

BIOGRAPHICAL SKETCH

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NAME Fabricio Medina-Bolivar		POSITION TITLE Associate Professor of Plant Metabolic Engineering	
eRA COMMONS USER NAME fmedinabolivar			
EDUCATION/TRAINING (include postdoctoral training)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Cayetano Heredia Univ., Lima, Peru	B.S.	1990	Biology
Cayetano Heredia Univ., Lima, Peru	Licenciate	1991	Biology
Pennsylvania State University, State College, PA	Ph.D.	1997	Plant Physiology
Virginia Tech	Postdoctoral	2001	Plant molecular biology/biotechnology

A. Positions and Honors

Positions and Employment

1992-1997 Research Assistant, Pennsylvania State University, State College, PA
1997-2001 Postdoctoral Research Scientist, Virginia Tech, Blacksburg, VA
2002-2005 Research Assistant Professor, Dept. of Plant Pathology, Virginia Tech, Blacksburg, VA
2005-present Co-Founder and Chief Scientific Officer, Nature West Inc., Jonesboro, AR
2005-2009 Assistant Professor, Dept. of Biological Sciences/Arkansas Biosciences Institute, Arkansas State University, Jonesboro, AR
2009-present Associate Professor, Dept. of Biological Sciences/Arkansas Biosciences Institute, Arkansas State University, Jonesboro, AR

Other Experience

1999-2001 Consultant (Hairy root-based expression of recombinant proteins), Crop Tech Corporation, Blacksburg, VA
2000 Consultant (Plant biotechnology), Intellibridge Corporation, Washington, DC
2002-2003 Consultant (DNA-based diagnostics for detection of plant pathogenic bacteria), Yoder Brothers Inc., Alva, FL
2002-2005 Research Director for the Virginia Tech component of the Consortium for Mucosal Immunology of Infectious and Autoimmune Diseases, Blacksburg, VA

Invited Talks (last 3 years)

Symposium on Medicinal Plants. American Society of Horticultural Sciences Annual Meeting, New Orleans, LA, July 25, 2006. (Invited Speaker)
First International Workshop on Hairy Roots, Jonesboro, AR, July 13, 2006. (Invited Speaker)
Phytochemical Society of North America Annual Meeting, Oxford, MS, July 8-12, 2006. (Invited Speaker)
University of Arkansas for Medical Sciences. Little Rock, AR. November 16, 2006. (Invited Speaker)
University of Arkansas, Little Rock, AR. January 29, 2007. (Invited Speaker).
International Symposium on Medicinal and Nutraceutical Plants. Fort Valley, Georgia. March 2007. (Invited Speaker).
61st Tobacco Science Research Conference. Charlotte. NC. September 23-26, 2007. (Invited Speaker)
VI Encuentro Latinoamericano y del Caribe de Biotecnología Agropecuaria. REDBIO/FAO. Vina del Mar, CHILE. October 22-26, 2007. (Invited Speaker)

Pablo Cassara Foundation. Buenos Aires, ARGENTINA. October 30-31, 2007. (Invited Speaker)
 Southern Association for Agricultural Scientists, SAAS. February 2008. (Invited Speaker)
 Society for In Vitro Biology, Tucson, AZ. June 2008. (Invited Speaker and Session Chair) – *talk was highlighted by Agricell Report on June 2008.*
 International Drug Discovery Science and Technology Conference, Beijing, CHINA. October 2008. (Invited Speaker)
 Chinese Academy of Sciences, Beijing, CHINA. October 2008. (Invited Speaker)
 238th American Chemical Society National Meeting. Washington DC. August 2009. (Invited Speaker)
 University of Arkansas for Medical Sciences, Dept. of Biochemistry. Little Rock. March 2010. (Invited Speaker)

Honors and Awards (last 3 years)

2006	Co-organizer of the 1st International Workshop on Hairy Roots, Jonesboro, AR
2006	Recipient of the Arthur Neish Award from the Phytochemical Society of North America
2006	Recipient of the Eleonor Lane travel award
2007	Coordinated research agreement between Arkansas State Univ. and Univ. Agraria, PERU
2007	Coordinated research agreement between Arkansas State Univ. and Cassara Foundation, ARGENTINA
2007	Elected member of the American Consortium for Aromatic and Medicinal Plants
2008	Invited Chair, session "New Strategies for the Production of Specialized Metabolites", Congress on In Vitro Biology, Tucson, AZ
2008	Invited Chair, session "Develop Bioprocesses for the Production of High Value Medicines", Congress of International Drug Discovery Science and Technology, Beijing, CHINA
2008	Co-editor, special issue "Hairy Roots: Applications in Biotechnology, Elec. J. Int. Biosciences
2009	NIH Special Emphasis Panel, Scientific Review group member, "Transcriptomics of Medicinal Plants".

Proposal Reviewer: American Institute of Science, US Army Medical Research and Materiel Command; Austrian Science Fund; Binational Agricultural Research and Development Fund (BARD); North Carolina Biotechnology Center; NIH Special Emphasis Panel.

Manuscript Reviewer: Plant Physiology, Plant Cell Reports, In Vitro Plant Cellular and Developmental Biology, Planta Medica, Applied Biochemistry and Bioengineering, Plant Cell Tissue and Organ Culture, Archives of Microbiology, Bioprocess and Biosystems Engineering, Scientific Research and Essays, Journal of Agricultural and Food Science.

American Council of Medicinally Active Plants (*Co-Founder membership*)
 Phi Beta Delta - Honor Society of International Scholars (*Elected membership*)
 Sigma Xi – The Scientific Research Society (*Elected membership*)
 Gamma Sigma Delta - Honor Society of Agriculture (*Elected membership*)
 Who's Who in Agriculture Higher Education (*Elected membership*)
 Professional Memberships: Phytochemical Society of North America, Society for In Vitro Biology, American Society of Plant Biologists, International Society for Horticultural Science

B. Selected Publications (in chronological order)

1. Porobo Dessai A, Gosukonda R, Blay E, Dumenyo C, **Medina-Bolivar F**, Prakash C. 1995. Plant regeneration of sweet potato (*Ipomoea batatas* L.) from leaf explants in vitro using a two-stage protocol. Sci. Hort. 62: 217-224.
2. **Medina-Bolivar F**, Flores H. 1995. Studies on the manipulation of tropane alkaloid biosynthesis in hairy roots of *Hyoscyamus muticus*. In: Phytochemicals and Health. D.L. Gustine and H. Flores (eds). American Society of Plant Physiology, MD. pp 297-299.
3. Flores H, **Medina-Bolivar F**. 1995. Root culture and plant natural products: "Unearthing" the hidden half of plant metabolism. Plant Tiss. Cult. Biotechnol. 1: 59-74.
4. **Medina-Bolivar F**, Flores H. 1995. Selection for hyoscyamine and cinnamoyl putrescine overproduction in cell and root cultures of *Hyoscyamus muticus*. Plant Physiol. 108: 1553-1560.

5. **Medina-Bolivar F**, Flores H. 1998. Biosynthesis of constitutive versus inducible metabolites in hairy root cultures of *Hyoscyamus muticus*. In: Radical Biology: Advances and Perspectives on the Function of Plant Roots. H.E. Flores, J.P. Lynch, D. Eissenstat (eds), American Society of Plant Physiologists, Rockville, MD, pp. 430-431.
6. **Medina-Bolivar F**, Wright R, Sentz D, Barroso L, Wilkins T, Petri Jr. W, Cramer C. 2003. A non-toxic lectin for mucosal antigen delivery of plant-based vaccines. *Vaccine* 21:997-1005.
7. Lorence A, **Medina-Bolivar F**, Nessler C. 2004. Camptothecin and 10-hydroxycamptothecin from *Camptotheca acuminata* hairy roots. *Plant Cell Rep.* 22:437-441.
8. **Medina-Bolivar F**, Cramer C. 2004. Production of recombinant proteins in hairy roots cultured in plastic sleeve bioreactors. In: Recombinant Gene Expression: Reviews and Protocols. P. Balbas and A. Lorence, (eds.). Humana Press, Totowa, pp 351-363.
9. Reed D, Nopo-Olazabal L, Woffenden B, Funk V, Reidy M, Dolan MC, Cramer C, **Medina-Bolivar F**. 2004. Expression of functional hexahistidine-tagged ricin B in tobacco. *Plant Cell Rep.* 24:15-24
10. Zhang C, **Medina-Bolivar F**, Buswell S, Cramer C. 2005. Purification and stabilization of ricin B from tobacco hairy root cultures by aqueous two phase extraction. *J Biotech.* 117:39-48
11. Buswell S., **Medina-Bolivar F**, Van Cott K, Zhang C. 2005. Expression of porcine prorelaxin in transgenic tobacco. *Ann N Y Acad Sci.* 1041:77-81.
12. **Medina-Bolivar F**. 2006. Rooting for new medicines. In: J. Trauth and A. Romero (eds.). Adventures in the Wild: Tales from Biologists of the Natural State. The University of Arkansas Press. pp. 83-88.
13. **Medina-Bolivar F**, Condori J, Rimando A, Hubstenberger J, Shelton K, Bennett S, Dolan M. 2007. Production and secretion of resveratrol in hairy root cultures of peanut. *Phytochemistry.* 68:1992-2003 (*this paper was highlighted among the "Top Hottest Papers" in Phytochemistry*)
14. **Medina-Bolivar F**, Nopo-Olazabal C, Nopo-Olazabal L, Sivakumar G, Condori J. 2007. Screening for bioactives stilbenes in the genus *Nicotiana*. *Recent Advances in Tobacco Science.* 33:93-100.
15. Woffenden B, Nopo L, Cramer C, Dolan M, **Medina-Bolivar F**. 2008. Expression of a ricin B:F1:V fusion protein in tobacco hairy roots: steps toward a novel pneumonic plague vaccine. *Electronic J Integrative Biosciences.* 3:10-19.
16. Sivakumar G, Christopher S, **Medina-Bolivar F**, Uccella N. 2009. Plant-based Small Molecules and Proteins: A Source for Natural Medicines. In: Plant Secondary Terpenoids. (*in press*)
17. Condori J, Medrano G, Sivakumar G, Nair V, Cramer C, **Medina-Bolivar F**. 2009. Functional characterization of a stilbene synthase gene using a transient expression *in planta*. *Plant Cell Reports.* 28:589-599.

Patents:

Medina-Bolivar F, Dolan M, Bennett S, Condori J, Hubstenberger J. 2007. Production of stilbenes in hairy roots. US Patent Application N. 11773178 and International Patent Application N. PCT/US07/72756.

C. Research Support

Ongoing Research Support

Medina-Bolivar (PI), Carrier, Dolan
NSF EPSCoR

05/16/08-11/15/09

"Regulation, Production and Purification of Bioactive Stilbenoids from Hairy Root Cultures of Peanut"

Description: The objectives of this proposal are to clone and characterize stilbene synthases from elicited peanut hairy roots and to study their production in 5 liter airlift bioreactors.

Role: PI

Joshee N, Parajuli P, Medina-Bolivar F (Co-PI)
USDA

10/01/08-09/30/11

"Scutellaria As A Medicinal Crop: Cryopreservation, Hairy Root Culture, Organic Farming and Anticancer Activity"

Description: To develop hairy root cultures of *Scutellaria* and perform elicitation studies to induce production of anticancer phenolics.

Role: Co-PI

Khodakovskaya, Grace, Ali, Medina-Bolivar (Co-PI)

NSF-EPSCoR

04/15/09-04/14/10

“Regulation of Specialized (“Secondary”) Metabolism in Tomato by Genetic Manipulation of the Phosphoinositol Pathway”

Description: To study the regulation of carotenoid and phenolic metabolism in transgenic hairy roots expressing a human inositolphosphate phosphatase.

Role: Co-PI

Khodakovskaya, Medina-Bolivar (Co-PI)

Arkansas Space Grant Consortium

04/15/08-4/14/11

“Enhancing Abiotic Stress Tolerance and Production of Antioxidants in Plants for Advanced Life Support in Space Exploration”

Description: To develop hairy roots of tomato and study their ability to produce antioxidant compounds.

Sivakumar, Lay, Medina-Bolivar (Co-PI)

04/15/09-4/14/10

NSF-EPSCoR

“Establishment of Root Culture for Botanical Insulin Production”

Description: To develop hairy roots of *Lagerstroemia speciosa* for the production of corosolic acid.

Role: Co-PI

Completed Research Support

Medina-Bolivar (PI)

07/01/05-06/30/08

Arkansas Biosciences Institute

“Metabolic Engineering for the Overproduction of Medicinal Phytochemicals”

Description: The objective of this program is to use genetically-transformed hairy root cultures over-expressing rate limiting steps and transcription factors in specialized biosynthetic pathways for bioproduction and discovery on novel human therapeutics.

Lorence, Medina-Bolivar (Co-PI), Redeker

07/01/06-06/30/08

Arkansas Bioscience Institute/Arkansas State University

“Collaborative Seed Grant: Mechanisms of Toxicity and Remediation of Superfund Environmental Toxicants”

Description: The objective of this proposal is to evaluate the toxicity of trichloroethylene in plant and hairy root cultures and do a preliminary assessment of the metabolism of TCE in these plant systems.

Medina-Bolivar (PI)

07/01/06-06/30/07

Arkansas State University

“Development of Transgenic Sorghum Root Cultures for Production of Herbicides”

Description: The main objective of this work is to establish hairy root cultures of sorghum using novel binary vectors and study the production of the herbicidal compounds in these cultures.

Medina-Bolivar (PI), Grippo (Co-PI)

07/01/06-06/30/07

Arkansas State University

“Effects of Resveratrol-Containing Extracts from Peanut Hairy Roots on Human Leukemia Cells”

Description: The objective of this study is to evaluate the anticancer activity of extracts from hairy root cultures of peanut containing resveratrol and resveratrol analogues.

Medina-Bolivar (PI-subcontract), Dolan (Co-PI), Cramer (PI)

01/01/03-06/30/04

NIH/STTR [Subcontract to Virginia Tech from NIAID/NIH STTR Phase I grant awarded to BioDefense Technologies, Inc.]

“Nasally-Delivered Subunit Mucosal Vaccine for Plague

Description: Feasibility study to determine if hairy roots of tobacco can produce immunogenic plague antigens (F1-V fusion fused to the RTB adjuvant) for development of intranasally-delivered vaccines.

Role: PI of subcontract