

Maureen C. Dolan, Ph.D.

Director of Biotechnology Program, Associate Professor of Molecular Biology
Department of Biological Sciences

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Professional Preparation

B.S.	1987	Biology and Chemistry, Quincy University, Quincy IL Graduated with honors: <i>Summa Cum Laude and Bonaventure Award</i>
M.S.	1990	Biochemistry: Muscle Biology, Iowa State University Thesis Advisor: <u>Dr. Richard M. Robson</u> Thesis: Isolation & Characterization of Mammalian Smooth Muscle Talin
Ph.D.	1996	Biochemistry and Molecular Biology, University of Florida Mentor: <u>Dr. Harry S. Nick</u> Dissertation: Glucocorticoid & Cytokine Regulation of Cytoplasmic Phospholipase A ₂ Gene Expression
Postdoc	1999	Plant Molecular Biology, Horticultural Sciences, University of Florida Laboratory of <u>Dr. Robert Ferl</u> Project topic: Promoter regulation of plant stress genes

Professional Experience

2018 – present	Director of Biotechnology Program, Dept of Biological Sciences, Arkansas State University, Jonesboro, AR
2012 - present	Associate Professor of Molecular Biology, Dept of Biological Sciences, Arkansas State University, Jonesboro, AR
2010- present	Faculty Advisor, ABI Educational Outreach Program, Arkansas Biosciences, Arkansas State University- <i>10% academic commitment</i>
2005- present	Co-founder, Nature West, Inc., Jonesboro, AR
2004- 2016	Co-founder & Board of Directors Applied Food Technologies Inc., Alachua, FL; (acting Chief Scientific Officer 2010-2015)
2004-2012	Assistant Research Professor, Arkansas Biosciences Institute, Arkansas State University- <i>Non-tenured track</i>
2001-2009	Co-founder and VP Research, Nature Diagnostics, Inc. Blacksburg, VA <i>Acquired by Applied Food Technologies, Inc.</i>
2000-2004	Faculty Research Scientist in the laboratory of <u>Dr. Carole Cramer</u> Fralin Biotechnology Center, Virginia Tech University

Professional Activities

Entrepreneurship

Co-founded and served as Chief Science Officer **Applied Food Technologies, Inc. (AFT)**
Led R&D efforts developing DNA-based diagnostics to authenticate food fish species ID
Built testing service for monitoring seafood product mislabeling/fraudulent activity

Participated in acquisition process of AFT by major food diagnostic lab in 2015.

Small Business Initiative Research (**SBIR**) Experience

Led scientific grant writer in securing >\$3.75M in research funds for AFT and subsidiaries
Served as PI/Scientific Consultant subcontracts for these AFT grants (PI: Applewhite)
Successful deliverables developed: kits/diagnostic reagents and procedures commercialized through AFT fee-for-service diagnostic testing laboratory

Co-founded **Nature West, Inc.**, Jonesboro, Arkansas aimed at commercialization of AState-patented technology using cultured root-based production of bioactive phytochemicals.

Educational Outreach and Innovation

Faculty Advisor, **ABI Biotechnology Educational Outreach** Program, initiated in Jan 2005.

Program targets middle thru high school science students (~100/month) for hands-on experiments (e.g., DNA extraction; electrophoresis; biofuels, forensics) and research tour stations to introduce ongoing research at the institute. We also sponsor the NIH supported DNA Day event at Arkansas State University each April (4 years)

Co-developed **Biotech-in-a-Box (BTNB) kits**

Designed and developed classroom-ready science activities with instrumentation supporting multiple student stations and accompanying lesson plans align with State/National Learning Standards for teaching biotechnology to Gr7-12 students. Program adopted at the state-level and distributed from several of our K-12 STEM Centers in Arkansas.

Professional Service Activities

Peer Reviewer (past 3 yrs): J Applied Biochem Biotechnol, Plant Cell Reports
Plant Biotech J, Biotechnol. Adv.

University Committees: Honors College Representative (Biology/Chemistry), AState IBC Committee Member; Molecular Biosciences Program Committee; College of Science and Math Leadership Council

Departmental Committees: Biotechnology Committee, Biology Curriculum Committee, Academic Scheduling Committee; Diversity Committee

External/Community Committees: NEA Clinical Biosafety Committee, IBC Member (local, non-affiliate) September 2017-present

Keynote Speaker, AState Future Women Leaders in STEM Conference, Jonesboro, AR
STEM conference targeting high school girls (Spring, 2016-19).

Convener of inaugural cross-disciplinary session-*Plants in Service for Medicine*-session; 2013 *In Vitro* Biology Conference (June 2013).

Professional Memberships

2012-present Society for In Vitro Biology (SIVB)

2015-present International Fish and Shellfish Immunology (IFSFI)

Honors and Awards

2018 College of Science and Math Advisor Award, Arkansas State University

2016 Professor of the Month (October), Arkansas State University

- 2013 Faculty highlighted in Measure Magazine (Fall 2013)-The Research Publication of Arkansas State University article entitled “Fishy Fraud and Food Mislabeling”.
- 2011 Research Development Institute (RDI) Fellowship; Arkansas State University
- 2008 Faculty Service Award from the Forensic Science Program; Arkansas State University

Publications

Peer-reviewed publications

- Hendrick, G., **Dolan, M.C.**, McKay, T., Sikkel, P.S. “Host DNA integrity within blood meals of hematophagous larval gnathiid isopods (Crustacea, Isopoda, Gnathiidae)” *Submitted to J Parasitol. May 2019.*
- Renoux, L.P., **Dolan, M.C.**, Cook, C., Smit, N., Sikkel, P. (2017) “Developing an apicomplexan DNA barcoding system to detect blood parasites of small coral reef fishes” *J Parasitol.* 103:366-376.
- Zhang N., **Dolan M.C.**, Wu D., Phillips G.C., Xu J. (2016) “Dramatic secretion of recombinant protein expressed in tobacco cells with a designer glycopeptide tag is highly impacted by medium composition” *Plant Cell Reports*, 35(12):2513-2522.
- Acosta, W., Ayala, J., **Dolan, M.C.**, Cramer, C.L. (2015). “RTB Lectin: a novel receptor-independent delivery system for lysosomal enzyme replacement therapies” *Nat. Scientific Reports.* 5:14144 DOI: 10.1038/srep14144
- Dolan, M.C.***, Wu, D., Cramer, C.L., Xu, J.* (2014) Hydroxyproline-mediated *O*-glycosylation occurs in stages and enhances recombinant protein yields in plant-based transient expression systems. *Process Biochem.* 49(3):490-495. *Co-corresponding authors*
- Park S.H., Aydin M., Khatiwara A., **Dolan M.C.**, Gilmore D.F., Bouldin J.L., Ahn S., Ricke S.C. (2014). Current and emerging technologies for rapid detection and characterization of Salmonella in poultry and poultry products. *Food Microbiology*, 38:250-62.
- Xu, J., **Dolan, M. C.**, Medrano, G., Cramer, C. L., Weathers, P. J. (2012). Green Factory: Plants as bioproduction platforms for recombinant proteins. *Biotechnol Advances*, **30**(5): 1171-1184.
- Xu, J., Ge, X., and **Dolan M.C.** (2011). Towards High-Yield Production of Therapeutic Proteins with Plant Cell Suspension Culture. *Biotechnol Advances*, **29**(3), 278-299.
- Sivakumar G., Medina-Bolivar F., Lay J.O., **Dolan M.C.**, Condori J., Wright S.M., Baque A., Lee E-J and Paek K.Y. (2011). Bioprocess and Bioreactor: Next generation technology for production of potential plant-based antidiabetic and antioxidant molecules. *Current Medicinal Chemistry*, **18**(1):79-90.
- Medina-Bolivar, F., Condori, J., Nopo-Olazabal, C., Carrier, D. J., Nair, V., Atwill, R. L., Baker, J., Nopo-Olazabal, L., **Dolan, M. C.** (2010). Controlled production of stilbenoids in hairy root cultures of peanut (*Arachis hypogaea*). *Polyphenols Communications*, **1**, 42-43.
- Condori J., Sivakumar G., Hubstenberger J., **Dolan MC**, Sobolev VS, and Medina-Bolivar, F. (2010). Induced biosynthesis of resveratrol and the prenylated stilbenoids arachidin-1 and arachidin-3 in hairy root cultures of peanut: Effects of culture medium and growth stage; accepted for publication. *Plant Physiology and Biochemistry*. **48**(5):310-8.
- Medrano, G., **Dolan, M.C.**, Stephens, N.T., McMickle, A., Erf, G., Radin, D. and Cramer C.L. (2010). Efficient plant-based production of chicken IL-12 yields a strong immunostimulatory cytokine. *J Interferon Cytokine Res.* **30**(3):21-31.

- Medrano, G., *M.J. Reidy, J. Liu, J. Ayala, Dolan, M.C.* Cramer C.L. (2009). “Rapid system for evaluating bioproduction capacity of complex pharmaceutical proteins in plants”. In: “Recombinant Proteins from plants”, L. Faye, and V. Gomord, eds. *Methods and Protocols. Series: Methods in Molecular Biology*. Humana Press, Totowa, NJ; Volume **483**: 41-50.
- Woffenden B.J., Ñopo L.H., Cramer C.L., **Dolan M.C.**, 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 Biosci.* **3**:10-19.
- Liu, J., **Dolan, M.C.**, Reidy, M. and Cramer, C.L. (2008). Production of bioactive single-chain murine IL-12 in transgenic plants. *J Interferon Cytokine Res* **28**(6):381-92.
- Medina-Bolivar F., Condori J., Rimando A., Hubstenberger J., Shelton K., Bennett S., **Dolan M.C.** (2007). Production and secretion of resveratrol in hairy root cultures of peanut. *Phytochemistry* **68**:1992-2003.
- Reed, D., Nopo-Olazabal, L., Funk, V., Woffenden, B., Reidy, M., **Dolan, MC.**, Cramer, C.L. and Medina-Bolivar, F.(2005). Expression of functional hexahistidine-tagged ricin B in tobacco. *Plant Cell Reports* **24**:15-24.
- Dolan-O’Keefe, M** and Ferl, R.J. (2000). “Adh as a model for analysis of the integration of stress response regulation in plants” J. Cherry *et al.*, eds. *Plant Tolerance to Abiotic Stresses in Agriculture: Role of Genetic Engineering*. Kluwer Academic Publishers, Netherlands; **83**:269-284.
- Dolan-O’Keefe, M.**, Chow, V., Monnier, J., Visner, G.A., and Nick, H.S. (2000). Transcriptional regulation and structural organization of the human cytosolic phospholipase A₂ gene. *Amer. J. Physiol.* **78**, L649-L657.
- Ferl, R. J., Chung, H. J., Daugherty, C. J., Bihn, E. A., Lysterly, C. R., **Dolan-O’Keefe, M.**, and Paul, A. L. (1999). Reporter gene expression in altered gravity environments. *ASGSB Bulletin* **13**: 47.
- Dolan-O’Keefe, M.** and Nick, H.S. (1999). Inhibition of cytoplasmic phospholipase A₂ expression by glucocorticoids in rat intestinal epithelial cells. *Gastroenterology* **116**:855-64.
- Fisher, B.M., Krunkosky, T.M., Wright, D., **Dolan-O’Keefe, M.C.** and Adler, K.B. (1995). Tumor Necrosis Factor (TNF- α) Stimulates Mucin Secretion and Gene Expression in Epithelium *In Vitro*. *Chest* **107**:133S-135S.
- McCarroll, D.R., Lathrop, S.A., **Dolan, M.C.**, and McDonald, T.P. (1987). Canine von Willebrand Factor Expresses a Multimeric Composition Similar to Human Homolog. *Exper. Hemat.* **15**:1060-1067.

Book/Methods Chapters.

- Dolan, M.C.***, Medrano, G., McMickle, A., Cramer C.L. “Tools of the trade: Developing antibody-based detection capabilities for recombinant proteins”. (2012). In A. Lorence (ed.) (Ed.), *In: Recombinant Gene Expression: Reviews and Protocols, Third Edition*. (pp. Pp 65-105). New York: Humana Press/Springer. * *Corresponding author*.

Medrano, G., **Dolan, M.C.**, Condori J., Radin D. and Cramer C.L. “Quality Assessment of Recombinant Proteins Produced in Plants”. (2012). In A. Lorence (ed.) (Ed.), In: *Recombinant Gene Expression: Reviews and Protocols, Third Edition*. (pp. Pp 535-564). New York: Humana Press/Springer.

Medrano, G., Reidy, M.J., Liu, J., Ayala, J., **Dolan, M.C.**, Cramer C.L. (2009). Rapid system for evaluating bioproduction capacity of complex pharmaceutical proteins in plants. In: “Recombinant Proteins from plants”, L. Faye, and V. Gomord, eds. *Methods and Protocols. Series: Methods in Molecular Biology*. Humana Press, Totowa, NJ; **483**:41-50.

Dolan, M.C. (2007). Contributor of Features in: *Criminalistics: Forensic Science and Crime Scene Investigation*, Ed. James Girard, Jones and Barlett, Inc. Sudbury, MA.

Patents/Patent Applications.

Cramer, C.L., Radin, D., **Dolan, M.C.**, Medrano, G. (2013). “Plant-based expression of avian interleukin-12 and methods of producing and using same”. US Patent N. 8431774 B1, (Issued Apr 30, 2013).

Medina-Bolivar F., **Dolan M.C.**, Bennett S., Condori J., Hubstenberger J. (2010). “Production of stilbenes in hairy roots” Patent N. 11773178 (Issued Jan. 23, 2010); European Patent Application N. PCT/US07/72756.

Dolan M.C., Lorence A., Medrano G. “Methods and compositions for enhancing polypeptide production” Patent Application No. PCT/US2010/053795 (Filed: October 23, 2010; Pending).

Grantsmanship –Select grant funding

Plant Biotechnology Funding-Supports my primary basic research in area of producing recombinant proteins with applications as therapeutics for animal and human health. We use plant-based expression platform for expressing functional forms of these complex animal proteins. To execute this research our group has expertise in the areas of molecular cloning, plant biotechnology, protein biochemistry and cell-based bioassays.

(7/1/18-6/30/22) **USDA NIFA/ 2017-05713** “Novel protein-based therapy for managing disease that stimulates catfish antimicrobial immunity and tissue repair systems” **PI.** (\$250,000).

(7/1/16 - 6/31/19) **NSF/1605564.** “Engineering novel designer glycopeptides as molecular carriers for boosting protein secretion in plant cell culture” **PI:** J. Xu College of Agriculture; **Co-PI.** (\$443,154).

(7/1/15 - 6/30/17) **ABI/AState Seed Grant 200122.** “Enabling technologies to stabilize delivery and efficacy of fish therapeutants in the aquaculture setting” **PI.** (\$99,963).

Molecular Diagnostics Funding – Supports both entrepreneurial and basic research initiatives focused on DNA-based diagnostics for species identification. For basic research projects I collaborate with Marine biology faculty in enabling molecular biology tools to enhance field studies. I also collaborate with Engineering faculty develop more user-friendly, field compatible molecular diagnostic platforms of use to the food industry. To execute this research our group has expertise in the areas of molecular diagnostic, PCR, qPCR, isothermal amplification, realtime RTqPCR, lateral flow technology, nanoislands.

(8/1/15-7/31/19) **NSF/OCE1536794.** “RUI: Beyond cleaning symbiosis: Ecology of "ticks of the

sea" on coral reefs" (Contribution: Molecular Species ID) PI: PS Sikkell Marine Biology; **Co-PI**. (\$929,369).

(1/2/19 - 12/31/20) **ABI/AState Seed Grant** 200126. "Interdisciplinary Research integrating Micro-Technology for improved DNA capture/detection in Food Industry Diagnostics " PI I. Seok, Mechanical Engineering; **Co-PI**. (\$99,433).

(7/1/15 - 6/30/17) **ABI/AState Seed Grant** 200126. "Interdisciplinary study for microfabrication of a novel in-field biosensor aimed at speciation of food products" **Co-PI**. (\$85,271).

(5/31/12 – 6/1/15) **NSF EAGER/OCE-12161651**. "Blood Parasite Infections in Fishes and their Transmission by Gnathiid Isopods on Caribbean Coral" **Collaborator** (\$299,120).

(1/1/13–12/31/15) **USDA SBIR PhII** (USDA2012-02159)-**Applied Food Technologies**; "Species Identification of Tuna in Commerce Utilizing Real Time qPCR" Industry PI: Applewhite; **Academic PI** AState subcontract (\$398,000 award total).

(8/1/12 – 7/31/14) **NSF MRI II** (CMMI1229404) "MRI: Acquisition of a Mask Aligner for Micro/Nano-Fabrication Research at Arkansas State University" PI: Seok; **co-PI** (\$298,578).

Science Education Outreach Funding –Supports biotechnology educational outreach initiatives that I have oversight on at the Arkansas State Biosciences Institute (ABI).

(4/1/12 - 7/31/12) **Arkansas Science & Technology Authority-STEM Summer Academy Grant** "*Enriching Biotech-in-a-Box Learning with Interactive Visualization Tools and Environments*" PI: Grady, **coPI** (\$19,977).

(4/1/12 - 7/31/12) **Arkansas Science & Technology Authority-STEM Summer Academy Grant**. "*Electrophoresis Biotechnology Summer Academy for Teachers & Students*" PI: Miller, **coPI** (\$15,321).

Research Mentoring and Teaching Activities

Courses taught 2012-present

Biology of the Cell (BIO 2013)	Applications in Biotechnology (BIO 4043/5043)
Cell Biology Lab (BIO 4131/5131)	Scientific Meth. & Res. Design (BIO 6003)
Pharmacology (BIO4143/CHEM4343)	Advanced Cell Biology (MBS 6213)
Molecular Biology (BIO 4163/5163)	

Academic Research Mentorship

Ph.D. Dissertation Advisees:

Ms. Gina Hendricks – Environmental Science Program Doctoral candidate (co-Advisor P. Sikkell) Jan. 2019 – present.

MS/MA Thesis Advisees:

Mr. Cristofer Calvo – Biology MS candidate (co-Advisor J. Xu) Aug 2017 – present

Honors Thesis Advisees:

Ms. Sarah Hall – Biology/Pre-Professional and Chemistry, May 2019 (anticipated May 2020)
Mr. Hugh Pascoe – Biology/Biotechnology, May 2019 – present (anticipated May 2021)

Honors Thesis Advisees: 8 since 2012; Committee Member: 8

Undergraduate Research Advisees (past 5 years): 28

Graduate Thesis/Doctoral Dissertation Committees: 10 (current); cumulative: 28

Former graduated thesis/dissertation advisees (completed during tenure-track position only):

Doctoral student (currently Teaching PostDoc, AState, Biological Sciences):

Dr. Lana Elkins –**Ph.D. Molecular Biosciences Program**, May 2019

MA student (currently pursuing MD degree):

Ms. Paula McClain **MA Biology**, May 2018

MS Thesis students (currently pursuing Ph.D. degree or in Post Doctoral training):

Ms. Gina Hendricks **M.S Biology**, Dec. 2018 Co-Advised w/Dr. Paul Sikkel

Ms. Lana Elkins **M.S Biology**, May 2012 Co-Advised w/Dr. Carole Cramer

Ms. Jessica Yactayo-Chang **M.S. Chemistry**, Dec. 2011 Co-Advised w/ Dr. Argelia Lorenc

Ms. Di Wu **M.S. Biology**, August 2011 Co-Advised w/ Dr. Jay Xu

Former Honors Student Advisee (all currently attending professional schools):

Ms. Madelyn Weiner **Honors BS Biology /BA Chemistry**, May 2019 (2017-2019)

Thesis: GENETICALLY-FUSED LECTIN BINDING PROTEIN FOR
ENHANCED STABILITY AND UPTAKE OF A RECOMBINANT
CATFISH THERAPEUTIC PROTEIN

Mr. Oliver Dozier – **Honors BS Biology**, May 2019 (2017-2019)

Thesis: UNDERSTANDING THE HYDROXYPROLINE-O-GLYCOSYLATION
PATHWAY TO ENHANCE RECOMBINANT THERAPEUTIC
PROTEIN PRODUCTION

Mr. Jose Williams – **Honors BS Biology**, May 2019 (2018-2019)

Thesis: ASSESSING THE IMMUNE STIMULATING CAPABILITIES OF
PLANT-MADE CATFISH INTERLEUKIN-22

Ms. Lindsey George **Honors BS Biology**, May 2017 (2016-2017)

Thesis: ENGINEERING DNA ISOTHERMAL AMPLIFICATION
TECHNOLOGY FOR FOOD FISH SPECIES IDENTIFICATION

Ms. Emily Moody **Honors BS Biology**, May 2017 (2016-2017)

Thesis: ENGAGEMENT ACTIVITY DEVELOPMENT AND IMPACT
ASSESSMENT FOR K-12 DNA DAY EVENT

Ms. Brandi Mize **Honors BS Biology/BA Chemistry**, May 2017 (2014-2017)

Thesis: UTILIZING RECOMBINANT CATFISH INTERLEUKIN-22 WITH THE
PLANT LECTIN RTB TO ENHANCE THERAPEUTIC DELIVERY

Ms. Morgan Tripod **Honors BS Biology**, May 2016 Co-Advise with Dr. Shiguang Yu

Thesis: USE OF RIBOSOME-INACTIVATING TOXIN B FOR
TRANSCYTOSIS OF CHICKEN IL-22 THROUGH TRANSIENT
PROTEIN PRODUCTION

Ms. Alyssa Caparas-Weyer **Honors BS Biology**, May 2015 (2013-2015)

Thesis: PLANT SPECIFIC HYP-GLYCO TECHNOLOGY FOR ENHANCING
STABILITY AND EXPRESSION OF RECOMBINANT PROTEIN FISH
INTERLEUKIN-22