

Michael A. Lawton Curriculum Vitae

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Nationality

US Citizen, UK Citizen

Education

1978-1982 Oxford University, D.Phil., Biochemistry
1975-1978 Bristol University, B.Sc., Biochemistry (Hons.)

Professional Experience

2013-2014 Sabbatical Leave, lab of Prof. Nir Ohad Dept. Molecular Biology and Ecology of Plants, Tel Aviv University, Tel Aviv, Israel.
2001-2002 Sabbatical Leave, lab of Prof. Jean-Pierre Zryd, Laboratoire Phytogénétique Cellulaire, Institut d'Ecologie, UNIL, Lausanne, Switzerland.
1996-present Associate Professor, Biotech Center for Agriculture and the Environment and Plant Biology Department, Rutgers University.
1990-present Assistant Professor, Center for Agricultural Molecular Biology and Plant Biology Department, Rutgers University.
1987-1990 Senior Research Associate, Salk Institute, San Diego, CA.
1985-1987 Post-Doctoral Researcher, Salk Institute, San Diego, CA, Prof. Chris Lamb.
1982-1985 Post-Doctoral Researcher, Washington University, St. Louis, MO. Profs. Mary-Dell Chilton and Roger Beachy.

Honours and Awards

1993 Recipient, Hoechst-Celene/Rutgers University Innovative Partnership Award
1982-1985 NATO/SERC Postdoctoral Fellowship, Washington University, St. Louis, MO.
1980 Biochemical Society/Boehringer-Mannheim Travelling Fellowship held in the laboratory of Dr. Klaus Hahlbrock, University of Freiburg, FRG.

Research Interests

Food Safety and Security; Reducing fungal toxin contamination of grain crops; Defining mechanisms and cellular targets for mycotoxin action in animals; Cellular mechanisms of health-promoting natural plant products; Developing genomic tools for non-traditional plants and crops.

My primary research interests are in enhancing food security and food safety. Efforts to improve crop yield and quality is focused on identifying plant genes (or chemical modifiers) that enhance resistance to fungal diseases and reduce contamination of food crops by mycotoxins. This research uses biotechnological approaches, including the expression of transgenes, the creation of gene knockouts and gene editing with CRISPR/Cas9 and Host-Induced Gene Suppression. This work makes use of both model systems and crop species. To better understand the mode-of-action of mycotoxins in humans and animals and to develop more effective strategies for amelioration of mycotoxin contamination, we have made use of the model organism *C. elegans* to identify novel molecular and cellular targets for the mycotoxin Deoxynivalenol (DON), which poses a serious and chronic health risk. This work has identified novel cellular targets that may play a role in mycotoxin susceptibility or detoxification. Both the plant and animal work focused on mycotoxins forms part

of a consortium of USDA-funded researchers focused on mechanisms designed to reduce and ameliorate mycotoxin contamination of food crops.

Additional collaborative projects include: Epigenetic regulation of stress-responsive genes (with Nir Ohad, TAU); Developing molecular and genomic tools for marine diatoms (with Paul Falkowski, Rutgers); Identifying cellular targets in animals for health-promoting, natural plant products (with Rong Di, Rutgers).

Programmatic Activities

Professional Science Masters

- Masters in Business and Science (MBS), Biotechnology and Genomics Track Coordinator. Developed track curriculum, teach MBS courses, handle admissions, internships, industrial outreach.

International Programs

- Co-Developed Joint Graduate Program Rutgers-U. São Paulo, Brazil.
- Led Dept. Ed-Funded ISE Program in International Agriculture and Biofuels: New-Use Crops. Rutgers, Ohio State University, University of Sao Paulo, UFRGS, Brazil.
- Participant in USDA IFAFS programs on (i) the Role of Intellectual Property in Biotechnological Innovation and (ii) the Public Acceptance of Biotechnology. Development of outreach tools and programs for the public. Development of educational materials and methods.

Teaching

Undergraduate Courses:

Issues and Concepts in Biotechnology
Plant Cell and Developmental Biology
Plant Genetics
Plant Molecular Biology
Cell Biology
International Agriculture (Biofuels and New-Use Crops)
Methods and Applications Molecular Biology (Lab Course)
Seminar in Plant Biology
Science and the Media

Graduate Courses:

Concepts in Biotechnology & Genomics (MBS)
NextGen Genomics (MBS)
Plant Molecular Biology
Advanced Plant Genetics
Introduction to Plant Molecular Biology.

Publications

1. Lawton, MA, RA Dixon and CJ Lamb. (1980). Elicitor modulation of the turnover of L-phenylalanine ammonia-lyase in French bean cell suspension cultures. *Biochim. Biophys. Acta* 633: 162-175.
2. Lamb, CJ, MA Lawton, SJ Taylor and RA Dixon. (1980). Elicitor Modulation of phenylalanine ammonia-lyase in *Phaseolus vulgaris*. *Ann. Phytopathol.* 12: 423-433.
3. Lamb, CJ, MA Lawton and SE Shields. (1981). Density labelling characterization of the effects of cordycepin and cycloheximide on the turnover of phenylalanine ammonia-lyase. *Biochim. Biophys. Acta* 675: 1-8.
4. Muirhead, H, JP Grant, MA Lawton, CA Midwinter, JC Nocton and DI Stuart (1981). The structure and function of pyruvate kinase. *Biochem. Soc. Trans.* 9: 212-213.
5. Lawton, MA, RA Dixon, K Hahlbrock and CJ Lamb. (1983). Rapid induction of the synthesis of phenylalanine ammonia-lyase and of chalcone synthase in elicitor treated plant cells. *Eur. J. Biochem.* 129: 593-601.
6. Lawton, MA, RA Dixon, K. Hahlbrock and CJ Lamb. (1983). Elicitor induction of mRNA activity: rapid effects of elicitor on phenylalanine ammonia-lyase and chalcone synthase mRNA activities in bean cells. *Eur. J. Biochem.* 130: 131-139.
7. Dixon, RA, PM Dey, MA Lawton and CJ Lamb. (1983). Phytoalexin induction in bean: intercellular transmission of elicitation in cell suspension cultures and hypocotyl sections of *Phaseolus vulgaris*. *Plant Physiol.* 71: 251-256.
8. Lamb, CJ, J. Bell, P Norman, MA Lawton, RA Dixon, P. Rowell, and JA Bailey (1983). Early molecular events in the phytoalexin defense response. In *NATO-ASI: Structure and Function of Plant Genomes*, (eds. Ciferri, O and L Dure) pp 313-328.
9. Lamb, CJ and MA Lawton (1983). The photocontrol of gene expression. In *Encyclopaedia of Plant Physiology: Photomorphogenesis* (eds. Shropshire, W and H Mohr), 16:213-257, Springer.
10. Lawton, MA and M-D Chilton, (1984). *Agrobacterium Ti* plasmids as potential vectors for genetic engineering. *Hort Science* 19, No. 1.
11. Ryder, TB, JN Bell, CL Cramer, SL Dildine, C Grand, Hedrick, SA, MA Lawton, and CJ Lamb (1985). In *NATO-ASI: Organization, Structure and expression of defense genes in Biology and Molecular Biology of Plant-Pathogen Interactions* (ed. Bailey, JA,) pp207-219, Plenum, New York.
12. Lamb, CJ, DR. Corbin, MA Lawton, N Sauer, and VPM Wingate (1986) *Recognition and Pathogenic Interactions* (ed. Lugtenberg, B) Vol H4, pp 333-344.
13. Lamb, CJ, JN Bell, DR Corbin, MA Lawton, MC Mehdy, TB Ryder, N Sauer and MA Walter (1986). Activation of Defense genes in response to elicitor and infection. In *UCLA Dupont Symposium: Molecular Strategies for Crop Protection* (eds. Arntzen, CJ and CA Ryan) pp 49-58.
14. Beachy, RN, Z-L Chen, EA Bray, MA Lawton, Y Komeda, I Nakamura, S. Naito, E. Anderson, P. Dube, SG Rogers, RT Fraley (1986). The expression of subunits of β -conglycinin in transgenic tobacco and petunia plants. In *Molecular Biology of Seed Storage Proteins and Lectins* (eds. Shannon LM and MJ Chrispeels). *Proc 9th Ann. Symp. Plant Physiol. Ann. Soc. Plant Physiol. Rockville MD.*, pp193-202.
15. Lawton, MA and CJ Lamb (1987). Transcriptional activation of plant defense genes by fungal elicitor, wounding and infection. *Mol. Cell Biol.* 7:335-341.
16. Lawton, MA, M.A. Tierney, I. Nakamura, E. Anderson, Y. Komeda, P. Dube, N. Hoffman, R.T. Fraley and R.N. Beachy (1987). Expression of a soybean β -conglycinin gene under the control of the cauliflower mosaic virus 35S and 19S promoters in transformed petunia tissues. *Plant Mol. Biol.* 9:315-324.
17. Wingate, VPM, MA Lawton, and CJ Lamb (1988). Glutathione causes a massive and selective induction of plant defense genes, *Plant Physiology* 87:206-210.
18. Lamb, CJ, M Dron, SD Clouse, RA Dixon, and MA Lawton (1988). Plant defense gene regulation, In *Transformation of Agriculturally Important Crops* (eds. Fraley, R, J St. Schell, and N Frey, eds), Cold Spring Harbor Laboratory Press, Cold Spring Harbor Laboratory, New York, pp 31-35.

19. Dron, M, SD Clouse, RA Dixon, MA Lawton, and CJ Lamb (1988). Glutathione and fungal elicitor-regulation of a plant defense gene promoter in electroporated protoplasts. *Proc. Natl. Acad. Sci. USA* 85:6738-6742.
20. Lamb, CJ, MA Lawton, M Dron, SD Clouse, SM Jenkins, KM Kragh, and RA Dixon (1988). Transduction mechanisms for elicitor activation of defense genes. In *University of California, Riverside: Symposium in Plant Physiology* (Keen, N. and L Walling, eds.), pp 120-123.
21. Lamb, CJ, MA Lawton, M Dron, and RA Dixon (1989). Signals and transduction mechanisms for activation of plant defenses against microbial attack. *Cell*, 56:215-224.
22. Lawton, MA, RT Yamamoto, SK Hanks and CJ Lamb (1989). Molecular cloning of plant transcript homologous to eukaryotic protein kinases. *Proc. Natl. Acad. Sci. USA*, 86:3140-3144.
23. Lawton, MA, RT Yamamoto, SK Hanks and CJ Lamb (1989). Molecular cloning of plant transcripts homologous to protein kinases. In *UCLA Symposia on Molecular and Cellular Biology, New Series, Volume 129* (eds. Lamb, C and R. Beachy) Alan R. Liss, Inc., New York, NY, pp 175-182.
24. Dixon, RA, MJ Harrison, SM Jenkins, CJ Lamb, MA Lawton and L Yu (1989). Cis-elements and trans-acting factors for regulation of the plant defense gene chalcone synthase. In *UCLA Symposia on Molecular and Cellular Biology, New Series, Volume 129* (eds. Lamb, C and R. Beachy) Alan R. Liss, Inc., New York NY, pp 101-109.
25. Dixon, RA, ER Blyden, M Dron, MJ Harrison, CJ Lamb, MA Lawton and M. Mavandad (1989). Regulation of gene expression in biologically stressed bean cell cultures. In *Primary and Secondary Metabolism of Plant Cell Cultures II.* (ed. W Kurz) Springer Verlag, Berlin, Heidelberg, pp 266-273.
26. Dixon, MS, SZ Zhang, RT Yamamoto, CJ Lamb and MA Lawton (1989). Molecular cloning of plant protein kinases. In *NATO ASI Series, Signal Perception and Transduction in Higher Plants* (eds. R Ranjeva and A M Boudet) Springer-Verlag, Berlin, pp 213-228.
27. Lawton, MA, SD Clouse, and CJ Lamb (1989). Glutathione-elicited changes in chromatin configuration in the promoter of the plant defense gene chalcone synthase. *Plant Cell Reports*, 8: 561-564.
28. Templeton, MD, RA Dixon, CJ Lamb and MA Lawton (1990). In situ hybridization analysis of the spatial patterns of defense gene activation in wounded and infected bean hypocotyls. *Plant Physiol*, 94: 1265-1269
29. Lawton, MA (1990) Plant protein kinases: a molecular genetic approach. In *Current Topics in Plant Biochemistry and Physiology, Vol 9* (eds. DD Randell and DG Blevins) University of Missouri, Columbia Missouri, pp 373-382.
30. Lawton, MA, SM Jenkins, M Dron, J. Kooter, KM Kragh, M. Harrison, L Yu, RA Dixon and CJ Lamb (1991). Nuclear protein interactions with the transcriptional silencer of the bean chalcone synthase gene. *Plant Molecular Biology*, 16.235-249.
31. Dixon, RA, AD Choudhary, MJ Harrison, BA Stermer, L Yu, SM Jenkins, CJ Lamb and MA Lawton, (1991). Transcription factors and defence gene activation. In *Biochemistry and Molecular Biology of Plant-Pathogen Interactions* (ed. C Smith) Oxford Science Publications, Oxford, pp 271-284.
32. Harrison, MJ, MA Lawton, CJ Lamb, and RA Dixon (1991). Characterization of a nuclear protein which binds to three elements within the silencer region of a bean chalcone synthase gene promoter. *Proc. Natl. Acad. Sci. USA*, 88.2515-2519.
33. Harrison, MJ, MA Lawton, AD Choudhary, CJ Lamb and RA Dixon, (1992) Analysis of Defense Gene Transcriptional Activation. In *Molecular Plant Pathology: A Practical Approach* (ed. DJ Bowles) Oxford University Press, Oxford, pp 147-162.
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36. León, J, S. Yalpani, N, I Raskin and MA Lawton. (1993) Induction of benzoic acid 2-hydroxylase activity in tobacco plants. *Plant Physiol.*, 103: 323-328.
37. Hanks, SK and MA Lawton, Homology-based approaches for identifying cDNAs that encode eukaryotic protein-serine/threonine and protein-tyrosine kinases. In *Protein Phosphorylation: A Practical Approach* (ed. G Hardie) IRL/Oxford University Press, Oxford. pp. 173-196.
38. León, J, MA Lawton, and I Raskin. (1993) Phenolic acids and the biosynthesis of defense-related compounds. In *Current Topics in Plant Physiology, Plant Signals in Interactions with Other Organisms, Proceedings of the Eighth Annual Penn State Symposium in Plant Physiology* (eds. JC Schultz and I Raskin), Waverly Inc, Mt. Royal, Vol 11, pp. 65-78.
39. León, J, N Yalpani, MA Lawton, and I Raskin. (1993) Salicylic acid biosynthesis in healthy and virus-inoculated tobacco. In *Current Topics in Plant Physiology, Plant Signals in Interactions with Other Organisms, Proceedings of the Eighth Annual Penn State Symposium in Plant Physiology* (eds. JC Schultz and I Raskin), Waverly Inc., Mt. Royal, Vol 11, pp. 262-265.
40. Zhang, S-H, MA Lawton, T. Hunter, CJ Lamb. (1994) Atpk1, A novel ribosomal protein kinase gene from *Arabidopsis thaliana* I: Isolation, characterization and expression. *J. Biol. Chem.* 269: 17586-17592.
41. Zhang, S-H, M Broome, MA Lawton, T. Hunter, CJ Lamb. (1994) Atpk1, A novel ribosomal protein kinase gene from *Arabidopsis thaliana* II: Functional and biochemical analysis of the encoded protein. *J. Biol. Chem.* 269: 17593-17599.
42. Lawton, M. PVPK1. (1995) In: *The Protein Kinase Factsbook: Protein Serine/Threonine Kinases* (eds. G Hardie, K Hanks). Academic Press, London. pp. 118-119.
43. Lawton, M. G11A. (1995) In: *The Protein Kinase Factsbook: Protein Serine/Threonine Kinases* (eds. G Hardie, S Hanks). Academic Press, London. pp. 120-121.
44. Gianfagna, T and MA Lawton. (1995) The signalling pathway leading to activation of plant defenses involves reversible protein phosphorylation. *Plant Science*, 109: 165-170.
45. León, J, MA Lawton, and I Raskin. (1995) Hydrogen peroxide stimulates salicylic acid biosynthesis in tobacco. *Plant Physiol.* 108: 1-6.
46. León, J, V Shulaev, N Yalpani, M Lawton, and I Raskin. (1995) Benzoic Acid 2-Hydroxylase, a Soluble Monooxygenase from Tobacco Catalyzes Salicylic Acid Biosynthesis. *Proc. Natl. Acad. Sci. USA* 92: 10413-10417.
47. Zhu, Q., Dabi, T., Beeche, A., Yamamoto, R., Lawton, M.A., and Lamb, C.J. (1995) Cloning and properties of a rice gene encoding phenylalanine ammonia-lyase. *Plant Mol. Biol.* 29: 535-550.
48. Wang, X., P Zafian, M Choudhary and M. Lawton. (1996). A novel receptor kinase from *Arabidopsis* is structurally related to a family of antimicrobial proteins. *Proc. Natl. Acad. Sci. USA.* 93: 2598-2602.
49. Lawton, M. (1997) Recognition and signaling in plant-pathogen interactions: implications for genetic engineering. In: *Genetic Engineering, Principles and Methods*, Vol. 19 (ed. J. Setlow) Plenum Press New York pp 271-293.
50. Wang, X and M Lawton. 1998. PR5K: A receptor serine kinase involved in the regulation of the plant defense response. In: *protein phosphorylation in plants. Proceedings of the Second International European Symposium.* (eds. P. Gadal, M. Kreis, M. Dron, J. Brulfert, C. Bergounioux and J. Vidal). University de Paris Sud, Orsay, France pp 88-89.
51. M. Lawton (1999). *Instructional Strategies for using the New York Times: Life Sciences* In: *New York Times Series in College & University Science Disciplines*, New York Times Co., New York.
52. Berkowitz, G, X Zhang, R Mercier, Q Leng and M Lawton (2000) Co-expression of calcium-dependent protein kinase with the inward rectified guard cell K⁺ channel KAT1 alters current parameters in *Xenopus laevis* oocytes. *Plant Cell Reports* 41: 1-6.
53. Lam, E., N Kato and M Lawton (2001), Programmed cell death, mitochondria and the plant hypersensitive response. *Nature* 411: 848-853.

54. Kahangi, E.M., Lawton, M.A. and Kumar, C.A.C.Y. (2002) RAPD profiling of some banana varieties selected by small-scale farmers in Kenya. *Journal of Horticultural Science & Biotechnology* 77 (4) 393-398.
55. H. Saidasan and Lawton, M.A. 2005. A rapid assay system for transgenes conferring resistance to DON. Proceedings of the 2005 National Fusarium Head Blight Forum, Milwaukee, WI, Dec 11-13, 2005
56. Saidasan, H. and Lawton, M. (2007) In *Proceedings of the 2007 National Fusarium Head Blight Forum* (Eds, Canty, S. M., Clarke, A., Ellis, D. and Van Sanford, D.) University of Kentucky, Kansas City, MO, pp. 58.
57. Hillman, B, Crouch, J., Sullivan, R.F. Alla, V., Dave., P Saidasan, H., Lawton, M.A. and Kobayashi. D.Y. (2007) *Lysobacter enzymogenes*, a broad spectrum biocontrol bacterium that infects lower eukaryotic hosts intracellularly. Proceedings of the 16th Annual Rutgers Turf grass symposium. Rutgers University, NJ.
58. Lawton, M. and Saidasan, H. 2009. Pathogenesis in Mosses. *In*. Annual Plant Reviews Vol 36: The Moss *Physcomitrella patens*. C. Knight, P.-F. Perroud and D. Cove, eds. Pp 298-338.
59. Lam, E., Shine Jr., J., Da Silva, J., Lawton, M., Bonos, S., Calvino, M., Carrer, H., Silva-Filho, M.C., Glynn, N., Helsel, Z., Ma, J., Richard, E., Souza, G.M. and Ming, R. (2009). Improving sugarcane for biofuel: engineering for an even better feedstock. *GCB Bioenergy*. 1: 251–255.
60. Widiez, T., Hartman, T.G., Dudai, N., Yan, Q., Lawton, M., Havkin-Frenkel, D. and Belanger F.C. (2011). Functional characterization of two new members of the caffeoyl CoA *O*-methyltransferase-like gene family from *Vanilla planifolia* reveals a new class of plastid-localized *O*-methyltransferases. *Plant Molecular Biology* 76(6): 475-488.
61. Lawton, M. (2011). Cell wall genomics in the recombinogenic moss *Physcomitrella patens* Routes to Cellulosic Ethanol. M. S. Buckeridge and G.H. Goldman, eds. Pp 241-261.
62. Lijuan Xin, Ritupriya Yamujala, Yuehu Wang, Huan Wang, Wen-Hsuan Wu, Michael A. Lawton, Chunlin Long and Rong Di. Acetylcholinesterase-inhibiting alkaloids from *Lycoris radiata* delay paralysis of amyloid beta-expressing transgenic *C. elegans* CL4176. Published: May 13, 2013, DOI: 10.1371/journal.pone.0063874
63. Widiez, T., Symeonidi, A., Luo, C.Y., Lam, E., Lawton, M. and Rensing, S.A. (2014). The chromatin landscape of the moss *Physcomitrella patens* and its dynamics during development and drought stress. *The Plant Journal*. 79: 67–81. DOI: 10.1111/tpj.12542

Current and Pending Support

USDA NIMMS Mycotoxins: Biosecurity, Food Safety and Biofuels Byproducts (NC129, NC1025) Oct 2010-Sept 2015. \$50,000

NSF-EAGER: Elucidating retrograde signal transduction processes in a marine diatom. Oct 2015-Sept 2017 \$298,400, Co-PI

USDA USWBSI Editing genes involved in FHB disease susceptibility in barley and *Brachypodium* (Pending).