renewal of the WV -INBRE grant last year, a new position – WV-INBRE Mentoring Coordinator - has been established within the WV-INBRE Administrative Core. Andrew (Drew) K. Shiemke, Ph.D. an associate professor of Biochemistry at West Virginia University (WVU) and a member of the WV-INBRE Administrative Core has been selected to serve in this capacity.

As the WV-INBRE Mentoring Coordinator, Dr. Shiemke will assist principal investigators (PI's) from the PUIs in identifying a mentor and ensure that the relationship between the mentor and the PI satisfies the expectations of both parties. To facilitate the latter task, he is developing a Mentoring Agreement that describes the minimal expectations for both the mentor and the PI.

The Mentoring Agreement for the major PUI Research Awards is nearly complete, and a slightly different agreement for the Faculty Research Development Awards (FRDA) is also in preparation. For both types of awards the mentor and the PI will be required to submit a brief checklist every six months that the Mentoring Coordinator will use to monitor the effectiveness of the relationship.

The purpose of the Mentoring Agreements is to help the mentor and the PI on a WV-INBRE funded project to more clearly define their responsibilities and expectations within the confines of their relationship. Since each relationship is unique, the agreement allows for some variation in the roles of the mentor and the PI. The Mentoring Agreement is designed merely to provide some guidelines and suggestions for the responsibilities and expectations outline the minimum responsibilities of the mentor and the PI relationship. The two parties can then add to these minimal expectations, as long as they are spelled out in the agreement and agreed to by both parties.

In the case of mentors for the major multi-year awards, one of the primary responsibilities is to assist the PI to develop a timeline and a research plan to accomplish the milestones that have been established for these awards. The mentor is also expected to review and edit abstracts, manuscripts and grant proposals prior to their submission by the PI.

The mentor is also expected to review and attend the PI's annual progress report presentation to the INBRE Steering Committee and External Advisory Committee. In addition at the PI's request, the mentor will discuss research management strategies, help locate resources and solutions to research problems, and help identify meetings and workshops that will benefit the PI's research productivity.

At present, the expectations for mentors on the Faculty Research Development Awards are in the early stages of development. It is anticipated they will include: (1) reviewing the initial proposal, (2) providing advice on experimental approaches, (3) providing assistance with data analysis, and (4) reviewing and editing abstracts and manuscripts.

The main responsibility of the PI in both the major PUI Research Awards and FRDA Mentoring Agreements is to establish (in collaboration with the mentor) a concrete plan for the frequency and type of contact (phone, email, face-to-face), in order to keep the mentor up to date on the progress of the research project. For the first year of the mentoring relationship contacts between the mentor and the mentee should be frequent, at least as often as once a month. In later years of the relationship, the contacts may be less frequent, but should still occur at least once every six to eight weeks. The mentee should also provide the mentor with a list of their professional responsibilities (teaching, research, administrative, and committee work) in order to facilitate development of realistic goals and timelines for achieving them.

These Mentoring Agreements should facilitate more productive relationships between the mentors and the PIs by clearly defining their respective responsibilities. If you have any suggestions for additions or improvements to these mentoring agreements please contact Dr. Drew Shiemke at:

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