

**UNIVERSITY OF RHODE ISLAND
FACULTY SENATE**

COUNCIL FOR RESEARCH

REPORT ON THE URI CENTER FOR MOLECULAR TOXICOLOGY

On May 1, 2006, the Council for Research reviewed a proposal submitted by Dr. Zahir A. Shaikh, Director, URI Center for Molecular Toxicology to change the status of the University of Rhode Island Center for Molecular Toxicology from temporary status to continuing status.

The Council for Research voted to approve continuing status for the URI Center for Molecular Toxicology.

In accordance with University Manual legislation governing Centers, Institutes, Bureaus and Partnerships, Section 8.90.22, Continuing Authorization for Centers, the Council for Research recommends that the Faculty Senate approve continuing status for the URI Center for Molecular Toxicology.

Following is the proposal in the format required by the Board of Governors for Higher Education.

University of Rhode Island Center for Molecular Toxicology

A. GENERAL INFORMATION

1. **Name of Institution:** University of Rhode Island
2. **Administrative Unit:** University of Rhode Island
3. **Title of Proposed Organizational Unit:** University of Rhode Island Center for Molecular Toxicology
4. **Intended Date of Organizational Change:** January 1, 2007
5. **Intended Location of Organizational Unit:** Fogarty Hall, University of Rhode Island, Kingston, RI
6. **Institutional Review and Approval Process:**

Department
College of Pharmacy
Council for Research
Faculty Senate
President of the University

DATE APPROVED
N/A
February 6, 2007
May 1, 2006

7. Summary of the Proposed Organizational Change

The URI Center for Molecular Toxicology currently operates under a temporary three-year approval from the Provost as a University center. The proposed organizational change would establish the Center for Molecular Toxicology as a continuing University center.

8. Signature of the President:

Robert L. Carothers, President

9. Name of Person(s) to contact during the review:

Name: Zahir A. Shaikh, Ph.D.
Title: Director, URI Center for Molecular Toxicology
Telephone: 874-5036
E-Mail: ZShaikh@uri.edu

B. RATIONALE

The mission of the Center for Molecular Toxicology (CMT) is to foster a statewide research and training network in toxicology and related disciplines. CMT supports mentored research by faculty and students at URI and other institutions of higher education in Rhode Island and provides access to the RI-INBRE grant-funded equipment and bioinformatics core facilities.

C. INSTITUTIONAL ROLE

The Center for Molecular Toxicology (CMT) was created in 2004 and granted temporary status by the Provost. The need to establish the CMT arose primarily to provide the multi-institutional RI-INBRE program an operational base that was not directly linked to a particular department. However, since a majority of the faculty participating in the RI-INBRE grant activities were from the department of Biomedical and Pharmaceutical Sciences, it was desirable to establish the Center as a unit within the College of Pharmacy. For many years the College had been actively recruiting new faculty with research interest in toxicology and this discipline had become one of the focus areas of research strengths within the College. Outside the College, the toxicology researchers from URI had maintained collaborations with colleagues in the department of Cell and Molecular Biology in the College of the Environment and Life Sciences, and at Brown University Medical School. The RI-INBRE program provided an excellent opportunity to launch an interdisciplinary and interinstitutional effort to coordinate toxicological research at the two doctoral degree granting institutions in the state, as well as at the primarily undergraduate institutions, under one umbrella. Consequently, the RI-INBRE grant proposal submitted to the National

Institutes of Health in fall 2003 was entitled "Rhode Island Network for Molecular Toxicology".

Formation of the CMT at the University of Rhode Island has provided operational identity to this multidisciplinary, multi-institutional effort. As an administrative entity, the CMT is responsible for securing funds for, as well as staffing, maintaining, and providing access to, the Statewide Centralized Research Equipment Core Facility and the Bioinformatics Core Facility. The Center has also provided a more stable source of funding, through external grants, for recruiting and training undergraduate and graduate students, postdoctoral fellows, and research faculty.

In keeping with the research focus areas identified in the University of Rhode Island's 2003-2006 Strategic Plan, the CMT seeks to strengthen the Pharmaceutical Sciences research area. Furthermore, the Center compliments the activities of the Center for Biotechnology and Molecular Biosciences. Establishment of the CMT places the State of Rhode Island in a leadership position in Toxicological research in the New England region. The CMT will foster interdepartmental and intercollegiate collaborations, enhance competitiveness of its members in securing external grants, train undergraduate and graduate students, postdoctoral fellows and research faculty, and support the University of Rhode Island's efforts to maintain Carnegie Research I University status. Since its inception, through the RI-INBRE grant, CMT has been instrumental in leveraging four new faculty positions at URI, one at Brown University, three at Rhode Island College, and two each at Providence College, Roger Williams University, and Salve Regina University. Research activities of five additional faculty members at these institutions are also being supported. In all 19 junior investigators receive as much as \$150,000/year from the RI-INBRE program, for three or more years, to support their research projects. The expectation is that during this period the junior investigators at URI and Brown University will be successful in securing independent extramural grant support. It is realized that most of the investigators at the primarily undergraduate institutions will probably not be able to obtain independent research grant support. These investigators will, therefore, continue to receive a lower level of support from the RI-INBRE program to sustain undergraduate student training in their laboratories.

Besides the continuing investigators, the RI-INBRE program also supports additional investigators through its Pilot Project program. During the 2006-2007 fiscal year, a total of eight such projects have been funded. The level of support ranges from \$10,000 to \$40,000/project. [A list of URI faculty associated with the Center activities in various capacities since July 2004 is provided in Appendix A.]

At URI, the four RI-INBRE-supported new faculty positions have been filled. Three of these positions are in the Department of Biomedical and Pharmaceutical Sciences and one in the Department of Cell and Molecular Biology. The research projects of these new faculty members at URI, one faculty member hired at Brown University, and many of the faculty

participants from the primarily undergraduate institutions are in an area of toxicology.

A number of junior faculty members at URI have benefited directly or indirectly from the Center and a number of these faculty have become successful in receiving independent extramural financial support for their research. The improved competitiveness of these investigators was made possible not only by direct financial support for their research projects through the RI-INBRE grant but also by the provision of dedicated equipment in their own laboratories and through the RI-INBRE centralized equipment and bioinformatics core facilities. More established senior investigators have also benefited from the availability of cutting edge technologies that have allowed them to conduct research they were unable to perform prior to the establishment of these facilities. It should be noted that the equipment in the multimillion dollar equipment core facilities is made available free of charge to all researchers at URI and at the other RI-INBRE-participating institutions.

CMT also recruited, through national advertisement, talented minority and non-minority undergraduate students for its summer undergraduate research program in biomedical sciences. During the past three summers, a total of 43 undergraduate students conducted independent research projects in URI and Brown University faculty laboratories for a 10-12 week period. A number of these trainees were pharmacy majors that were considering graduate education and research-oriented careers. In addition, a limited number of graduate students and postdoctoral fellows also received some financial support. [A list of undergraduate and graduate students, and postdoctoral fellows supported at least partially through the RI-INBRE grant at the University of Rhode Island is provided in Appendix B.] In addition to URI and Brown University, RI-INBRE-supported training of undergraduate students in research during the academic year and summer also took place in faculty laboratories at the participating primarily undergraduate institutions. At the culmination of the summer program in August, the students presented their research findings in a poster session. The undergraduate research experience has resulted in many of the trainees to opt for careers in the biomedical sciences.

Each year, CMT organized a monthly seminar series involving lectures by experts in molecular toxicology and related disciplines. Also, during the last two summers, joint toxicology symposia were organized at the Alton Jones campus with the Superfund Basic Research Program at Brown University. This program seeks solutions to the complex health and environmental issues associated with the Nation's hazardous chemical waste sites. Additionally, CMT organized several training workshops to introduce new technologies and software available in the RI-INBRE core facilities to the network investigators and their students.

In summary, CMT will continue to provide financial support to junior investigators, support undergraduate and graduate students and postdoctoral fellows in research, organize seminars, workshops and

symposia, and provide the biomedical researchers in the State access to the centralized equipment and bioinformatics core facilities. It is envisioned that CMT associated faculty would benefit from these research support activities and would be successful in obtaining independent extramural grants for their research projects. Once a critical mass of junior and senior investigators with independent grant funding is achieved, the CMT will coordinate the efforts to establish a multidisciplinary graduate and postdoctoral training program in toxicology through a training grant from the National Institute of Environmental Health Sciences, NIH. On a long-term basis CMT will act as a catalyst for multidisciplinary collaborative research projects that could be supported through program grants from external agencies. With a diverse toxicology expertise, the CMT would also serve a Statewide and perhaps a regional resource in this scientific discipline. [A list of publications during the past two years, that acknowledged the BRIN/RI-INBRE grant support, is provided in Appendix C.]

D. INTERINSTITUTIONAL CONSIDERATIONS

As previously mentioned, the Center for Molecular Toxicology was established primarily to provide the multi-institutional RI-INBRE grant an operational base. As such, CMT promotes interdisciplinary and interinstitutional toxicological research at URI, Brown University, Rhode Island College, Providence College, Roger Williams University, and Salve Regina University. CMT is also responsible for securing funds for, as well as staffing, maintaining, and providing access to, the RI-INBRE core equipment and bioinformatics facilities.

E. RESOURCES

At URI, the participants in the Center for Molecular Toxicology (CMT) activities have been primarily faculty and students from the Department of Biomedical and Pharmaceutical Sciences. However, the program draws faculty from various other disciplines on campus such as: Pharmacy Practice, Cell and Molecular Biology, Computer Science and Statistics, Biological Sciences, Plant Science, Chemistry, Physics, and Engineering. [A list of URI faculty participants and their students is provided in Appendices A and B.] Additionally, research in toxicology and related disciplines is being supported in a number of faculty laboratories at the other five RI-INBRE-participating institutions in Rhode Island.

The activities of CMT are funded through the 5-year RI-INBRE grant from the National Center for Research Resources, NIH. The funding period of the grant is 7/1/04 – 4/30/09 and the total award for the 5-year period is \$16,653,121. An additional amount (up to \$250,000/year) is contributed by the participating institutions towards the operation of the centralized equipment core facility. It is anticipated that the RI-INBRE program will be continued for at least another 5-year period beyond the 2009 end date of the present award. As mentioned above, a second potential source of funding to augment the Center activities would be an NIH training grant.

At URI, several RI-INBRE junior investigators and Pilot Project investigators have already succeeded in receiving substantial multi-year independent grant support from outside agencies. Examples of these individuals include: David Rowley (Biomedical and Pharmaceutical Sciences), Keykavous Parang (Biomedical and Pharmaceutical Sciences), Gongqin Sun (Cell and Molecular Biology), and Yana Reshetnyak (Physics). [A list of external grants received by these RI-INBRE-supported junior investigators is provided in Appendix D.]

F. EVALUATION

The Center is required to submit an Annual Progress Report to NCRR-NIH for the RI-INBRE grant-supported activities. Starting in 2007, the grant-funded activities will also be evaluated by an external committee convened annually through the American Association for the Advancement of Science. In addition, an External Advisory Committee, representing seasoned toxicologists, administrators, and business consultants, including the Director of the RI Economic Development Corporation, provides programmatic oversight. This Committee convenes biannually and holds meetings with the URI President, Provost, Dean of Pharmacy and other administrators to discuss the issues concerning the RI-INBRE Program. The CMT Director reports to the Dean of the College of Pharmacy and provides periodic appraisal of the Center activities. Presently, a group of College of Pharmacy faculty consisting of Robert Rodgers, Bongsup Cho, and Clinton Chichester serve as the internal advisory committee. This committee may be expanded in the future as the Center grows and becomes more interdisciplinary.

Appendix A

URI Faculty Involved in RI-INBRE Activities (2004-)

<u>Name</u>	<u>Department</u>	<u>Role</u>
Aftab Ahmed	Biomedical and Pharmaceutical Sciences	Core Facility Manager
Fatemeh Akhlaghi	Biomedical and Pharmaceutical Sciences	Student Mentor
Geoffrey Bothun	Chemical Engineering	Pilot Project Investigator
Clinton Chichester	Biomedical and Pharmaceutical Sciences	Bioinformatics Core Co-coordinator, Student Mentor
Bongsup Cho	Biomedical and Pharmaceutical Sciences	Research Core Coordinator, Student Mentor
Brenton DeBoef	Chemistry	Pilot Project Investigator, Student Mentor
Ruitang Deng	Biomedical and Pharmaceutical Sciences	Pilot Project Investigator
Lutz Hamel	Computer Science	Bioinformatics Consultant
Niall Howlett	Cell and Molecular Biology	Subproject Investigator
Steve Irvine	Biological Sciences	Student Mentor
Shahid Karim	Plant Science	Pilot Project Investigator
Abraham Kavoor	Biomedical and Pharmaceutical Sciences	Subproject Investigator
Roberta King	Biomedical and Pharmaceutical Sciences	Pilot Project Investigator, Student Mentor
Kerry LaPlante	Pharmacy Practice	Pilot Project Investigator, Student Mentor
David Laux	Cell and Molecular Biology	Student Mentor
David Nelson	Cell& Molecular Biology	Faculty Mentor, Student Mentor
Keykavous Parang	Biomedical and Pharmaceutical Sciences	Subproject Investigator, Seminar Coordinator, Student Mentor
Joan Peckham	Computer Science	Bioinformatics Core Co-coordinator
Yana Reshetnyak	Physics	Pilot Project Investigator
Robert Rodgers	Biomedical and Pharmaceutical Sciences	Program Coordinator, Faculty Mentor, Student Mentor
David Rowley	Biomedical and Pharmaceutical Sciences	Subproject Investigator, Undergrad. Prog. Coordinator
Zahir Shaikh	Biomedical and Pharmaceutical Sciences	Program Director, Faculty Mentor, Student Mentor
Yuzuru Shimizu	Biomedical and Pharmaceutical Sciences	Faculty Mentor
Angela Slitt	Biomedical and Pharmaceutical Sciences	Subproject Investigator
Matthew Stoner	Biomedical and Pharmaceutical Sciences	Subproject Investigator
Gongqin Sun	Cell and Molecular Biology	Subproject Investigator, Student Mentor
Bingfang Yan	Biomedical and Pharmaceutical Sciences	Faculty Mentor, Student Mentor

Appendix B

Undergraduate Students Supported by RI-INBRE (2004-)

Zubia Alam	Anna-Maria Alves [#]	Anthony Alessio
Christian Apollon [#]	Ryan Atwood	Nathan Charpentier
Viviana Castano	Michael Cipriano	Allison Clark
Susannah Colt	Daniel Contreras [#]	Jonathan Costa [#]
Rob DeLuca	Alison Devault	Richard Dion
Katheryn Dipalma [#]	Stephanie Forschner [*]	Deirdre Fuller
Dzenana Halilovic	Michael Hanley	Matthew Harmon [#]
Kristina Harris	David Hathaway	Roylisha Jackson [#]
Kelley Loethen	Courtney Lyman	Alissa Marien
Sean Marnane	Jazmin Martin [#]	Kevin McConeghy
Brad Milette	Paula Moneiro [#]	Gregory Norigian
Amy Radke	Nicholas Rue	Lynh Souphanthavong [#]
David Shawver	Aaron Socha [*]	Scott Struzik [#]
Elise Trahant	Kahle Toothill	Joselynn Wallace
Annie Wang	Fongman Wu	Millie White [#]
Sarah Yarnall		

[#]Minority student.

^{*}Currently enrolled as a graduate student at URI.

Graduate Students Supported by RI-INBRE (2004-)

Dipanwata Das	Amanda DeAngelis	Rhijuta D'Mello
Khaled Elsaid	Laura hamel	Julia Harney
Stephanie Forschner	Supriya Kulkarni	Anurag Kumar
Bharat Madhavan	Roseanne Meyer	Mary Niederman
Catalina Price	Karuna Sachdeva	Aaron Socha
Jeffrey Tagan	Lynne Ucrane	Jianxun Xie
Tianle Yang	Guofeng Ye	Xinyuan Yu
Jing Zhang	Li Zhang	

Post Doctoral Fellows Suported by RI-INBRE (2004-)

Yousef Ahmadibeni	Qiuqiong Chen	Anil Kumar
Zhiwei Liu	Jianxun Xie	Yuehao Wang

Appendix C

URI Faculty Publications Acknowledging BRIN/INBRE Grant Support (2004-)

Ahmadibeni, Y., Parang, K. (2005) Polymer-bound oxathiaphospholane: A solid-phase reagent for regioselective monothiophosphorylation and monophosphorylation of unprotected nucleosides and carbohydrates. *Org Lett* 7,1955-1958.

Ahmadibeni, Y., Parang, K. (2005) Selective diphosphorylation, dithiodiphosphorylation, triphosphorylation, and trithiotriphosphorylation of unprotected carbohydrates and nucleosides. *Org Lett* 7, 5589-5592.

Akhlaghi, F., Gonzalez, M.L., Trull, A.K. (2005) Association between cyclosporine concentrations at two hours post dose (C-2) and clinical outcomes in de novo lung transplant recipients, *J Heart Lung Transplant* 24, 2120-8.

Akhlaghi, F., Patel, C.G., Zuniga, X.P., Halilovic, J., Preis, I.S., Gohh, R.Y. (2006) Pharmacokinetics of mycophenolic acid and metabolites in diabetic kidney transplant recipients. *Ther Drug Monit* 28, 95-101.

Ayrapetov, M. K., Nam, N. H., Ye, G., Kumar, A., Parang, K., Sun, G. (2005) Functional diversity of Csk, Chk, and Src SH2 domains due to a single residue variation. *J Biol Chem* 280, 25780-25787.

Bolin, C., Riyaz Bisha, M.D., Cox, D., Zawia, N., Maloney, B., Lahiri, D., Cardozo-Pelaez, F. (2006) Exposure to lead (Pb) and the developmental-origin of oxidative DNA damage in the aging brain. *FASEB J* 20, 788-790.

Carballeira, N. M., O'Neill, R., Parang, K. (2005) Racemic and optically active 2-methoxy-4-oxatetradecanoic acids: Novel synthetic fatty acids with selective antifungal properties. *Chem Phys Lipids* 136, 47-54.

Carballeira, N. M., Sanabria, D., Parang, K. (2005) Total synthesis and further scrutiny of the in vitro antifungal activity of 6-nonadecynoic acid. *Arch Pharm-Pharm Med Chem* 338, 441-443.

Deng, R., Yang, D., Yang, J., Yan, B. (2006) Oxysterol 22(R)-hydroxycholesterol induces the expression of the bile salt export pump through nuclear receptor FXR but not LXR. *J Pharmacol Exper Ther* 317, 317-325.

Elsaid, K., Jay, G.D., Warman, M.L., Rhee, D.K., Chichester, C. (2005) Association of articular cartilage degradation and loss of synovial fluid boundary-lubricating ability following injury and inflammatory arthritis. *Arthritis Rheum* 52,1746-1755.

Espinosa, A., Clark, A., Stanley, S.L. (2004) Entamoeba histolytica alcohol dehydrogenase 2 (EhADH2) as a target for anti-amoebic agents. *J Antimicrob Chemother* 54, 56-59.

- Hamel, L., Sun, G., Zhang, J. (2006) Toward protein structure analysis with self-organizing maps. 2005 Symposium on Computational Intelligence in Bioinformatics and Computational Biology (In Press).
- Hyatt, C., Mironow, S., Vetter, F., Zemlin, C., Pertsov, A. (2005) Optical action potential upstroke morphology reveals near-surface transmural propagation direction. *Cir Res* 97, 277-284.
- King, R.S., Ghosh, A.A., Wu, J. (2006) Inhibition of human phenol and estrogen sulfotransferase by certain non-steroidal anti-inflammatory agents. *Current Drug Metabolism* (In Press).
- Li, Y., Song, X.Z., Ma, Y., Liu, J., Yang, D., Yan, B. (2004) DNA binding, but not interaction with Bmal1, is responsible for DEC1-mediated transcription regulation of the circadian gene mPer1. *Biochem J* 382, 895-904.
- Li, Y., Yang, J., Song, X., Xie, M., Yang, D., Deng, R., Wan, Y., Yan, B. (2006) The expression of antiapoptotic protein survivin is transcriptionally upregulated by DEC1 primarily through multiple Sp1 binding sites in the proximal promoter. *Oncogene* Feb 6 [Epub ahead of print].
- Lieser, S., Shindler, C., Aubol, B., Lee, S., Sun, G., Adams, J. (2005) Phosphoryl transfer step in the C-terminal Src kinase controls Src recognition. *J Biol Chem* 280, 7769-7776.
- Ma, Y., Sachdeva, K., Liu, J., Ford, M., Yang, D.Q., Khan, I.A., Chichester, C., Yan, B. (2004) Desmethoxyyangonin and dihydromethysticin are two major pharmacological avalactones with marked activity on the induction of CYP3A23. *Drug Metab Disp* 32, 317-324.
- Mendoza, A., Gohh, R., Akhlaghi, F. (2004) Determination of cyclosporine in saliva using liquid chromatography-tandem mass spectrometry. *Ther Drug Monit* 26, 569-575.
- Meneni, S.R., D'Mello, R., Norigian, G., Baker, G., Gao, L., Chiarelli, M.P., Cho, B. (2006) Sequence effects of aminofluorene-modified DNA duplexes: thermodynamic and circular dichroism properties. *Nucl Acid Res* 34, 755-763.
- Nam, N.H., Ye, G., Sun, G., Parang, K. (2004) Conformationally constrained peptide analogues of pTyr-Glu-Ile as inhibitors of the Src domain binding. *J Med Chem* 47, 3131-3141.
- Nam, N.H., Lee, S., Ye, G., Sun, G., Parang, K. (2004) ATP-phosphopeptide conjugates as inhibitors of Src tyrosine kinases. *Bioorg Med Chem* 12, 5753-5766.
- Nam, N.H., Pitts, R., Sun, G., Sardari, S., Tiemo, A., Xie, J., Parang, K. (2004) Design of tetrapeptide ligands as inhibitors of the Src SH2 domain. *Bioorg Med Chem* 12, 779-787.

- Parang, K., Sun, G. (2005) Recent advances in the discovery of Src kinases inhibitors. *Expert Opin Ther Patents* 15, 1183-1207.
- Parang, K., Sun, G. (2005) Protein kinase inhibitors in drug discovery. In: *Drug Discovery Handbook*, S.C. Gad, ed., Wiley_Interscience, New Jersey, pp. 1191-1257.
- Patel, C., Mendoza, A., Majid, O., Trull, A.K., Lee, T., Holt, D.W., Akhlaghi, F. (2004) Determination of total mycophenolic acid and its glucuronide metabolite using liquid chromatography with ultraviolet detection and unbound mycophenolic acid using tandem mass spectrometry. *J Chromat B* 813: 287-294.
- Qiu, L., Di, W., Jiang, Q., Scheffler, E., Derby, S., Yang, J., Kouttab, N., Wanebo, H., Yan, B., Wan, Y.S. (2005) Targeted inhibition of transient activation of EGFR-mediated cell survival pathway enhances paclitaxel-induced ovarian cancer cell death. *Int J Oncol* 27, 1441-1448.
- Qiu, L., Qun, W., Di, W., Jiang, Q., Scheffler, E., Derby, S., Wanebo, H., Yan, B., Wan, Y.S. (2005) Transient activation of EGFR/ AKT cell survival pathway and expression of survivin contribute to reduced sensitivity of human melanoma cells to betulinic acid. *Int J Oncol* 27, 823-830.
- Riyaz Basha, M.D., Wei, W., Bakheet, S., Benitez, N., Siddiqi, H., Ge, Y., Lahiri, D., Zawia, N. (2005) The fetal basis of amyloidogenesis: exposure to lead and latent overexpression of amyloid precursor protein and B-amyloid in the aging brain. *J Neurosci* 25, 823-829.
- Schmidt, B., Jiricek, J., Titz, A., Ye, G., Parang, K. (2004) Copper dipicolinates as peptidomimetic ligands for the Src SH2 domain. *Bioorg Med Chem Lett*, 4, 4203-4206.
- Song, X.Z., Gragen, S., Li, Y., Ma, Y., Liu, J., Yang, D., Matoney, L., Yan, B. (2004) Intramolecular disulfide bonds are required for folding hydrolase B into a catalytically active conformation but not for maintaining it during catalysis. *Biochem Biophys Res Commun* 319, 1072-1080.
- Song, X.Z., Li, Y., Liu, J., Mukundan, M., Yan, B. (2005) Simultaneous substitution of phenylalanine-305 and aspartate-318 of rat pregnane X receptor with the corresponding human residues abolishes the ability to transactivate the CYP3A23 promoter. *J Pharmacol Exper Ther* 312, 571-582.
- Tang, W., Xie, J., and Shaikh, Z.A. (2006) Protection of renal tubular cells against the cytotoxicity of cadmium by glycine. *Toxicology* 223:202-208.
- Wang, Q., Turlington, A., Heo, S., Blanco, A., Yan, B., Wan, Y. (2005) Extra-cellular matrix activity and caveolae events contribute to cell surface receptor activation that leads to MAP kinase activation in response to UV irradiation in cultured human keratinocytes. *Int J Mol Med* 15, 633-640.

- Xie, J., Shaikh, Z. (2006) Cadmium-induced apoptosis in rat kidney epithelial cells involves decrease in NF- κ B activity. *Tox Sci* 91, 299-308.
- Xie, J. and Shaikh, Z.A. (2006) Cadmium induces cell cycle arrest in rat kidney epithelial cells in G2/M phase. *Toxicology* 224:56-65.
- Yang, T., Huang, Y., Cho, B. (2006) Synthesis and characterization of enantiomeric anti-2-fluorobenzo[a]pyrene-7, 8-dihydrodiol-9, 10-epoxides and their 2'-deoxyguanosine and oligodeoxynucleotide adducts. *Chem Res Toxicol* 19, 242-254.
- Ye, G., Ayrapetov, M., Nam, N. H., Sun, G., Parang, K. (2005) Solid-phase binding assays of peptides using EGFP-Src SH2 domain fusion protein and biotinylated Src SH2 domain. *Bioorg Med Chem Lett* 15, 4994-4997.
- Zahir, H., McLachlan, A.J., Nelson, A., McCaughan, G., Gleeson, M., Akhlaghi, F. (2005) Population pharmacokinetic estimation of tacrolimus apparent clearance in adult liver transplant recipients. *Ther Drug Monit* 27, 422-430.

Appendix D

External Grants Received by RI-INBRE-Supported junior Investigators at URI (2004-2006)

<u>Investigator</u>	<u>Funding Agency</u>	<u>Title</u>	<u>Amount</u>
K. Parang	CONRAD / USAID	Novel Bifunctional Anti-HIV-1 Agents as Microbicides	\$274,379
	AmCanSoc	Mechanistic Studies and Inhibitor Design for Protein Tyrosine Kinase	\$178,750
	HHS	Local Immunosuppression for Liver Transplantation	\$102,379
	HHS	Mechanism of PTK Substrate Recognition and Specificity	\$111,456
G. Sun	AmCanSoc	Mechanistic Studies and Inhibitor Design for Protein Tyrosine Kinase	\$536,250
	HHS	Mechanism of PTK Substrate Recognition and Specificity	\$631,584
D. Rowley	DOC	Exploration of Marine Subsurface Environment for Novel	\$299,560
	NSF	Acquisition of Field Laboratory for Study of Sub-seafloor	\$34,500
	NSF	Collaborative Proposal: MIP Bacterial Interactions and Processes that Regulate Bacterial Biodiversity on Marine Organic Particles	\$81,054
Y. Reshetnyak*	DOD	Development of Peptide-Toxin Conjugates Specifically Targeting Prostate Cancer	\$323,000
K. LaPlante*	AmAssocColPharm	New Investigators Program for Pharmacy Faculty	\$10,000
R. Deng*	RI Foundation	Transcriptional Regulation of the Bile Salt Export Pump	\$10,000
Total Amount			\$2,592,912

* Pilot Project investigator