



Mary Beth Mudgett

Senior Associate Dean for Undergraduate Educational Initiatives and Professor of Biology

CONTACT INFORMATION

- **Alternate Contact**

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Bio

ACADEMIC APPOINTMENTS

- Associate Professor, Biology
- Professor, Biology
- Member, Bio-X

ADMINISTRATIVE APPOINTMENTS

- Committee on Committees (CoC), Stanford University, (2019-2022)
- Senior Associate Dean, School of Humanities & Sciences, Stanford University, (2019-2022)
- Committee on Review of Undergraduate Majors (C-RUM), Stanford University, (2016-2019)
- Advisory Committee, NIH IRACDA Postdoctoral Program, Stanford University, (2015- present)
- Director of Graduate Studies, Department of Biology, Stanford University, (2015- present)
- Steering Committee, NIH Biotechnology Predoctoral Training Program, Bioengineering, Stanford University, (2014- present)
- Chair, Bioscience Diversity Advisory Council, School of Medicine, Stanford University, (2013- present)
- Faculty Senate, Stanford University, (2011-2013)
- Committee on Research, Stanford University, (2010-2013)

HONORS AND AWARDS

- Bass Fellow, Stanford Friends University Fellow in Undergraduate Education, Stanford University (2018-2022)
- Dean's Award for Distinguished Teaching, School of H&S, Stanford University (2017)
- Phi Beta Kappa Teaching Excellence Prize, PBK Northern Chapter (2017)
- Phi Beta Kappa Teaching Prize, Stanford University (2016)
- Excellence in Diversity, Bioscience Faculty Excellence Award, School of Medicine, Stanford University (2014)
- VPUE Faculty Scholar, Stanford University (2013-2014)
- Chambers Fellow, Stanford University (2011-2014)

- Teacher of the Year, Associated Students of Stanford University (2008)
- Hellman Faculty Scholar, Stanford University (2005-2006)
- Terman Fellow, Stanford University (2004-2010)
- National Research Service Award, National Institute of Health (1997-1999)
- Graduate Research Achievement Award, University of California, Los Angeles (1992)
- Graduate Teaching Assistant Award, University of California, Los Angeles (1990)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Board Member, International Society for Molecular Plant-Microbe Interactions (2012 - present)
- Chair, Board Member, Pierce's Disease/Glassy Wing Sharp Shooter Research Advisory Board (2009 - 2014)
- Specialty Chief Editor, *Frontiers in Plant-Microbe Interactions* (2010 - 2014)

PROFESSIONAL EDUCATION

- Postdoctoral Scholar, University of California, Berkeley , Plant-Microbe Interactions (2001)
- Postdoctoral Scholar, University of California, Los Angeles , Biochemistry (1995)
- PhD, University of California, Los Angeles , Biochemistry (1994)
- BA, Ithaca College , Biochemistry (1989)

LINKS

- Mudgett Lab Website: <http://web.stanford.edu/group/mudgettlab/cgi-bin/wordpress/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My laboratory studies the biochemical mechanisms used by bacterial pathogens to alter plant physiology during infection. Extensive genetic and phenotypic data indicate that the bacterial type three secretion (T3S) system and its protein substrates (referred to as T3S effectors) are the major virulence determinants that promote pathogen colonization in plants. The paradigm for T3S effector function has been that these proteins collectively suppress host defense responses to promote colonization and disease progression. The biological function(s) of most T3S effectors, however, is extremely limited and biochemical support for this paradigm is lacking. Thus, the goal of our research has been to elucidate T3S effector function, identify host targets, and provide fundamental knowledge of how perturbation of distinct nodes in host signaling pathways leads to bacterial pathogenesis. To do so, we study the T3S effectors in *Xanthomonas euvesicatoria* (Xcv), a Gram-negative, facultative parasite that causes leaf spot disease in tomato and pepper. Understanding how plant innate immunity is regulated and how pathogens manipulate plant hosts is fundamental knowledge that is required for the development of novel strategies to prevent and/or eliminate plant disease in the field.

Currently, my group is investigating: 1) how *Xanthomonas* employs a transcription repressor to rewire host transcription during infection to alter immune signaling and growth programs; 2) how *Xanthomonas* effectors target 14-3-3 phospho-binding proteins to alter immune complexes and signaling; 3) the impact of *Xanthomonas*-mediated acetylation of host proteins that are involved with lipid signaling and microtubule dynamics; 4) how *Xanthomonas* uses a "default to death and defense strategy" to promote plant pathogenesis; and 5) unique natural products made during pathogen infection in tomato by applying a untargeted metabolomics in conjunction with transcriptomics to accelerate the discovery of new antimicrobial compounds and their biosynthetic pathways.

Teaching

COURSES

2018-19

- Biology PhD Lab Rotation: BIO 299 (Aut, Win, Spr, Sum)
- Plant Biology Seminar: BIO 342 (Win)
- Problem solving in infectious disease: BIO 60 (Win)

2017-18

- Biology PhD Lab Rotation: BIO 299 (Aut, Win, Spr)
- Introduction to Problem Solving in Biology: BIO 60 (Win)
- Plant Biology Seminar: BIO 342 (Win, Spr)

2016-17

- Bio Solve-It: BIO 41A (Aut)
- Bio Solve-It: BIO 42A (Win)
- Bio Solve-It: BIO 43A (Spr)
- Biology PhD Lab Rotation: BIO 299 (Aut, Win, Spr, Sum)
- Genetics, Biochemistry, and Molecular Biology: BIO 41 (Aut)
- Introduction to Problem Solving in Biology: BIO 60 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Susan Brewer, Eric Holmes, Michelle Lissner

Doctoral Dissertation Advisor (AC)

Anne Duncan, Jessica Foret, Andrew Guzman

Doctoral Dissertation Co-Advisor (AC)

Yanniv Dorone, Jacob Moe-Lange, Iris Mollhoff

Doctoral (Program)

Yanniv Dorone, Anne Duncan, Iris Mollhoff

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)

Publications

PUBLICATIONS

- **Tomato Atypical Receptor Kinase1 is involved in the regulation of pre-invasion defense.** *Plant physiology*
Guzman, A. R., Kim, J., Taylor, K. W., Lanver, D., Mudgett, M. B.
2020
- **A Pathogen-Responsive Gene Cluster for Highly Modified Fatty Acids in Tomato.** *Cell*
Jeon, J. E., Kim, J. G., Fischer, C. R., Mehta, N., Dufour-Schroif, C., Wemmer, K., Mudgett, M. B., Sattely, E.
2020; 180 (1): 176–87.e19
- **An engineered pathway for N-hydroxy-pipecolic acid synthesis enhances systemic acquired resistance in tomato.** *Science signaling*
Holmes, E. C., Chen, Y., Sattely, E. S., Mudgett, M. B.
2019; 12 (604)
- **Aphid effector Me10 interacts with tomato TFT7, a 14-3-3 isoform involved in aphid resistance** *NEW PHYTOLOGIST*
Chaudhary, R., Peng, H., He, J., MacWilliams, J., Teixeira, M., Tsuchiya, T., Chesnais, Q., Mudgett, M., Kaloshian, I.

2019; 221 (3): 1518–28

- **Tomato bHLH132 transcription factor controls growth and defense and is activated by *Xanthomonas euvesicatoria* effector XopD during pathogenesis.** *Molecular plant-microbe interactions : MPMI*
Kim, J. G., Mudgett, M. B.
2019
- **Aphid effector Me10 interacts with tomato TFT7, a 14-3-3 isoform involved in aphid resistance.** *The New phytologist*
Chaudhary, R., Peng, H., He, J., MacWilliams, J., Teixeira, M., Tsuchiya, T., Chesnais, Q., Mudgett, M. B., Kaloshian, I.
2018
- **Tomato 14-3-3 proteins are required for Xv3 disease resistance and interact with a subset of *Xanthomonas euvesicatoria* effectors.** *Molecular plant-microbe interactions : MPMI*
Dubrow, Z., Sunitha, S., Kim, J., Aakre, C., Girija, A. M., Sobol, G., Teper, D., Chen, Y., Ozbaki-Yagan, N., Vance, H., Sessa, G., Mudgett, M. B.
2018
- **N-hydroxy-pipecolic acid is a mobile metabolite that induces systemic disease resistance in Arabidopsis** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Chen, Y., Holmes, E. C., Rajniak, J., Kim, J., Tang, S., Fischer, C. R., Mudgett, M., Sattely, E. S.
2018; 115 (21): E4920–E4929
- **Quantification of Ethylene Production in Tomato Leaves Infected by *Xanthomonas euvesicatoria*.** *Bio-protocol*
Kim, J., Stork, W., Mudgett, M. B.
2016; 6 (3)
- **Functional Analysis of Plant Defense Suppression and Activation by the *Xanthomonas* Core Type III Effector XopX** *MOLECULAR PLANT-MICROBE INTERACTIONS*
Stork, W., Kim, J., Mudgett, M. B.
2015; 28 (2): 180-194
- **A Comprehensive Analysis of MicroProteins Reveals Their Potentially Widespread Mechanism of Transcriptional Regulation.** *Plant physiology*
Magnani, E., de Klein, N., Nam, H., Kim, J., Pham, K., Fiume, E., Mudgett, M. B., Rhee, S. Y.
2014; 165 (1): 149-159
- **The bHLH Transcription Factor HBI1 Mediates the Trade-Off between Growth and Pathogen-Associated Molecular Pattern-Triggered Immunity in Arabidopsis.** *Plant cell*
Fan, M., Bai, M., Kim, J., Wang, T., Oh, E., Chen, L., Park, C. H., Son, S., Kim, S., Mudgett, M. B., Wang, Z.
2014; 26 (2): 828-841
- **AvrBsT acetylates Arabidopsis ACIP1, a protein that associates with microtubules and is required for immunity.** *PLoS pathogens*
Cheong, M. S., Kirik, A., Kim, J., Frame, K., Kirik, V., Mudgett, M. B.
2014; 10 (2)
- **A robust methodology to subclassify pseudokinases based on their nucleotide-binding properties.** *Biochemical journal*
Murphy, J. M., Zhang, Q., Young, S. N., Reese, M. L., Bailey, F. P., Evers, P. A., Ungureau, D., Hammaren, H., Silvennoinen, O., Varghese, L. N., Chen, K., Tripaydonis, A., Jura, et al
2014; 457 (2): 323-334
- ***Xanthomonas euvesicatoria* typeIII effector XopQ interacts with tomato and pepper 14-3-3 isoforms to suppress effector-triggered immunity** *PLANT JOURNAL*
Teper, D., Salomon, D., Sunitha, S., Kim, J., Mudgett, M. B., Sessa, G.
2014; 77 (2): 297-309
- ***Xanthomonas* type III effector XopD desumoylates tomato transcription factor SIERF4 to suppress ethylene responses and promote pathogen growth.** *Cell host & microbe*
Kim, J., Stork, W., Mudgett, M. B.
2013; 13 (2): 143-154
- ***Xanthomonas euvesicatoria* type III effector XopQ interacts with tomato and pepper 14-3-3 isoforms to suppress effector-triggered immunity.** *The Plant journal : for cell and molecular biology*
Teper, D., Salomon, D., Sunitha, S., Kim, J. G., Mudgett, M. B., Sessa, G.

2013

- **Regulation of Cell Wall-Bound Invertase in Pepper Leaves by *Xanthomonas campestris* pv. *vesicatoria* Type Three Effectors** *PLOS ONE*
Sonneward, S., Priller, J. P., Schuster, J., Glickmann, E., Hajirezaei, M., Siebig, S., Mudgett, M. B., Sonneward, U.
2012; 7 (12)
- **Tomato TFT1 Is Required for PAMP-Triggered Immunity and Mutations that Prevent T3S Effector XopN from Binding to TFT1 Attenuate *Xanthomonas* Virulence** *PLOS PATHOGENS*
Taylor, K. W., Kim, J., Su, X. B., Aakre, C. D., Roden, J. A., Adams, C. M., Mudgett, M. B.
2012; 8 (6)
- **Comparative analysis of the XopD type III secretion (T3S) effector family in plant pathogenic bacteria** *MOLECULAR PLANT PATHOLOGY*
Kim, J., Taylor, K. W., Mudgett, M. B.
2011; 12 (8): 715-730
- **A New Leaf Blight of Rice Caused by *Pantoea ananatis* in India.** *Plant disease*
Mondal, K. K., Mani, C., Singh, J., Kim, J. G., Mudgett, M. B.
2011; 95 (12): 1582
- **Sugar transporters for intercellular exchange and nutrition of pathogens** *NATURE*
Chen, L., Hou, B., Lalonde, S., Takanaga, H., Hartung, M. L., Qu, X., Guo, W., Kim, J., Underwood, W., Chaudhuri, B., Chermak, D., Antony, G., White, et al
2010; 468 (7323): 527-U199
- **SOBER1 phospholipase activity suppresses phosphatidic acid accumulation and plant immunity in response to bacterial effector AvrBsT** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Kirik, A., Mudgett, M. B.
2009; 106 (48): 20532-20537
- ***Xanthomonas* T3S Effector XopN Suppresses PAMP-Triggered Immunity and Interacts with a Tomato Atypical Receptor-Like Kinase and TFT1** *PLANT CELL*
Kim, J., Li, X., Roden, J. A., Taylor, K. W., Aakre, C. D., Su, B., Lalonde, S., Kirik, A., Chen, Y., Baranage, G., McLane, H., Martin, G. B., Mudgett, et al
2009; 21 (4): 1305-1323
- **XopD SUMO protease affects host transcription, promotes pathogen growth, and delays symptom development in *Xanthomonas*-infected tomato leaves** *PLANT CELL*
Kim, J., Taylor, K. W., Hotson, A., Keegan, M., Schmelz, E. A., Mudgett, M. B.
2008; 20 (7): 1915-1929
- **Blue-light-activated histidine kinases: Two-component sensors in bacteria** *SCIENCE*
Swartz, T. E., Tseng, T., Frederickson, M. A., Paris, G., Comerci, D. J., Rajashekara, G., Kim, J., Mudgett, M. B., Splitter, G. A., Ugalde, R. A., Goldbaum, F. A., Briggs, W. R., Bogomolni, et al
2007; 317 (5841): 1090-1093
- **An alpha-amylase (At4g25000) in Arabidopsis leaves is secreted and induced by biotic and abiotic stress** *PLANT CELL AND ENVIRONMENT*
Doyle, E. A., Lane, A. M., Sides, J. M., Mudgett, M. B., Monroe, J. D.
2007; 30 (4): 388-398
- **A conserved carboxylesterase is a SUPPRESSOR OF AVRBS-ELICITED RESISTANCE in Arabidopsis** *PLANT CELL*
Cunnac, S., Wilson, A., Nuwer, J., Kirik, A., Baranage, G., Mudgett, M. B.
2007; 19 (2): 688-705
- **New insights to the function of phytopathogenic bacterial type III effectors in plants** *ANNUAL REVIEW OF PLANT BIOLOGY*
Mudgett, M. B.
2005; 56: 509-531
- **A genetic screen to isolate type III effectors translocated into pepper cells during *Xanthomonas* infection** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Roden, J. A., Belt, B., Ross, J. B., Tachibana, T., Vargas, J., Mudgett, M. B.
2004; 101 (47): 16624-16629
- **Cysteine proteases in phytopathogenic bacteria: identification of plant targets and activation of innate immunity** *CURRENT OPINION IN PLANT BIOLOGY*

- Hotson, A., Mudgett, M. B.
2004; 7 (4): 384-390
- **Characterization of the Xanthomonas AvrXv4 effector, a SUMO protease translocated into plant cells** *MOLECULAR PLANT-MICROBE INTERACTIONS*
Roden, J., Eardley, L., Hotson, A., Cao, Y. Y., Mudgett, M. B.
2004; 17 (6): 633-643
 - **Importance of opgH(Xcv) of Xanthomonas campestris pv. vesicatoria in host-parasite interactions** *MOLECULAR PLANT-MICROBE INTERACTIONS*
Minsavage, G. V., Mudgett, M. B., Stall, R. E., Jones, J. B.
2004; 17 (2): 152-161
 - **Xanthomonas type III effector XopD targets SUMO-conjugated proteins in planta** *MOLECULAR MICROBIOLOGY*
Hotson, A., Chosed, R., Shu, H. J., Orth, K., Mudgett, M. B.
2003; 50 (2): 377-389
 - **Common and contrasting themes of plant and animal diseases** *SCIENCE*
Staskawicz, B. J., Mudgett, M. B., Dangl, J. L., Galan, J. E.
2001; 292 (5525): 2285-2289
 - **Mutational analysis of the Arabidopsis RPS2 disease resistance gene and the corresponding Pseudomonas syringae avrRpt2 avirulence gene** *MOLECULAR PLANT-MICROBE INTERACTIONS*
Axtell, M. J., McNellis, T. W., Mudgett, M. B., Hsu, C. S., Staskawicz, B. J.
2001; 14 (2): 181-188
 - **Disruption of signaling by Yersinia effector YopJ, a ubiquitin-like protein protease** *SCIENCE*
Orth, K., Xu, Z. H., Mudgett, M. B., Bao, Z. Q., Palmer, L. E., Bliska, J. B., Mangel, W. F., Staskawicz, B., Dixon, J. E.
2000; 290 (5496): 1594-1597
 - **Molecular signals required for type III secretion and translocation of the Xanthomonas campestris AvrBs2 protein to pepper plants** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Mudgett, M. B., Chesnokova, O., Dahlbeck, D., Clark, E. T., Rossier, O., Bonas, U., Staskawicz, B. J.
2000; 97 (24): 13324-13329
 - **Molecular Characterization of the avrBs2 gene of Xanthomonas campestris pv. vesicatoria and the Bs2 gene of pepper** *9th International Congress on Molecular Plant-Microbe Interactions*
Tai, T., Dahlbeck, D., Gassmann, W., Chesnokova, O., Whalen, M., Clark, E., Mudgett, M. B., Staskawicz, B.
INTERNATIONAL SOC MOLECULAR PLANT-MICROBE INTERACTIONS.2000: 223-226
 - **Characterization of the Pseudomonas syringae pv. tomato AvrRpt2 protein: demonstration of secretion and processing during bacterial pathogenesis** *MOLECULAR MICROBIOLOGY*
Mudgett, M. B., Staskawicz, B. J.
1999; 32 (5): 927-941
 - **Glucocorticoid-inducible expression of a bacterial avirulence gene in transgenic Arabidopsis induces hypersensitive cell death** *PLANT JOURNAL*
McNellis, T. W., Mudgett, M. B., Li, K., Aoyama, T., Horvath, D., Chua, N. H., Staskawicz, B. J.
1998; 14 (2): 247-257
 - **Protein signaling via type III secretion pathways in phytopathogenic bacteria** *CURRENT OPINION IN MICROBIOLOGY*
Mudgett, M. B., Staskawicz, B. J.
1998; 1 (1): 109-115
 - **Protein repair L-isoaspartyl methyltransferase in plants - Phylogenetic distribution and the accumulation of substrate proteins in aged barley seeds** *PLANT PHYSIOLOGY*
Mudgett, M. B., Lowenson, J. D., Clarke, S.
1997; 115 (4): 1481-1489
 - **A distinctly regulated protein repair L-isoaspartylmethyltransferase from Arabidopsis thaliana** *PLANT MOLECULAR BIOLOGY*
Mudgett, M. B., Clarke, S.
1996; 30 (4): 723-737
 - **EXCEPTIONAL SEED LONGEVITY AND ROBUST GROWTH - ANCIENT SACRED LOTUS FROM CHINA** *AMERICAN JOURNAL OF BOTANY*

SHENMILLER, J., Mudgett, M. B., Schopf, J. W., Clarke, S., Berger, R.
1995; 82 (11): 1367-1380

● **HORMONAL AND ENVIRONMENTAL RESPONSIVENESS OF A DEVELOPMENTALLY-REGULATED PROTEIN REPAIR L-ISOASPARTYL METHYLTRANSFERASE IN WHEAT** *JOURNAL OF BIOLOGICAL CHEMISTRY*

Mudgett, M. B., Clarke, S.
1994; 269 (41): 25605-25612

● **CHARACTERIZATION OF PLANT L-ISOASPARTYL METHYLTRANSFERASES THAT MAY BE INVOLVED IN SEED SURVIVAL - PURIFICATION, CLONING, AND SEQUENCE-ANALYSIS OF THE WHEAT-GERM ENZYME** *BIOCHEMISTRY*

Mudgett, M. B., Clarke, S.
1993; 32 (41): 11100-11111