AMEETA K. AGARWAL

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Education

1995	Ph.D., Biology, University of Maryland, Baltimore, Maryland
1987	M.S., Microbiology, University of Bombay, Bombay, India
1985	B.S., Microbiology, University of Bombay, Bombay, India

Research Experience

2009-present	Research Associate Professor, Department of Pharmacology, U. of Mississippi, University, MS
2011-present	Adjunct Professor, Department of Biology, U. of Mississippi
2015-present	Principal Scientist, National Center for Natural Products Research, U. of Mississippi, University, MS
2008-2015	Senior Scientist, National Center for Natural Products Research, U. of Mississippi, University, MS
2002-2008	Research Scientist, National Center for Natural Products Research, U. Mississippi, University, MS
1998-2001	Plant Molecular Biologist, Monsanto Company, St. Louis, MO
1995-1998	Postdoctoral Research Associate, Monsanto Company, St. Louis, MO
1990-1994	Research Assistant, University of Maryland, Baltimore, MD

Ongoing Research

At the National Center for Natural Products Research, we have isolated novel natural products that have potent activity against opportunistic fungal pathogens, including *Candida albicans*, *Cryptococcus neoformans*, and *Aspergillus fumigatus*. We have also identified natural products that can enhance the activity of currently used antifungal drugs such as fluconazole, amphotericin B, and caspofungin. My research is focused on identifying the mechanism of action of these novel compounds using *S. cerevisiae* as a model organism. We are using genomic profiling approaches for these studies, and the molecular targets identified are validated using genetic and molecular strategies. The overall goal of this project is to identify new compounds and pathways for the development of new treatments for disseminated fungal infections. We are also conducting mechanistic studies in the major fungal pathogens *C. albicans* and *C. neoformans*. This work will not only serve as a starting point towards the development of novel antifungal therapies, but it will also broaden our understanding of the basic biology of fungal pathogens, with potential clues for pathogenesis, virulence, and resistance mechanisms.

Funding

"Discovery and Development of Natural Products for Pharmaceutical and Agrochemical Applications" USDA Co-operative Research Agreement, 58-6060-6-015, 05/02/16 – 04/30/21, PI: Ikhlas A. Khan.

"New Drugs for Opportunistic Infectious Diseases" NIH/NIAID, 2R0AI27094-20A1, 07/01/09 - 06/30/15, PI: Alice M. Clark; Co-PI: Ameeta K. Agarwal

"Molecular Targets of Novel Antifungal Compounds" NIH/NIAID, 5R21AI067873-02, 9/20/07 – 2/28/10, PI: Ameeta K. Agarwal, Co-PI: Michael C. Lorenz (University of Texas Health Science Center at Houston)

Awards and Honors

2009-2013	Member (ad hoc), Non-HIV Anti-Infective Therapeutics SBIR/STTR special emphasis panel ZRG-IDM-Q (10) study section, NIH
2015-2017	Member (ad hoc), Topics in Drug Discovery and Mechanisms of Antimicrobial Resistance ZRG1-IDM-T-82 study section, NIH
2017-present	Member (ad hoc), Exploration of Antimicrobial Therapeutics & Resistance ZRG1-IDM-Y-82 study section, NIH
2002-present	Reviewer for *Eukaryotic Cell*, *PLoS One*, *Antimicrobial Agents and Chemotherapy*, *Scientific Reports*, *ACS Chemical Biology*, *Journal of Antimicrobial Chemotherapy*, *BMC Microbiology*, *BMC Systems Biology*, *FEMS Yeast Research*, *Journal of Biomolecular Screening*, *Fungal Biology*, *Applied Microbiology and Biotechnology*, *Journal of Medical Microbiology*, *Journal of Natural Products*, and *Planta Medica*
2012-present	Editorial Board, *International Journal of Microbiology*

Patents

Agarwal, A. K., Brown, S. M. and Y. Qi (1997) Method for controlling seed germination using soybean acyl-CoA oxidase sequences. Patent No. WO-9744465.

Agarwal, A. K., Liu, J-D. and D. Lahiri (2003) Plant sequences associated with the beta-oxidation metabolic pathway. Patent No. US-6518488.

Banu, G., Bell, E., Boddupalli, R., Kretzmer, K. A., Daly, M., Deikman, J., Deng, M., Dong, J., Chomet, P. S., Edgerton, M. D., Adams, T. H., Ruff, T. G., **Agarwal, A. K**., Ahrens, J., Ball, J., A., Duff, S. M., Galligan, M., Hinchey, B. S., Huang, S., Johnson, R. G., Vincent, J., Laccetti, L. B., Lai, C. Q., Lee, G. J., Lin, J., Lu, B., Luethy, M., Lund, A., Madson, L. L., Malloy, K., Mckiel, C. L., Miller, P. W., Padmathi, M., Parnell, L., Liu, J., Xu, N., Start, W. G., Tennesen, D., Vidya, K. R., Wang, H., Xin, Z., Yang, C., Zeng, X., Zhang, Q., Zhao, Y., and L. Zhou (2004) Transgenic maize with enhanced phenotype. Patent No. WO 2004053055.

Adams, T., **Agarwal, A.K.**, Ahrens, J., Ball, J. A., Basra, A., Bell, E., Bradshaw, T. L., Chomet, P. S., Crowley, J. H., Deikman, J., Deng, M., Donnarummo, M., Duff, K. F. Z., Duff, S., Edgerton, M. D., Gopalan, B., He, X., Heal, M., Hinchey, B. S., Huang, S., Johnson, R. G., Jung, V., Kretzmer, K., Laccetti, L. B., Lai, C. Q., Lee, G. J., Luethy, M. H., Leland, T. J., Liu, J., Lu, B., Lund, A. A., Madson, L. L., Malloy, K. P., McNabnay, M. P., Padmavati, M., Ruff, T., Start, W., Tennessen, D., Urwin, C. P., Vaduva, G., Vidya, K. R., Voss, S. T., Voyles, C., Xin, Z., Xu, N., Xu, Q., Zhang, Q., Zhao, and Y., L. Zhou (2009) Transgenic plants with enhanced agronomic traits. Patent No. US-20090100536.

Publications

*Corresponding Author

Tripathi, S. K., Xu, T., Feng, Q., Avula, B., Shi, X., Pan, X., Mask, M. M., Baerson, S. R., Jacob, M. R., Ravu, R. R., Khan, S. I., Li, X. C., Khan, I. A., Clark, A. M., and **A. K. Agarwal*** (2017) Two plant-derived aporphinoid alkaloids exert their antifungal activity by disrupting mitochondrial iron-sulfur cluster biosynthesis. *J. Biol. Chem.* 292:16578-16593.

Singh, A., **Agarwal, A. K.**, Xie, Y. (2017) Novel cell-killing mechanisms of hydroxyurea and the implication towards combination therapy for the treatment of fungal infections. *Antimicrob. Agents Chemother.* 61(11). pii: e00734-17.

Park, Y. N., Srikantha, T, Daniels, K. J., Jacob, M. R., **Agarwal, A. K.**, Li, X. C., and D. R. Soll (2017) Protocol for identifying natural agents that selectively affect adhesion, thickness, architecture, cellular phenotypes, extracellular matrix, and human white blood cell impenetrability of *Candida albicans* biofilms. *Antimicrob. Agents Chemother.* 61(11). pii: e01319-17.

Yu, Q., Ravu, R. R., Jacob, M. R., Khan, S. I., **Agarwal, A. K.**, Yu, B. Y., Li, X. C. (2016) Synthesis of natural acylphloroglucinol-based antifungal compounds against *Cryptococcus* species. *J. Nat. Prod.* 79:2195-2201.

Ravu, R. R., Jacob, M. R., Jeffries, C., Tu, Y., Khan, S. I., **Agarwal, A. K.**, Guy, R. K., Walker, L. A., Clark, A. M., and X. C. Li (2015) LC-MS- and (1)H NMR spectroscopy-guided identification of antifungal diterpenoids from *Sagittaria latifolia*. *J. Nat. Prod.* 78:2255-2259.

Mahdi, F., Morgan, J. B., Liu, W., **Agarwal, A. K.**, Jekabsons, M. B., Liu, Y., Zhou, Y. D., and D. G. Nagle (2015) Sampangine (a copyrine alkaloid) exerts biological activities through cellular redox cycling of its quinone and semiquinone intermediates. *J. Nat. Prod.* 78:3018-3023.

Ravu, R. R., Chen, Y. L., Jacob, M. R., Pan, X., **Agarwal, A. K.**, Khan, S. I., Heitman, J., Clark, A. M., and X. C. Li (2013) Synthesis and antifungal activities of miltefosine analogs. *Bioorg Med. Chem. Lett.* 23:4828-4831.

Zhang, X., Jacob, M. R., Ranga Rao, R., Wang, Y-H, **Agarwal, A. K.**, Newman, D. J., Khan, I. A., Clark, A. M., and X. C. Li (2012) Antifungal cyclic peptides from the marine sponge *Microscleroderma herdmani*. *Res. Rep. Med. Chem*. 2:7-14.

Xu, T., Tripathi, S. K., Feng, Q., Lorenz, M. C., Wright, M. A., Jacob, M. R., Mask, M. M., Baerson, S. R., Li, X. C., Clark, A. M., and **A. K. Agarwal*** (2012) A potent plant-derived antifungal acetylenic acid mediates its activity by interfering with fatty acid homeostasis. *Antimicrob. Agents Chemother.* 56:2894-2907.

Agarwal, A. K.*, Tripathi, S. K., Xu, T., Jacob, M. R., Li, X. C., and A. M. Clark (2012) Exploring the molecular basis of antifungal synergies using genome-wide approaches. *Front. Microbiol.* 3:115.

Seale, S. M., Feng, Q., **Agarwal, A. K.**, and A. T. El-Alfy (2012) Neurobehavioral and transcriptional effects of acrylamide in juvenile rats. *Pharmacol. Biochem. Behav.* 101:77-84.

Huang, Z., Chen, K., Xu, T., Zhang, J., Li, Y., Li, W., **Agarwal, A. K.**, Clark, A. M., Phillips, J. D., and X. Pan (2011) Sampangine inhibits heme biosynthesis in both yeast and human. *Eukaroyt. Cell* 10:1536-1544.

Li, X. C., Babu, K. S., Jacob, M. R., Khan, S. I., **Agarwal, A. K.**, and A. M. Clark (2011) Natural product-based 6-hydroxy-2,3,4,6-tetrahydropyrrolo[1,2-*a*]pyrimidinium scaffold as a new antifungal template. *ACS Med. Chem. Lett.* 2:391-395.

Xu, T., Feng, Q., Jacob, M. R., Avula, A.,Mask, M. M., Baerson, S. R., Tripathi, S. K., Mohammed, R., Hamann, M. T., Khan, I. A., Walker, L. A., Clark, A. M., and **A. K. Agarwal*** (2011) The marine sponge-derived polyketide endoperoxide plakortide F acid mediates its antifungal activity by interfering with calcium homeostasis. *Antimicrob. Agents Chemother*. 55:1611-1621.

Xu, W. H., Jacob, M. R., **Agarwal, A. K.**, Clark, A. M., Liang, Z. S., and X. C. Li (2010) ent-Kaurane glycosides from *Tricalysia okelensis*. *Chem. Pharm. Bull. (Tokyo)* 58:261-264.

Xu, W. H., Ding, Y., Jacob, M. R., **Agarwal, A. K.**, Clark, A. M., Ferreira, D., Liang, Z. S., and X. C. Li (2009) Puupehanol, a sesquiterpene-dihydroquinone derivative from the marine sponge *Hyrtios* sp. *Bioorg. Med. Chem. Lett.* 19:6140-6143.

Xu, W. H., Jacob, M. R., **Agarwal, A. K.**, Clark, A. M., Liang, Z. S., and X. C. Li (2009) Flavonol glycosides from the native American plant *Gaura longiflora*. *Heterocycles* 78:2541-2548.

Xu, W. H., Jacob, M. R., **Agarwal, A. K.**, Clark, A. M., Liang, Z. S., and X. C. Li (2009) Verbesinosides A-F, 15,27-cyclooleanane saponins from the American native plant *Verbesina virginica*. *J. Nat. Prod.* 72:1022-1027.

Li, X. C., Jacob, M. R., Khan, S. I., Ashfaq, K. M., Babu, K. S., **Agarwal, A. K.**, Elsohly, H. N., Manly, S. P., and A. M. Clark (2008) Potent *in vitro* antifungal activity of naturally occurring acetylenic acids. *Antimicrob. Agents Chemother*.52:2442-2448.

Agarwal, A. K.*, Xu, T., Jacob, M. R., Feng, Q., Li, X. C., Walker, L. A., and A. M. Clark (2008) Genomic and genetic approaches for the identification of antifungal drug targets. *Infect. Disord. – Drug Targets.* 8:2-15.

Pan, Z., **Agarwal, A. K.**, Xu, T., Feng, Q., Baerson, S. R., Duke, S. O., and A. M. Rimando (2008) Identification of molecular pathways affected by pterostilbene, a natural dimethylether analog of resveratrol. *BMC Med. Genomics.* 1:7.

Agarwal, A. K.*, Xu, T., Jacob, M. R., Feng, Q., Lorenz, M. C., Walker, L. A., and A. M. Clark (2008) Role of heme in the antifungal activity of the azaoxoaporphine alkaloid sampangine. *Eukaryot. Cell.* 7:387-400.

Singh, K., **Agarwal, A. K.**, Khan, S., Walker, L. A., and B. L. Tekwani (2007) Growth, drug susceptibility and gene expression profiling of *Plasmodium falciparum* cultured in medium supplemented with human serum or lipid-rich bovine serum albumin. *J. Biomol. Screen*. 12:1109-1114.

Li, X-C., Jacob, M. R., Ding, Y., **Agarwal, A. K.**, Smillie, T. J., Khan, S. I., Nagle, D. G., Ferreira, D., and A. M. Clark (2006) Capisterones A and B, which enhance fluconazole activity in *Saccharomyces cerevisiae*, from the marine green alga *Penicillus capitatus*. *J. Nat. Prod.* 69:542-546.

Hossain, C. F., Kim, Y-P., Baerson, S. R., Zhang, L., Bruick, R. K., Mohammed, K. A., **Agarwal, A. K**., Nagle, D. G., and Y-D. Zhou (2005) *Saururus cernuus* lignans - potent small molecule inhibitors of hypoxia-inducible factor-1. *Biochem. Biophys. Res. Commun.* 333: 1026-1033.

Baerson, S. R., Sánchez-Moreiras, A., Pedrol-Bonjoch, N., Schulz, M., Kagan, I. A., **Agarwal, A. K.**, Reigosa, M. J., and S. O. Duke (2005) Detoxification and transcriptome response in *Arabidopsis* seedlings exposed to the allelochemical benzoxazolin-2(3H)-one (BOA). *J. Biol. Chem.* 280: 21867-21881.

Zhou, Y-D., Kim, Y-P., Li, X-C., Baerson, S. R., **Agarwal, A. K.**, Hodges, T. W., Ferreira, D., and D. G. Nagle (2004) Hypoxia-inducible factor-1 activation by (-)-epicatechin gallate: Potential adverse effects of cancer chemoprevention with high-dose green tea extracts. *J. Nat. Prod.* 67: 2063-2069.

Agarwal, A. K.*, Rogers, P. D., Jacob, M. R., Barker, K. S., Cleary, J. D., Walker, L. A., Nagle, D. G., and A. M. Clark (2003) Genome-wide expression profiling of the response to polyene, pyrimidine, azole, and echinocandin antifungal agents in *Saccharomyces cerevisiae*. *J. Biol. Chem.* 278: 34998-35015.

Duke, S.O., Dayan, F. E., Baerson, S. R., Romagni, J.G., **Agarwal, A. K.**, and A. Oliva. (2003) Natural phytotoxins with potential for development in weed management strategies. In *Chemistry of Crop Protection*, G. Ramos and G. Voss, eds., Wiley-VCH Verlag, Weinheim, Germany, pp. 143-154.

Agarwal, A. K., Qi, Y., Woerner, M., Bhat, D. G., and S. M. Brown (2001) Gene isolation and characterization of two acyl CoA oxidases from soybean with broad substrate specificities and enhanced expression in the growing seedling axis. *Plant Molecular Biology*. 47: 519-531.

Agarwal, A.K., Parish, S. N., and D. D. Blumberg (1999) Cell type specific shut off of ribosomal protein gene expression during development of *Dictyostelium discoideum. Differentiation*. 65: 73-88. Journal cover photo is from this paper.

Agarwal, A.K. and D. D.Blumberg (1999) *Dictyostelium* ribosomal protein genes and the elongation factor 1B gene show coordinate developmental regulation which is under post-transcriptional control. *Differentiation*. 64: 247-254.

Agarwal, A. K., Sloger, M. S., Oyama, M., and D. D. Blumberg (1994) Analysis of a novel cAMP-inducible prespore gene in *Dictyostelium discoideum*: Evidence for different patterns of cAMP regulation. *Differentiation*. 57: 151-162.

Blumberg, D. D., **Agarwal, A. K.**, Sloger, M. S., and B. K. Yoder (1990) Gene expression and chromatin structure in the cellular slime mold, *Dictyostelium discoideum*. *Developmental Genetics*. 12: 65-77.

Professional Memberships

American Association for the Advancement of Science
American Society for Biochemistry and Molecular Biology
American Society for Microbiology
Genetics Society of America