

**Appointment: 100% Research**

**Requested Actions: Promotion to the Rank of Associate Professor with Tenure**

**Dr. Zhi-Yuan Chen  
Assistant Professor**

Department of Plant Pathology and Crop Physiology  
Louisiana State University Agricultural Center, Baton Rouge

**A. EDUCATION**

- Ph.D., 1996. Plant Biology, Louisiana State University, Baton Rouge, Louisiana.  
M. S., 1991. Plant Physiology, Biochemistry and Molecular Biology, Peking University (Beijing University), Beijing, China.  
B. S., 1988. Plant Physiology and Biochemistry, Peking University.

**B. PROFESSIONAL EXPERIENCE**

- 11/2005-present: Assistant Professor, Dept of Plant Pathology and Crop Physiology, Louisiana State University Agricultural Center, Baton Rouge, investigating host-pathogen interactions in maize-*Aspergillus flavus* and soybean-*Phakopsora pachyrhizi* to understand host resistance mechanisms.  
09/2002-10/2005: Assistant Professor, Research, Dept of Plant Pathology and Crop Physiology, Louisiana State University Agricultural Center (stationed at Southern Regional Research Center, USDA-ARS, New Orleans), investigating possible roles of aflatoxin resistance-associated maize kernel proteins identified through proteomic comparisons.  
11/1996-08/2002: Postdoctoral Fellow, Dept of Plant Pathology and Crop Physiology, Louisiana State University Agricultural Center (stationed at Southern Regional Research Center, USDA-ARS, New Orleans), identifying protein factors associated with maize aflatoxin resistance.

**C. RESEARCH AND CREATIVE ACTIVITY (100% appointment)**

**1. Listing of research publications [Published Items Only]**

**Refereed Journal Articles**

- Park, S., Chen, Z.-Y., Chanda, A. K., Schneider, R. W., and Hollier, C. 2008. Viability of *Phakopsora pachyrhizi* urediniospores under simulated southern Louisiana winter conditions. Plant Disease 92:1456-1462

- Cleveland, T. E. IV, Hussey, D. S., **Chen, Z. -Y.**, Jacobson, D. L., Brown, R. L., Carter-Wientjes, C., Cleveland, T. E., and Arif, M. 2008. The use of neutron tomography for the structural analysis of corn kernels. *J. Cereal Science* 48:517-525.
- Rajasekarana, K., Cary, J. W., **Chen, Z. -Y.**, Brown, R. L., and Cleveland, T. E. 2008. Antifungal traits of a 14 kD maize kernel trypsin inhibitor protein in transgenic cotton. *J. Crop Improvement* 22:1-16.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2007. Identification of maize kernel endosperm proteins associated with resistance to aflatoxin contamination by *Aspergillus flavus*. *Phytopathology* 97:1094-1103.
- Brown, R. L., **Chen, Z. -Y.**, Menkir, A., and Cleveland, T. E. 2006. Proteomics to identify resistance factors in corn—a review. *Mycotoxin Research* 22:22-26.
- Chen, Z. -Y.**, Brown, R. L., Rajasekaran, K., Damann, K. E., and Cleveland, T. E. 2006. Evidence for involvement of a pathogenesis-related protein in maize resistance to *Aspergillus flavus* infection /aflatoxin production. *Phytopathology* 96:87-95.
- Menkir, A., Brown, R. L., Bandyopadhyay, R., **Chen, Z. -Y.**, and Cleveland, T. E. 2006. A U.S.A.-Africa collaborative strategy for identifying, characterizing, and developing maize germplasm with resistance to aflatoxin contamination. *Mycopathologia* 162:225-232.
- Brown, R. L., Bhatnagar, D., Cleveland, T. E., and **Chen, Z. -Y.** 2004. Molecular biology for control of mycotoxigenic fungi. *Mycology* 21:69-77.
- Chen, Z. -Y.**, Brown, R. L., and Cleveland, T. E. 2004a. Evidence of an association between stress tolerance and host resistance in corn against *Aspergillus flavus* infection and aflatoxin contamination. *African J. Biotechnol.* 3:693-699.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2004b. Identification of a maize kernel stress-related protein and its effect on aflatoxin accumulation. *Phytopathology* 94:938-945.
- Cleveland, T. E., Yu, J., Bhatnagar, D., **Chen, Z. -Y.**, Brown, R. L., Chang, P. K., and Cary, J. W. 2004. Elucidation of the molecular basis of the host *plant-Aspergillus flavus* interaction, a basis for devising strategies to reduce aflatoxin contamination in crops. *J. Toxicology, Toxin Reviews* 23:345-380.
- Brown, R. L., **Chen, Z. -Y.**, Menkir, A., and Cleveland, T. E. 2003. Using biotechnology to enhance host resistance to aflatoxin contamination of corn. *African J. Biotechnol.* 2:557-562.
- Banks, W. A., Niehoff, M. L., Brown, R. L., **Chen, Z. -Y.**, and Cleveland, T. E. 2002. Transport across the blood-brain barrier of an antifungal trypsin inhibitor isolated from corn. *Antimicrobial Agents and Chemotherapy* 46:2633-2635.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2002. Identification of unique or elevated levels of kernel proteins in aflatoxin-resistant maize genotypes through proteome analysis. *Phytopathology* 92:1084-1094.
- Brown, R. L., **Chen, Z. -Y.**, Cleveland, T. E., Cotty, P. J., and Cary, J. W. 2001. Variation in *in vitro*  $\alpha$ -amylase and protease activity is related to the virulence of *Aspergillus flavus* isolates. *J. Food Protection* 64:401-404.

- Brown, R. L., **Chen, Z. -Y.**, Menkir, A., Cleveland, T. E., Cardwell, K., Kling, J. and White, D. G. 2001. Resistance to aflatoxin accumulation in kernels of maize inbreds selected for ear rot resistance in West and Central Africa. *J. Food Protection* 64:396-400.
- Chen, Z. -Y.**, Brown, R. L., Cleveland, T. E., Damann, K. E., and Russin, J. S. 2001. Comparison of constitutive and inducible maize kernel proteins of genotypes resistant or susceptible to aflatoxin production. *J. Food Protection* 64:1785-1792.
- Chen, Z. -Y.**, Brown, R. L., Lax, A. R., Cleveland, T. E., and Russin, J. S. 1999a. Inhibition of plant pathogenic fungi by a corn trypsin inhibitor over-expressed in *Escherichia coli*. *Applied Environmental Microbiology* 65:1320-1324.
- Chen, Z. -Y.**, Brown, R. L., Russin, J. S., Lax, A. R., and Cleveland, T. E. 1999b. A corn trypsin inhibitor with antifungal activity inhibits *Aspergillus flavus*  $\alpha$ -amylase. *Phytopathology* 89:902-907.
- Brown, R. L., **Chen, Z. -Y.**, Cleveland, T. E., and Russin, J. S. 1999. Advances in the development of host resistance to aflatoxin contamination by *Aspergillus flavus*. *Phytopathology* (review) 89:113-117.
- Chen, Z. -Y.**, Brown, R. L., Lax, A. R., Guo, B. Z., Cleveland, T. E., and Russin, J. S. 1998. Resistance to *Aspergillus flavus* in corn kernels is associated with a 14 kDa protein. *Phytopathology* 88: 276-281.
- Karlsson, J., Clarke, A. K., **Chen, Z. -Y.**, Huggins, S. Y., Park, Y.-H, Husic, H. D., Moroney, J. V., and Samuelsson, G. 1998. A novel  $\alpha$ -type carbonic anhydrase associated with the thylakoid membrane in *Chlamydomonas reinhardtii* is required for growth at ambient CO<sub>2</sub>. *EMBO J.* 17:1208-1216.
- Moroney, J. V., and **Chen, Z. -Y.** 1998. The role of the chloroplast in inorganic carbon uptake by eukaryotic algae. *Canadian Journal of Botany* (review) 76:1025-1034.
- Chen, Z. -Y.**, Lavigne, L. L., Mason, C. B. and Moroney, J. V. 1997. Cloning and overexpression of two cDNAs encoding the low-CO<sub>2</sub>-inducible chloroplast envelope protein LIP-36 from *Chlamydomonas reinhardtii*. *Plant Physiology* 114: 256-273.
- Guo, B. Z., **Chen, Z. -Y.**, Brown, R. L., Lax, A. R., Cleveland, T. E., Russin, J. S., Mehta, A. D., Selitrennikoff, C. P., and Widstrom, N. W. 1997. Germination induces accumulation of specific proteins and antifungal activities in corn kernels. *Phytopathology* 87:1174-1178.
- Burow, M. D., **Chen, Z. -Y.**, Mouton, T. M., and Moroney, J. V. 1996. Isolation of cDNA clones of genes induced upon transfer of *Chlamydomonas reinhardtii* cells to low CO<sub>2</sub>. *Plant Molecular Biology* 31:443-448.
- Chen, Z. -Y.**, Burow, M. D., Mason, C. B., and Moroney, J. V. 1996. A low CO<sub>2</sub> inducible gene encoding an alanine:alpha-ketoglutarate aminotransferase in *Chlamydomonas reinhardtii*. *Plant Physiology* 112:677-684.
- Chen, Z. -Y.**, and Moroney, J. V. 1995. Identification of a *Chlamydomonas reinhardtii* chloroplast gene with significant homology to bacterial genes involved in cytochrome *c* biosynthesis. *Plant Physiology* 108:843-844.

#### Refereed Conference Proceedings

- Cleveland, T. E., Rajasekaran, K., Cary, J. W., **Chen, Z. -Y.**, Brown, R. L., Bhatnagar, D., and Radin, J. W. 2002. Balancing the possible risks and benefits of using biotechnology to enhance resistance in crops to *Aspergillus flavus* infection and aflatoxin contamination. *In* Pathogenic Microorganisms and Their Toxins: A Global Perspective of Their Risk (S. Yamamoto and W. P. Norred eds.) (Book Chapter). IXth International Symposium-U.S.-Japan Natural Resources Panel on Toxic Microorganisms (UNJR), pp. 268-301.
- Moroney, J. V., Burow, M. D., **Chen, Z. -Y.**, Borkhsenius, O. N., Mason, C. B., and Somanchi, A. 1998. Adaptation of *Chlamydomonas reinhardtii* to limiting CO<sub>2</sub> conditions. *In* Photosynthesis: Mechanisms and Effects. Vol V, Ed. by G. Garab, Kluwer Academic Publishers, Dordrecht, pp. 3443-3446.
- Chen, Z. -Y.**, Burow, M. D., and Moroney, J. V. 1995. Characterization of genes induced by low CO<sub>2</sub> in *Chlamydomonas reinhardtii*. *Photosynthesis: from Light to Biosphere*, (P. Mathis ed.), Kluwer Academic Publishers, Vol. V; 619-622.

#### Refereed Book Chapters

- Brown, R.L, **Chen, Z.-Y.**, Menkir, A., Cleveland, T.E., and Bhatnagar, D. 2008. Strategies for the prevention of preharvest aflatoxin contamination of maize. *In* Recent Advancement in Agriculture (Eds. C. Stevens and V. A. Khan), Research Signpost, Kerala, India, pp. 131-150.
- Brown, R. L., **Chen, Z. -Y.**, Menkir, A., Cleveland, T. E., and Bhatnagar, D. 2008. Application of biotechnology towards enhancement of maize resistance to aflatoxin contamination by *Aspergillus flavus*. *In* Crop Improvement and Biochnology (Eds. D. Thangadurai, L. Tripathi, H.K.N. Vasanthaiah, and D.J. Cantu), Bioscience Publications, India, pp. 57-67.
- Menkir, A., Brown, R. L., Bandyopadhyay, R., **Chen, Z. -Y.**, and Cleveland, T. E. 2008. Breeding maize for resistance to mycotoxins at IITA. *In* Mycotoxins: Detection Methods, Management, Public Health and Agricultural Trade (Ed. J. F. Leslie), CABI Publishing, pp. 277-289.
- Chen, Z. -Y.**, Rajasekaran, K., Brown, R. L., Bhatnagar D., and Cleveland, T. E. 2006. Removal of aflatoxin contamination from food and feed crops. *In* Plant Genetic Engineering Vol. 8: Metabolic Engineering and Molecular Farming II (Eds. P. K. Jaiwal and R. P. Singh), Studium Press, Houston, TX, pp. 73-110.
- Brown, R. L., **Chen, Z. -Y.**, Cleveland, T. E., and Bhatnagar, D. 2005. Molecular aspects of corn resistance mechanisms against aflatoxigenic fungi. *In* Genetic Resources and Biotechnology, Vol II (Eds. D. Thangadurai, T. Pullaiah and P. A. Balatti), Regency Publications, New Delhi, India, pp. 281-294.
- Cleveland, T. E., Yu, J., Bhatnagar, D. **Chen, Z. -Y.**, Brown, R. L., Chang, P.-K., and Cary, J. W. 2005. Progress in elucidating the molecular basis of the host plant-*Aspergillus flavus* interaction: A basis for devising strategies to reduce aflatoxin contamination in crops. *In* Aflatoxin and Food Safety (Ed. H. Abbas), CRC Press, Boca Raton, FL, pp. 167-193.
- Rajasekaran, K., Bhatnagar, D., Brown, R. L., **Chen, Z. -Y.**, Cary, J. W., and Cleveland, T. E. 2005. Enhancing Food Safety: prevention of preharvest aflatoxin contamination. *In*

- Perspectives of Agricultural Research and Development (Eds. C. Ramasamy, S. Ramanathan, and M. Dhakshinamoorthy), Tamil Nadu Agricultural University, Coimbatore, India, pp. 434-467.
- Brown, R. L., **Chen, Z. -Y.**, Bhatnagar, D., and Cleveland, T.E. 2004. Molecular biology for control of mycotoxigenic fungi. *In* Fungal Biotechnology in Agricultural, Food, and Environmental Application, (Eds. D. Arora, P. Bridge, and D. Bhatnagar). Marcel Dekker, Inc. New York, pp. 69-77.
- Brown, R. L., **Chen, Z. -Y.**, Gembah, S. V., Cleveland, T. E., Bhatnagar, D., and Howard, K. 2004. Identification of natural resistance in corn against mycotoxin-producing fungi. *In* Research Advances in Food Science (Ed. R. M. Mohan), Global Research Network, Kerala, India, pp. 85-96.
- Chen, Z. -Y.**, Cleveland, T. E., Brown, R. L., Bhatnagar, D., Cary, J. W., and Rajasekaran, K. 2002. Corn as a source of antifungal genes for genetic engineering of crops for resistance to aflatoxin contamination. *In* Crop Biotechnology (Eds. K. Rajasekaran, J. W. Finley, and T. J. Jacks), ACS Symposium Series No. 829, American Chemical Society, Washington, DC, pp. 131-150.

#### Refereed/Published Abstracts

- Brown, R. L., Menkir, A., **Chen, Z. -Y.**, Bandyopadhyay, R., Luo, M., and Cleveland, T. E. 2008. Investigation of maize kernel proteins for use as markers for newly developed aflatoxin-resistant inbreds. *Phytopathology* 98: S26.
- Chen, Z. -Y.**, Brown, R. L., and Cleveland, T. E. 2008. Identifying genes/proteins to enhance crop resistance to fungal pathogens through proteomics and RNAi gene silencing. *J. Biotechnology* (in press).
- Chen, Z. -Y.**, Brown, R. L., Cleveland, T. E., Damann, K. E. 2008. The expression of maize 14 kDa trypsin inhibitor protein on host resistance to *Aspergillus flavus* infection and aflatoxin production. *Phytopathology* 98: S35
- Park, S., **Chen, Z. -Y.**, Chanda, A. K., and Hazard, N. 2008. Identification of pathogen-responsive proteins from soybean leaves during interaction of soybean and *Phakopsora pachyrhizi* using proteomics. *Phytopathology* 98: S120.
- Baker, R. L., Brown, R. L., **Chen, Z. -Y.**, Cleveland, T. E., and Fakhoury, A. M. 2007. Isolation and characterization of novel sources of resistance to ear rot and aflatoxin accumulation in corn. *Phytopathology* 97: S7.
- Brown, R. L., Menkir, A., Bandyopadhyay, R., Cleveland, T. E., and **Chen, Z. -Y.** 2007. Comparative proteomics of near-isogenic maize inbred lines to identify potential aflatoxin-resistance markers. *Phytopathology* 97: S14.
- Brown, R. L., Menkir, A., Bandyopadhyay, R., Cleveland, T. E., and **Chen, Z. -Y.** 2007. Developing resistant maize inbreds: a progress review with future projections. Proceedings of the USDA-ARS 7<sup>th</sup> Fungal Genomics, 8<sup>th</sup> Fumonisin Elimination, and 20<sup>th</sup> Aflatoxin Elimination Workshops, pp. 83-84.



- Chen, Z. -Y., Brown, R. L., Cleveland, T. E., and Damann, K. E. 2007. RNAi silencing of the 14 kDa trypsin inhibitor protein in maize and its effect on host resistance to *Aspergillus flavus* infection and aflatoxin production. Proceedings of the USDA-ARS 7<sup>th</sup> Fungal Genomics, 8<sup>th</sup> Fumonisin Elimination, and 20<sup>th</sup> Aflatoxin Elimination Workshops, p. 109.
- Chanda, A. Chen, Z. -Y., and Schneider, R. W. 2007. Identification of cercosporin biosynthesis-related proteins through a proteomic approach. *Phytopathology* 97: S19.
- Park, S., Hazard, N., Chanda, A., and Chen, Z. -Y. 2007. Protein profile changes in soybean leaves upon *Phakopsora pachyrhizi* infection. *Phytopathology* 97:S90.
- Brown, R. L., Menkir, A., Chen, Z. -Y., Bandyopadhyay, R., and Cleveland, T. E. 2006. The development of aflatoxin-resistance in maize through a U.S. – Africa collaboration. *Phytopathology* 96: S16.
- Chen, Z. -Y., Brown, R. L., Cleveland, T. E., and Damann, K. E. 2006. Identifying aflatoxin resistance-related proteins/genes in maize through proteomics and RNAi gene silencing. Proceedings of the International Groundnut Conference on Groundnut Aflatoxin and Genomics. Nov 5-9. Guangzhou, China, p. 37.
- Chen, Z. -Y., Brown, R. L., Damann, K. E., and Cleveland, T. E. 2006. The effect of PR-10 expression on host resistance in maize against *Aspergillus flavus* infection and aflatoxin production. Proceedings of the USDA-ARS 6<sup>th</sup> Fungal Genomics, 7<sup>th</sup> Fumonisin Elimination, and 19<sup>th</sup> Aflatoxin Elimination Workshops, Fort Worth, TX., p. 55.
- Chen, Z. -Y., Mumma, E. P., and Schneider, R. W. 2006. *Phakopsora pachyrhizi* inoculation and proteome analysis of greenhouse-grown soybean plants. *Phytopathology* 96: S22.
- Chen, Z. -Y., Park, S., Hazard, N., Mumma, E. P., and Schneider, R. W. 2006. Proteome analysis of greenhouse-grown soybean plants inoculated with *Phakopsora pachyrhizi*. Proceedings of the 2006 National Soybean Rust Symposium, Nov. 29-Dec. 1, 2006. St. Louis, MO., p. 6.
- Hollier, C. A., Berggren, R., Padgett, G. B., Schneider, R. W., Landlos, D., Groth, D. E., Chen, Z. -Y., Colyer, P., Ferguson, R., Hogan, A., Wilkerson, H., Brashier, M., Daniels, G., Richard, J., Harrison, H., and Parish, R. 2006. Asian Soybean Rust sentinel plots for Louisiana in 2006. Proceedings of the 2006 National Soybean Rust Symposium, Nov. 29-Dec. 1, 2006. St. Louis, MO., p. 8.
- Park, S., Hazard, N., Chanda, A. K., and Chen, Z. -Y. 2006. Viability of *Phakopsora pachyrhizi* urediniospores under simulated winter conditions. Proceedings of the 2006 National Soybean Rust Symposium, Nov. 29-Dec. 1, 2006. St. Louis, MO., p. 7.
- Brown, R. L., Chen, Z. -Y., Menkir, A., and Cleveland, T. E. 2005. Development of aflatoxin-resistant maize inbreds and identification of potential resistance markers through USA-Africa collaborative research. Proceedings of the USDA-ARS 5<sup>th</sup> Fungal Genomics, 6<sup>th</sup> Fumonisin Elimination, and 18<sup>th</sup> Aflatoxin Elimination Workshops, Raleigh, NC., p. 78.
- Chen, Z. -Y., Brown, R. L., Cleveland, T. E., and Damann, K. E. 2005. Silencing the expression of RAP genes in maize and the effect on host resistance against *Aspergillus flavus* infection and aflatoxin production. Proceedings of the USDA-ARS 5<sup>th</sup> Fungal Genomics, 6<sup>th</sup> Fumonisin Elimination, and 18<sup>th</sup> Aflatoxin Elimination Workshops, Raleigh, NC., p. 110.

- Chen, Z. -Y.,** Brown, R. L., Menkir, A., Damann, K. E., and Cleveland, T. E. 2005. Proteome analysis of near isogenic maize lines differing in the level of resistance against *Aspergillus flavus* infection/aflatoxin production. *Phytopathology* 95: S19.
- Brown, R. L., **Chen, Z. -Y.,** and Cleveland, T. E. 2004. The role of kernel water relations in resistance to aflatoxin production in corn. *Phytopathology* 94: S11.
- Brown, R. L., **Chen, Z. -Y.,** Menkir, A., White, D. G., and Cleveland T. E. 2004. Identification of natural resistance to aflatoxin elaboration in maize. Proceedings of the 15<sup>th</sup> International Plant Protection Congress, Beijing, China, p. 367.
- Chen, Z. -Y.,** Brown, R. L., Cleveland, T. E., and Damann, K. E. 2004. Investigating the roles of an aflatoxin resistance-associated protein in maize using RNAi. *Phytopathology* 94: S18.
- Chen, Z. -Y.,** Brown, R. L., Cleveland, T. E., and Damann, K. E. 2004. Identification and characterization of potential resistance markers through proteome analysis. *Mycopathologia* 157: 487.
- Chen, Z. -Y.,** Brown, R. L., Frame, B. R. Wang, K., Cleveland, T. E. and Damann, K. E. 2004. Investigating the role(s) of corn glyoxalase I protein in host resistance to *Aspergillus flavus* infection/aflatoxin production using RNAi technology Proceedings of the USDA-ARS 4<sup>th</sup> Fungal Genomics, 5<sup>th</sup> Fumonisin Elimination, and 17<sup>th</sup> Aflatoxin Elimination Workshops, Sacramento, CA., p. 32.
- Chen, Z. -Y.,** Brown, R. L., Damann, K. E., and Cleveland, T. E. 2004. Identification and characterization of maize kernel proteins associated with resistance against *Aspergillus flavus* infection/ aflatoxin production using proteomics. Proceedings of the 15<sup>th</sup> International Plant Protection Congress, Beijing, China, p. 367.
- Cleveland, T. E., Yu, J., **Chen, Z. -Y.,** Brown, R., and Bhatnagar, D. 2004. Fungal genomics-an overview. *Mycopathologia* 157: 396.
- Kale, S., Cary, J., **Chen, Z.-Y.,** Nguyen, K., Bennett, J. and Bhatnagar, D. 2004. Western blot and 2-D gel analyses of experimentally isolated non-toxigenic *Aspergillus parasiticus* variants. Abstract of the American Society for Microbiology 104<sup>th</sup> General Meeting (New Orleans, LA).
- Stuart, J., **Chen, Z. -Y.,** Yapi, R., Cary, J., Bhatnagar, D., Ross, J., and Kale, S. P. 2004. Optimization of extraction protocols for two-dimensional electrophoresis of *Aspergillus parasiticus* intracellular proteins. Abstract of the American Society for Microbiology 104<sup>th</sup> General Meeting (New Orleans, LA).
- Brown, R. L., **Chen, Z. -Y.,** Cleveland, T. E., Gonzalez, P., Jackson, T., Menkir, A., Damann, K. E., and Rajasekaran, K. 2003. Progress in the identification and characterization of maize resistance traits against aflatoxigenic fungi. Proceedings of the USDA-ARS 3<sup>rd</sup> Fungal Genomics, 4<sup>th</sup> Fumonisin Elimination, and 16<sup>th</sup> Aflatoxin Elimination Workshops, Savannah, GA., p. 47.
- Brown, R. L., **Chen, Z. -Y.,** Menkir, A., and Cleveland, T. E. 2003. Proteins associated with aflatoxin-resistance in maize lines from a West African breeding program. *Phytopathology* 93: S12.
- Chen, Z. -Y.,** Brown, R. L., Cleveland, T. E., and Damann, K. E. 2003. Construction of a gene-silencing binary vector for studying the functions of aflatoxin resistance-associated

- proteins/genes in corn through genetic engineering. Proceedings of the USDA-ARS 3<sup>rd</sup> Fungal Genomics, 4<sup>th</sup> Fumonisin Elimination, and 16<sup>th</sup> Aflatoxin Elimination Workshops, Savannah, GA., p. 109.
- Brown, R. L., Cleveland, T. E., **Chen, Z. -Y.**, Gembah, S. V., Menkir, A. Moore, S., Jeffers, D., Damann, K. E., and Bhatnagar, D. 2002. The identification of maize kernel resistance traits through comparative evaluation of aflatoxin-resistant with susceptible germplasm. *Mycopathologia* 155: 77.
- Chen, Z. -Y.**, Brown, R. L., Cleveland, T. E., and Damann, K. E. 2002. Identification and characterization of potential resistance markers through proteome analysis. Proceedings of the USDA-ARS 2<sup>nd</sup> Fungal Genomics, 3<sup>rd</sup> Fumonisin Elimination, and 15<sup>th</sup> Aflatoxin Elimination Workshops, San Antonio, TX., p. 135.
- Chen, Z. -Y.**, Brown, R. L., Cleveland, T. E., and Damann, K. E. 2002. The use of proteomics to elucidate factors regulating the corn-*Aspergillus flavus* interaction. *Mycopathologia* 155: 14.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2002. Characterization of an endosperm protein expressed at higher levels in maize genotypes resistant to *Aspergillus flavus* infection/aflatoxin production. *Phytopathology* 92: S15.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2002. Characterization of a maize kernel protein associated with resistance against *Aspergillus flavus* infection/aflatoxin production. *Mycopathologia* 155: 111.
- Cleveland, T. E., Yu, J. J., **Chen, Z. -Y.**, Brown, R. L., and Bhatnagar, D. 2002. Fungal genomics—an overview. Proceedings of the USDA-ARS 2<sup>nd</sup> Fungal Genomics, 3<sup>rd</sup> Fumonisin Elimination, and 15<sup>th</sup> Aflatoxin Elimination Workshops, San Antonio, TX., p. 26.
- Brown, R. L., Cleveland, T. E., **Chen, Z. -Y.**, Gembah, S. V., Menkir, A. Moore, S., Jeffers, D., Damann, K. E., and Bhatnagar, D. 2001. The identification of maize kernel resistance traits through comparative evaluation of aflatoxin-resistant with susceptible germplasm. Proceedings of the USDA-ARS 1<sup>st</sup> Fungal Genomics, 2<sup>nd</sup> Fumonisin Elimination, and 14<sup>th</sup> Aflatoxin Elimination Workshops, Phoenix, AZ., p. 117.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2001. Characterization of a corn embryo protein associated with resistance against *Aspergillus flavus* infection/aflatoxin production. *Phytopathology* 91: S16.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2001. The use of proteomics to elucidate factors regulating the corn-*Aspergillus flavus* interaction. Proceedings of the USDA-ARS 1<sup>st</sup> Fungal Genomics, 2<sup>nd</sup> Fumonisin Elimination, and 14<sup>th</sup> Aflatoxin Elimination Workshops, Phoenix, AZ., p. 43.
- Chen, Z. -Y.**, Brown, R. L., Damann, K. E., and Cleveland, T. E. 2001. Characterization of a maize kernel protein associated with resistance against *Aspergillus flavus* infection/aflatoxin production. Proceedings of the USDA-ARS 1<sup>st</sup> Fungal Genomics, 2<sup>nd</sup> Fumonisin Elimination, and 14<sup>th</sup> Aflatoxin Elimination Workshops, Phoenix, AZ., p. 156.
- Brown, R. L., **Chen, Z. -Y.**, Gembah, S. V., Goh, Y. -K., Damann, K. E., Grimm, C., Yu, J. J., Cleveland, T. E., and Bhatnagar, D. 2000. Identification and characterization of new corn kernel traits associated with resistance to *Aspergillus flavus* infection/aflatoxin



- production. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, Yosemite, CA., pp. 148-149.
- Chen, Z. -Y.,** Brown, R. L., Damann, K. E., and Cleveland, T. E. 2000. Proteomics analysis of kernel embryo and endosperm proteins of corn genotypes resistant or susceptible to *Aspergillus flavus* infection. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, Yosemite, CA., p. 88.
- Chen, Z. -Y.,** Brown, R. L., Damann, K. E., and Cleveland, T. E. 2000. Proteome comparisons of corn kernels resistant or susceptible to *Aspergillus flavus* infection. *Phytopathology* 90: S14.
- Cleveland, T. E., Brown, R. L., **Chen, Z. -Y.,** Cary, J. W., and Rajasekaran, K. 2000. Corn as a source of antifungal genes for genetic engineering of crops for resistance to aflatoxin contamination. American Chemical Society Abstr. #AGFD 105.
- Cleveland, T. E., Brown, R. L., **Chen, Z. -Y.,** Cary, J. W., Rajasekaran, K., and Bhatnagar, D. 2000. Corn as a source of antifungal genes for enhancement of resistance in crops to aflatoxin contamination. Proceedings of the 35<sup>th</sup> Annual Meeting UJNR (United States-Japan cooperative program on development and utilization of natural resources)-joint panel on toxic microorganisms. Nov 5-11, Wash., DC.
- Cleveland, T. E., Brown, R. L., **Chen, Z. -Y.,** Cary, J. W., Rajasekaran, K., Jacks, T. J., and Bhatnagar, D. 2000. Identification of antifungal genes from corn and other sources for enhancement of host plant resistance to invasion by mycotoxin-producing fungi. Proceedings of the Fumonisin Risk Assessment Workshop.
- Brown, R. L., **Chen, Z. -Y.,** and Cleveland, T. E. 1999. Biochemical characterization of corn kernels resistant to infection by *Aspergillus flavus* and *Fusarium moniliforme*. *Phytopathology* 89: S9.
- Brown, R. L., **Chen, Z. -Y.,** Cleveland, T. E., Menkir, A., Cardwell, K., Kling, J., and White, D. G. 1999. Resistance to aflatoxin accumulation in maize inbreds selected for ear rot resistance in West and Central Africa. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, Atlanta, GA., p. 11.
- Chen, Z. -Y.,** Brown, R. L., Damann, K. E., and Cleveland, T. E. 1999. Characterization of an alkaline protease excreted by *Aspergillus flavus* and its function in fungal infection of corn kernels. *Phytopathology* 89: S15.
- Chen, Z. -Y.,** Cary, J. W., Brown, R. L., Damann, K. E., and Cleveland, T. E. 1999. Characterization of an alkaline protease excreted by *Aspergillus flavus* in infected corn kernels. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, Atlanta, GA., p 75.
- Brown, R. L., **Chen, Z. -Y.,** and Cleveland, T. E. 1998. The production of hydrolytic enzymes by *Aspergillus flavus* isolates differing in invasive ability in cotton bolls. *Phytopathology* 88: S11.
- Brown, R. L., **Chen, Z. -Y.,** Cleveland, T. E., Russin, J. S., Lax, A. R., Cary, J. W., Payne, G. A., Menkir, A., Cardwell, K. E., Kling, J., White, D. G., Windham, G. L., Davis, G., and Williams, W. P. 1998. Maize resistance to *Aspergillus flavus* infection: Field evaluations and biochemical characterization of antifungal traits. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, St. Louis, MO., p. 8.

- Chen, Z. -Y., Brown, R. L., Russin, J. S., Lax, A. R., and Cleveland, T. E. 1998. Contribution of maize kernel constitutive and induced proteins to resistance against *Aspergillus flavus* infection. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, St. Louis, MO., p. 41.
- Chen, Z. -Y., Brown, R. L., Russin, J. S., Lax, A. R., and Cleveland, T. E. 1998. A corn trypsin inhibitor with antifungal activity and associated with host resistance to aflatoxin elaboration inhibits *Aspergillus flavus* alpha-amylase production. Phytopathology 88: S16.
- Chen, Z. -Y., Brown, R. L., Lax, A. R., Cleveland, T. E., and Russin, J. S. 1998. Growth inhibition of various fungi by a corn trypsin inhibitor over expressed in *E. coli*. Plant Physiology 5149: 718.
- Chlan, C., Guo, J., Cardenas, W., Cary, J. W., Rajasekaran, K., Stromberg, K., Brown, R. L., Chen, Z. -Y., and Cleveland, T. E. 1998. Genetic engineering of cotton: Focusing on expression of anti-fungal compounds in the seed. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, St. Louis, MO., p. 67.
- Chen, Z. -Y., Brown, R. L., Lax, A. R., Guo, B. Z., Cleveland, T. E., and Russin, J. S. 1997. A maize kernel trypsin inhibitor is associated with resistance to *Aspergillus flavus* infection. Proceedings of the USDA-ARS Aflatoxin Elimination Workshop, Memphis, TN., p. 34.
- Chen, Z. -Y., Brown, R. L., Lax, A. R., Guo, B. Z., Cleveland, T. E., and Russin, J. S. 1997. Resistance to *Aspergillus flavus* in corn kernels is associated with a 14 kDa protein. Phytopathology 87: S19.
- Chen, Z. -Y., Burow, M. D., Mason, C. B., and Moroney, J. V. 1996. A low-CO<sub>2</sub>-inducible gene encoding an alanine:α-ketoglutarate aminotransferase in *C. reinhardtii*. Plant Physiology 111: S96.
- Chen, Z. -Y., Lavigne, L. L., Mason, C. B., and Moroney, J. V. 1996. Characterization of a low CO<sub>2</sub> inducible chloroplast envelope protein LIP-36 in *Chlamydomonas reinhardtii*. Plant Physiology 111: S96.
- Chen, Z. -Y., Burow, M. D., and Moroney, J. V. 1995. Characterization of genes induced by low CO<sub>2</sub> in *Chlamydomonas reinhardtii*. Photosynthesis Research (supplement 1): 146.

#### Other Publications (Submissions to GenBank)

- Chen, Z.-Y., Brown, R. L., Damann, K. E., and Cleveland, T. E. Comparisons of endosperm proteins of domestic corn genotypes resistant or susceptible to *Aspergillus flavus* infection/aflatoxin production using proteomics. GenBank Accession No. DQ378060, February 1, 2007.
- Chen, Z.-Y., Brown, R. L., Rajasekaran, K., Damann, K. E., and Cleveland, T. E. Evidence for involvement of a pathogenesis-related protein in maize resistance to *Aspergillus flavus* infection and aflatoxin production. GenBank Accession No. AY953127, March 1, 2006.
- Chen, Z.-Y., Brown, R. L., Damann, K. E. and Cleveland, T. E. The role of maize embryo glyoxalase I protein in resistance to aflatoxin production. GenBank Accession No. AY241545, March 1, 2004.

- Chen, Z.-Y., Cary, J. W., Brown, R. L., Damann, K. E., and Cleveland, T. E.** Characterization of an *Aspergillus flavus* alkaline protease and its possible role in the infection of maize kernels. GenBank Accession No. AF324246, May 14, 2001.
- Chen, Z.-Y., Lavigne, L. L., Mason, C. B., and Moroney, J. V.** Cloning and overexpression of the genes encoding the low CO<sub>2</sub> inducible chloroplast envelope protein LIP-36G1 in *Chlamydomonas reinhardtii*. GenBank Accession No. U75345, October 02, 1997.
- Chen, Z.-Y., Lavigne, L. L., Mason, C. B., and Moroney, J. V.** Cloning and overexpression of the genes encoding the low CO<sub>2</sub> inducible chloroplast envelope protein LIP-36G2 in *Chlamydomonas reinhardtii*. GenBank Accession No. U75346, October 02, 1997.
- Chen, Z.-Y., Burow, M. D., and Moroney, J. V.** Study of a low CO<sub>2</sub> inducible clone encoding alanine aminotransferase in *Chlamydomonas reinhardtii*. GenBank Accession No. U31975, June 05, 1996.

**2. List of other publications (in press, accepted, submitted or to be submitted for publication)**

**Refereed Journal Articles**

- Chen, Z.-Y., Brown, R. L., Guo, B. Z., Menkir, A., and Cleveland, T. E.** 2009. Identifying aflatoxin resistance-related proteins/genes through proteomics and RNAi gene silencing. *Peanut Science* 36 (1): (in press, accepted on July 07, 2008).
- Guo, B., Chen, Z.-Y., Lee, R. D., and Scully, B. T.** 2008. Drought stress and preharvest aflatoxin contamination in agricultural commodity: genetics, genomics and proteomics. *J. Integrative Plant Biology* (in press, accepted on Jun 19, 2008; pdf available online at: <http://www.jipb.net/tupian/2008/6/24/142526.pdf>).
- Baker, R. L., Brown, R. L., Chen, Z.-Y., Cleveland, T. E., and Fakhoury, A. M.** 2008. ZmCOR, a maize lectin-like protein with antifungal activity against *Aspergillus flavus*. *J. Food Protection* (in press, accepted on August 29, 2008).
- Luo, M., Brown, R. L., Chen, Z.-Y., and Cleveland, T. E.** 2008. Host genes involved in the interaction between *Aspergillus flavus* and maize. *J. Toxicology, Toxin Reviews* (revision).
- Baker, R. L., Brown, R. L., Chen, Z.-Y., Cleveland, T. E., and Fakhoury, A. M.** 2008. ZmTI, a maize trypsin inhibitor with limited activity against *Aspergillus flavus*. *J. Food Protection* (in press, accepted on August 29, 2008).
- Chen, Z.-Y., Brown, R. L., Damann, K. E., and Cleveland, T. E.** 2008. RNAi silencing of PR10 expression in maize and its effect on host resistance against *Aspergillus flavus* infection/aflatoxin production. *Plant Biotechnology* (submitted).
- Osiri, J. K., Shadpour, H., Snowden, B. C., Park, S., Chen, Z.-Y., and Soper, S. A.** 2008. Multidimensional protein profiling of fetal calf serum using poly (methyl methacrylate) microchips. *Electrophoresis* (submitted).
- Park, S., and Chen, Z.-Y.** 2008. Identification and characterization of soybean leaf proteins induced/suppressed during *Phakopsora pachyrhizi* infection. *Molecular Plant Microbe Interactions* (to be submitted).

- Chen, Z. -Y., Brown, R. L., Damann, K. E., and Cleveland, T. E. 2008. RNAi silencing of a 14 kDa trypsin inhibitor protein in maize and its effect on host resistance against *Aspergillus flavus* infection/aflatoxin production. Phytopathology (to be submitted).**
- Chen, Z. -Y., Brown, R. L., Menkir, A., Damann, K. E., and Cleveland, T. E. 2008. Proteome comparison of African near isogenic corn lines differing in resistance against *Aspergillus flavus* infection and aflatoxin production. Phytopathology (to be submitted).**
- Xie, Y., Chen, Z. -Y., Brown, R. L., and Cleveland, T. E. 2008. Identification and characterization of a new pathogenesis-related protein 10 from maize. Planta (to be submitted).**

### **3. Other creative and artistic contributions**

None

### **4. Participation in professional meetings, symposia, workshops, and conferences (other than artistic performances)**

#### **Conferences, meetings participated**

- The 13<sup>th</sup> International Biotechnology Symposium, October, 2008 (Dalian, China).
- The 2008 American Phytopathological Society Centennial Meeting, July, 2008 (Minneapolis, MN).
- The 85<sup>th</sup> Southern Division of the American Phytopathological Society Annual Meeting, February, 2008 (Dallas, TX).
- The 2007 National Soybean Rust Symposium, December, 2007 (Louisville, KY).
- The 2007 LSU Agcenter Annual Conference, December, 2007.
- The 20<sup>th</sup> Aflatoxin Elimination Workshop, October, 2007 (Atlanta, GA).
- The 2007 American Phytopathological Society Annual Meeting, July, 2007 (San Diego, CA).
- The 84<sup>th</sup> Southern Division of the American Phytopathological Society Annual Meeting, February, 2007 (Mobile, AL).
- The 2006 LSU Agcenter Annual Conference, December, 2006.
- The 2006 National Soybean Rust Symposium, November, 2006 (St. Louis, MO).
- The International Groundnut Conference on Groundnut Aflatoxin and Genomics. November 2006 (Guangzhou, China)
- The 19<sup>th</sup> Aflatoxin Elimination Workshop, October, 2006 (Fort Worth, TX).
- The 2006 American Phytopathological Society Annual Meeting, July, 2006 (Quebec City, Canada).
- The 18<sup>th</sup> Aflatoxin Elimination Workshop, October, 2005 (Raleigh, NC).
- The 2005 American Phytopathological Society Annual Meeting, July, 2005 (Austin, TX).
- The 17<sup>th</sup> Aflatoxin Elimination Workshop, October, 2004 (Sacramento, CA).
- The 15<sup>th</sup> International Plant Protection Congress (IPPC), May, 2004 (Beijing, China).
- The 16<sup>th</sup> Aflatoxin Elimination Workshop, October, 2003 (Savannah, GA).
- The Gordon Research Conference on Mycotoxins and Phycotoxins, June, 2003 (Coby, Maine).

The 15<sup>th</sup> Aflatoxin Elimination Workshop, October, 2002 (San Antonio, TX).  
The 2002 American Phytopathological Society Annual Meeting, July, 2002 (Milwaukee, WI).  
The 2001 American Phytopathological Society Annual Meeting, August, 2001 (Salt Lake City, UT).  
The 14<sup>th</sup> Aflatoxin Elimination Workshop, October, 2001 (Phoenix, AZ).  
The 13<sup>th</sup> Aflatoxin Elimination Workshop, October, 2000 (Yosemite, CA).  
The 2000 American Phytopathological Society Annual Meeting, August, 2000 (New Orleans, LA).  
The 1998 American Phytopathological Society Annual Meeting, November, 1998 (Las Vegas, NV).  
The 1997 American Phytopathological Society Annual Meeting, August, 1997 (Rochester, NY).

#### **Conferences, Workshops and Short Courses Organized**

Helped organize the 2002 USDA-ARS Aflatoxin Elimination Workshop held in San Antonio with R. L. Brown.  
Helped organize the 2008 APS symposium "Resistance Genes-Past, Present, and Future."

#### **Membership in Professional Organizations**

Member of the American Phytopathological Society (APS)  
Member of the APS Southern Division

#### **Invited Presentations and Seminars**

(Also see "Published Abstracts" under Section 1)

Chen, Z. -Y. and Park, S. 2008. Southern Division of the American Phytopathological Society 85<sup>th</sup> Annual Meeting, February 2-5, 2008 (Dallas, TX). "Investigating soybean- *Phakopsora pachyrhizi* interactions using proteomics."

Chen, Z. -Y. 2007. The LSU Agcenter Annual Conference (Dec 17-18, 2007). "Protein profile changes of soybean leaves in response to *Phakopsora pachyrhizi* (soybean rust) infection."

Chen, Z. -Y. 2007. The 2007 National Soybean Rust Symposium, Dec. 12-14, 2007 (Louisville, KY). "Proteomic analysis of resistant and susceptible soybean lines."

Chen, Z. -Y. 2007. The 2007 Southern Division of the American Phytopathological Society 84<sup>th</sup> Annual Meeting, February 4-5, 2007 (Mobile, AL). "Characterization of an aflatoxin resistance-associated protein from maize."

Chen, Z. -Y. 2006. International Groundnut Conference on Groundnut Aflatoxin and Genomics. Nov 5-9. Guangzhou, China. "Identifying aflatoxin resistance-related proteins/genes in maize through proteomics and RNAi gene silencing."

Chen, Z. -Y. 2005. Department of Plant Pathology and Crop Physiology, Louisiana State University, July, 2005. "Investigating host-parasite interactions: the maize-*Aspergillus flavus* system."



- Chen, Z. -Y.** 2004. The 15<sup>th</sup> International Plant Protection Congress (IPPC) in Beijing, China. May 11-17, 2004. "Identification and characterization of maize kernel proteins associated with resistance against *Aspergillus flavus* infection/aflatoxin production using proteomics" and "Identification of natural resistance to aflatoxin elaboration in maize."
- Chen, Z. -Y.** 2004. Department of Plant Pathology and Crop Physiology, Louisiana State University, Oct 20, 2004. "Understanding the host resistance mechanisms in corn against *Aspergillus flavus* infection and aflatoxin contamination."
- Chen, Z. -Y.** 2003. Department of Plant and Soil Sciences, Southern Illinois University, May, 2003. "Identification and characterization of protein markers for enhancing resistance in corn against *Aspergillus flavus*."
- Chen, Z. -Y.** 1999. Department of Plant Pathology and Crop Physiology, Louisiana State University, November, 1999. "Identification and characterization of biochemical markers for resistance in corn against *Aspergillus flavus*."
- Chen, Z. -Y.** 1999. Department of Agronomy, University of Missouri, April 1999. "Identification and characterization of biochemical markers for resistance in corn against *Aspergillus flavus*."
- Chen, Z. -Y.** 1996. Department of Botany, Duke University, May 1996. "Low CO<sub>2</sub> inducible genes and proteins in *C. reinhardtii*."

#### National: Oral Presentations

- Park, S., Chen, Z.-Y., Chanda, A. K., and Hazard, N.** 2008. The American Phytopathological Society centennial meeting, July 26-30, 2008 (Minneapolis, MN). "Identification of pathogen-responsive proteins from soybean leaves during interaction of soybean and *Phakopsora pachyrhizi* using proteomics."
- Brown, R. L., Menkir, A., Bandyopadhyay, R., Chen, Z. -Y., and Cleveland, T. E.** 2006. The 19<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2006. "The development of aflatoxin-resistant maize germplasm and the identification of potential markers."
- Chen, Z. -Y.** Brown, R. L., Damann, K. E., and Cleveland, T. E. 2006. The 19<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2006. "The effect of PR-10 expression on host resistance in maize against *Aspergillus flavus* infection and aflatoxin production."
- Brown, R. L., Chen, Z. -Y., Menkir, A., and Cleveland, T. E.** 2005. The 18<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2005. "Development of aflatoxin-resistant maize inbreds and identification of potential resistance markers through USA-Africa collaborative research."
- Chen, Z. -Y.** Brown, R. L., Cleveland, T. E., and Damann, K. E. 2005. The 18<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2005. "Silencing the expression of RAP genes in maize and the effect on host resistance against *Aspergillus flavus* infection and aflatoxin production."
- Brown, R. L., Chen, Z. -Y., Menkir, A., and Cleveland, T. E.** 2004. The 17<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2004. "Identification of aflatoxin-resistance and potential markers in maize breeding materials developed in West Africa."

- Chen, Z. -Y., Brown, R. L., Frame, B. R., Wang, K., Cleveland, T. E., and Damann, K. E. 2004. The 17<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2004. "Investigating the role(s) of corn glyoxalase I protein in host resistance to *Aspergillus flavus* infection/aflatoxin production using RNAi technology."
- Brown, R. L., Chen, Z.-Y., Cleveland, T. E., Gonzalez, P., Jackson, T., Menkir, A., Damann, K. E., and Rajasekaran, K. 2003. The 16<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2003. "Resistance traits against aflatoxigenic fungi."
- Chen, Z. -Y. 2002. The 15<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2002. "Characterization of a PR-10 like protein expressed at higher levels in maize genotypes resistant to *Aspergillus flavus* infection/aflatoxin production."
- Chen, Z. -Y. 2002. The American Phytopathological Society Annual Meeting, July, 2002. "Characterization of an endosperm protein expressed at higher levels in maize genotypes resistant to *Aspergillus flavus* infection/aflatoxin production."
- Chen, Z. -Y. 2001. The 14<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2001. "The use of proteomics to elucidate factors regulating the corn-*Aspergillus flavus* interaction" and "Characterization of a maize kernel protein associated with resistance against *Aspergillus flavus* infection/aflatoxin production."
- Chen, Z. -Y. 2000. The American Phytopathological Society Annual Meeting, August, 2000. "Proteome comparisons of corn kernels resistant or susceptible to *Aspergillus flavus* infection."
- Chen, Z. -Y. 1998. The American Phytopathological Society Annual Meeting, November, 1998. "A corn trypsin inhibitor with antifungal activity and associated with host resistance to aflatoxin elaboration inhibits *Aspergillus flavus* alpha-amylase production."
- Chen, Z. -Y. 1997. The American Phytopathological Society Annual Meeting, August, 1997. "Resistance to *Aspergillus flavus* in corn kernels is associated with a 14 kDa protein."
- Chen, Z. -Y. and Moroney, J. V. 1994. The American Society of Plant Physiologist (ASPP) Southern Session Meeting, March, 1994. "Cloning, sequencing, and characterization of low-CO<sub>2</sub> inducible genes in *Chlamydomonas reinhardtii*."

#### National Posters

- Chen, Z. -Y., Brown, R. L., Cleveland, T. E., and Damann, K. E. 2008. The American Phytopathological Society centennial meeting, July 26-30, 2008 (Minneapolis, MN). "The expression of maize 14 kDa trypsin inhibitor protein on host resistance to *Aspergillus flavus* infection and aflatoxin production."
- Wang, Z. Y., Fountain, J., Lee, R. D., Scully, B. T., Chen, Z. -Y., and Guo, B. Z. 2008. The American Phytopathological Society centennial meeting, July 26-30, 2008 (Minneapolis, MN). "Postharvest *Aspergillus flavus* colonization of corn kernels in response to preharvest drought stress and oligo-microarray gene expression profiling of corn kernels."
- Baker, R. L., Brown, R. L., Chen, Z. -Y., Cleveland, T. E., and Fakhoury, A. M. 2007. The 2007 American Phytopathological Society Annual Meeting, July 28-Aug 1, 2007 (San Diego,

- CA). "Isolation and characterization of novel sources of resistance to ear rot and aflatoxin accumulation in corn."
- Brown, R. L., Menkir, A., Bandyopadhyay, R., Cleveland, T. E., and Chen, Z. -Y. 2007. The 2007 American Phytopathological Society Annual Meeting, July 28-Aug 1, 2007 (San Diego, CA). "Comparative proteomics of near-isogenic maize inbred lines to identify potential aflatoxin-resistance markers."
- Chanda, A. Chen, Z. -Y, and Schneider, R. W. 2007. The 2007 American Phytopathological Society Annual Meeting, July 28-Aug 1, 2007 (San Diego, CA). "Identification of cercosporin biosynthesis-related proteins through a proteomic approach."
- Chen, Z. -Y., Brown, R. L., Cleveland, T. E., and Damann, K. E. 2007. The 20<sup>th</sup> Aflatoxin Elimination Workshop meeting, Oct 21-24, 2007. "RNAi silencing of the 14 kDa trypsin inhibitor protein in maize and its effect on host resistance to *Aspergillus flavus* infection and aflatoxin production."
- Park, S., Hazard, N., Chanda, A., and Chen, Z. -Y. 2007. The 2007 American Phytopathological Society Annual Meeting, July 28-Aug 1, 2007 (San Diego, CA). "Protein profile changes in soybean leaves upon *Phakopsora pachyrhizi* infection."
- Chen, Z. -Y., Mumma, E. P., and Schneider, R. W. 2006. The American Phytopathological Society Annual Meeting, August, 2006. "*Phakopsora pachyrhizi* inoculation and proteome analysis of greenhouse-grown soybean plants."
- Chen, Z. -Y., Park, S., Hazard, N., Mumma, E. P., and Schneider, R. W. 2006. The National Soybean Rust Symposium, November, 2006. "Proteome analysis of greenhouse-grown soybean plants inoculated with *Phakopsora pachyrhizi*."
- Chen, Z. -Y., Brown, R. L., Menkir, A., Damann, K. E., and Cleveland, T. E. 2005. The American Phytopathological Society Annual Meeting, August, 2005. "Proteome analysis of near isogenic maize lines differing in the level of resistance against *Aspergillus flavus* infection/ aflatoxin production."
- Chen, Z. -Y., Brown, R. L., Cleveland, T. E., and Damann, K. E. 2003. The 16<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2003. "Construction of a gene-silencing binary vector for studying the functions of aflatoxin resistance-associated proteins/genes in corn through genetic engineering."
- Chen, Z. -Y., Brown, R. L., Rajasekaran, K., Damann, K. E., and Cleveland, T. E. 2003. Gordon Research Conference on Mycotoxins and Phycotoxins, June, 2003. "Identification and characterization of a maize kernel protein associated with resistance against *Aspergillus flavus* infection/aflatoxin production using proteomics."
- Chen, Z. -Y., Brown, R. L., Damann, K. E., and Cleveland, T. E. 2000. The 13<sup>th</sup> Aflatoxin Elimination Workshop meeting, October, 2000. "Proteomics analysis of kernel embryo and endosperm proteins of corn genotypes resistant or susceptible to *Aspergillus flavus* infection."
- Chen, Z. -Y., Brown, R. L., Damann, K. E., and Cleveland, T. E. 1999. The American Phytopathological Society Annual Meeting, August, 1999. "Characterization of an alkaline protease excreted by *Aspergillus flavus* and its function in fungal infection of corn kernels."

- Chen, Z. -Y., Cary, J. W., Brown, R. L., Damann, K. E., and Cleveland, T. E. 1999. The Aflatoxin Elimination Workshop, October, 1999. "Characterization of an alkaline protease excreted by *Aspergillus flavus* in infected corn kernels."
- Chen, Z. -Y., Brown, R. L., Russin, J. S., Lax, A. R., and Cleveland, T. E. 1998. The Aflatoxin Elimination Workshop, October, 1998. "Contribution of maize kernel constitutive and induced proteins to resistance against *Aspergillus flavus* infection."
- Chen, Z. -Y., Brown, R. L., Lax, A. R., Guo, B. Z., Cleveland, T. E., and Russin, J. S. 1997. The Aflatoxin Elimination Workshop, October, 1997. "A maize kernel trypsin inhibitor is associated with resistance to *Aspergillus flavus* infection."
- Chen, Z. -Y., Burow, M. D., Mason, C. B., and Moroney, J. V. 1996. The American Society of Plant Physiologists Annual Meeting, July, 1996. "A low-CO<sub>2</sub>-inducible gene encoding an alanine:  $\alpha$ -ketoglutarate aminotransferase in *C. reinhardtii*."
- Chen, Z. -Y., Lavigne, L. L., Mason, C. B. and Moroney, J. V. 1996. The American Society of Plant Physiologists Annual Meeting, July, 1996. "Characterization of a low CO<sub>2</sub> inducible chloroplast envelope protein LIP-36 in *C. reinhardtii*."

**International: Oral Presentations**

- Chen, Z. Y., Brown, R. L., and Cleveland T. E. 2008. The 13<sup>th</sup> International Biotechnology Symposium, Oct 12-17, 2008 (Dalian, China). "Identifying genes/proteins to enhance crop resistance to fungal pathogens through proteomics and RNAi gene silencing."

**International: Poster Presentations**

- Chen, Z. -Y. and Moroney, J. V. 1995. The X<sup>th</sup> International Photosynthesis Congress, France, August, 1995. "Characterization of low-CO<sub>2</sub> inducible genes in *Chlamydomonas reinhardtii*."

**5. Other scholarly or creative activities or other contributions to the profession**

- Technical editor of the Asian Journal of Biochemistry (2006-2008).  
Chairman of the APS Host Resistance Subcommittee (2008-2009).  
Vice Chairman of the APS Host Resistance Subcommittee (2007-2008).  
Member of the APS Mycotoxin Subcommittee (2006-2008).  
Refereed over 10 manuscripts for various journals and over 25 manuscripts for USDA-ARS internal reviews.  
Reviewed over 15 proposals from various agencies, including NSF, USDA-NRI, and USDA Aflatoxin Elimination Workshop.  
Established a multi-lab journal club since Spring 2008 to encourage graduate students to catch up on the most recent major progress and discoveries in agricultural and biological sciences.

Invited/guest lecturer in Plant Molecular Biology (PLHL 7010) course taught by Dr. N. Murai, October, 2006.

Supervised/directed the following postdocs and associates:

Dr. Meng Luo. Postdoctoral Researcher. 01/2008-present  
Dr. Yirong Xie. Postdoctoral Researcher. 06/2007-present  
Mrs. Nicole Hazard. Research Associate. 06/2006-07/2007  
Poom Preedakoon, Thailand Intern, 05/2008-08/2008  
Wanida Seehachai, Thailand Intern, 07/2007-10/2007  
Yenjit Rarung, Thailand Intern, 06/2006-09/2006

**6. Other awards, lectureships, or prizes that show recognition of scholarly or artistic achievement**

Recipient of C. W. Edgerton award for the outstanding graduate student, Department of Plant Biology, Louisiana State University in 1996.

Invited and granted a fellowship in 1995 to attend the X<sup>th</sup> International Photosynthesis Congress held in Montpellier, France.

**7. Research support/grant activities**

**Funded Proposals**

Total research grants/contracts received: **\$1,001,217.**

**Chen, Z. -Y.** 2008. The USDA-ARS cooperative agreement award (58-6435-6-055, #4) for "Identification and evaluation of proteins/genes associated with aflatoxin-resistance in soybean and maize." **\$10,000.** (09/2008-04/2011)

**Chen, Z. -Y.** 2008. The USDA-ARS cooperative agreement award (58-6435-6-055, #3) for "Identification and evaluation of proteins/genes associated with aflatoxin-resistance in soybean and maize." **\$72,730.** (04/2008-04/2011)

**Chen, Z. -Y., Schneider, R. W.** 2008. The Louisiana Board of Regents Research Competitiveness Subprogram funding for "Investigation of soybean-*Phakopsora pachyrhizi* interactions through a proteomics-based approach." **\$129,000** (LEQSF (2008-11)-RD-A-01). (07/2008-06/2011)

**Chen, Z. -Y.** 2008. The 2008 Louisiana Soybean and Grain Research and Promotion Board grant for "Developing a new strategy to control soybean rust disease through a proteomics-based approach." **\$63,400.** (04/2008-03/2009)

**Chen, Z. -Y., Aime, M. C., and Ham, J. H.** 2008. Flagship Agenda Assistantship. **\$72,000** (\$18,000/year for 4 years). (08/2008-07/2012)

**Chen, Z. -Y.** 2007. The USDA-ARS cooperative agreement award (58-6435-6-055, #2) for "Identification and evaluation of proteins/genes associated with aflatoxin-resistance in soybean and maize." **\$104,000.** (05/2007-04/2011)



- Chen, Z. -Y. 2007. The Louisiana Soybean and Grain Research and Promotion Board grant for "Developing a new strategy to control soybean rust disease through a proteomics-based approach." \$62,250. (04/2007-03/2008)
- Chen, Z. -Y. 2006. The USDA-ARS cooperative agreement award (58-6435-6-055, #1) for "Identification and evaluation of proteins/genes associated with aflatoxin-resistance in soybean and maize." \$89,500. (05/2006-04/2011)
- Chen, Z. -Y. 2006. The Louisiana Soybean and Grain Research and Promotion Board grant for "Developing a new strategy to control soybean rust disease through a proteomics-based approach." \$50,250. (04/2006-03/2007)
- Chen, Z. -Y., Cleveland, T. E., and Wang, K. 2006. The USDA-ARS Aflatoxin Workshop grant titled "Evaluation of aflatoxin resistance in transgenic corn with RNAi silenced expression of resistance-associated proteins and development of assays to screen these biomarkers." \$20,000. (04/2006-03/2007)
- Chen, Z. -Y., Cleveland, T. E., and Wang, K. 2005. The USDA-ARS Aflatoxin Workshop grant titled "Evaluation of changes in aflatoxin resistance and stress tolerance of transgenic corn lacking the expression of GLX I, PR-10, or a newly identified serine/threonine kinase." \$30,000. (04/2005-03/2006)
- Chen, Z. -Y., Cleveland, T. E., and Wang, K. 2004. The USDA-ARS Aflatoxin Workshop grant titled "Investigating the role(s) of three resistance-associated proteins in corn host resistance to *Aspergillus flavus* infection/ aflatoxin production using RNAi technology." \$30,000. (04/2004-03/2005)
- Chen, Z. -Y., Cleveland, T. E., and Wang, K. 2003. The USDA-ARS Aflatoxin Workshop grant titled "Investigating the role(s) of corn glyoxalase I protein in host resistance to *Aspergillus flavus* infection/ aflatoxin production using RNAi technology." \$28,000. (04/2003-03/2004)
- Brown, R. L., Chen, Z. -Y., Cleveland, T. E. 2002. The USDA-NRICGP grant (2002-35201-12541) titled "Characterization of proteins associated with resistance in corn against *Aspergillus flavus* infection/ aflatoxin production." \$240, 087 for 3 years (07/2002-06/2005).

#### Proposals Submitted but not Funded

- USDA-NRI, "Investigating *Phakopsora pachyrhizi*-soybean interaction for control of rust disease." Oct 1, 2008 to Sep 30, 2011, Not Funded for \$398,825. Lead PI Zhi-Yuan Chen, Co-PI Raymond W. Schneider.
- Louisiana Board of Regents, "Investigation of soybean-*Phakopsora pachyrhizi* interactions and development of new strategies to control soybean rust disease through a proteomics-based approach." June 01, 2007 to May 31, 2010, Not Funded for \$199, 438, Lead PI Zhi-Yuan Chen, Co-PI, Raymond W. Schneider.
- USDA-ARS Aflatoxin Elimination Workshop, "Characterization of a maize aflatoxin resistance-associated protein kinase and its possible role in host resistance." May 1, 2007 to April 30, 2008, Not Funded for \$49,000. Lead PI Zhi-Yuan Chen, Co-PI's, Thomas E. Cleveland, SRRC, USDA-ARS and Kan Wang, Plant Transformation Facility, University of Iowa.

Louisiana Board of Regents, "Investigation of soybean-*Phakopsora pachyrhizi* interactions and development of new strategies to control soybean rust disease through a proteomics-based approach." June 01, 2006 to May 31, 2009, Not Funded for \$194, 900, **Lead PI** Zhi-Yuan Chen.

USDA-NRI, "Elucidating maize-*Aspergillus flavus* interaction for enhancement of resistance to aflatoxin contamination." Sep 01, 2006 to Aug 31, 2009, Not Funded for \$397,800. **Lead PI** Zhi-Yuan Chen, Co-PI's Robert L. Brown and Thomas E. Cleveland, Southern Regional Research Center, USDA-ARS.

NSF-IOB, "Identification of maize kernel traits responsive to abiotic stresses and their linkage to resistance against *Aspergillus flavus* infection/aflatoxin contamination." July 01, 2005-June 30, 2008, Not Funded for \$486,829. **Lead PI** Zhi-Yuan Chen, Co-PI's Robert L. Brown and Thomas E. Cleveland, Southern Regional Research Center, USDA-ARS.

**Funding Sources:**

- \* LEQSF
- \* Louisiana Soybean and Grain Research and Promotion Board
- \* USDA-NRI
- \* USDA-ARS Cooperative Agreement Award
- \* USDA-ARS Aflatoxin Elimination Workshop

**8. Theses/dissertations directed (numbers only)**

*As major advisor*

3-Ph. D. dissertations (on-going):

Sunjung Park, Ph. D., presently enrolled (expect to finish in Aug, 2009)

Ashok K. Chanda, Ph. D., presently enrolled (co-advised with Dr. Raymond Schneider)

Peipei Han, Ph. D., presently enrolled

*As member of graduate committee*

Rebecca Sweany (K. Damann, Major Professor)

Freddy Garces (J. Hoy, Major Professor)

Yi Wang (M. Cohn, Major Professor)

Zelam Kaluskar (G. Pettis, Major Professor, Dept of Biological Sciences)

Yuhua Zhang (D. Shih, Major Professor, Dept of Biological Sciences, Dean's Representative) May, 2006.

Sri Ch. Sankara Rao (as a member of the Adjudication Board, Andhra University, Visakhapatnam, India) December, 1999.

**9. Major areas of research interest**

My major areas of research have been to understand the interactions between host plants and their fungal pathogens using proteomics, and to enhance host resistance through upregulation of key resistance-related genes. My research work is focused on the interactions in two economically important pathosystems: maize-*Aspergillus flavus* and soybean-*Phakopsora pachyrhizi*, the causal agent of Asian Soybean Rust. The main objectives for the aflatoxin program are to identify and characterize maize kernel aflatoxin resistance-associated proteins, and to determine their importance in host resistance. The long-term goal is to enhance host resistance in maize to aflatoxin contamination. The objectives for the soybean rust program are to identify host and fungal proteins differentially expressed after rust infection or between soybean lines resistant and susceptible to rust, and to characterize these proteins to understand host-fungus interactions and host resistance mechanisms. The long term objective is to develop new strategies to control soybean rust and other diseases of soybean, such as *Cercospora* leaf blight.

**10. Outreach- field days, trade-shows, direct clientele contact**

Met crop consultant Dr. Blaine Viator frequently during soybean growing season to help diagnose leaf samples from the fields he suspected to have rust disease.  
Traveled numerous times with Drs. Raymond Schneider and Clayton Hollier to survey soybean rust disease development in different parishes.  
Visited rust infected soybean fields managed by Dr. Guy Boyd Padgett at the Northeast Research Station, Winnsboro, LA to collect soybean rust samples.  
Participated in soybean rust field day organized by Dr. Raymond Schneider, October, 2007 and September, 2008.

**11. Cooperative/ collaborative efforts with other faculty**

I cooperate with faculty members in research, extension, and teaching both within and outside the LSU system. The following are a few highlights:  
Collaborated with Dr. M. Cohn and obtained equipment funding from LSU AgCenter for \$79,000 to purchase a Thyphoon laser scanner to be used in proteomics (2007).  
Obtained a Graduate Assistantship from LSU Graduate School through a grant with Drs. Aime and Ham as Co-PIs (\$18,000/year, 2008-2012).  
Established a 5-year (2006-2011) Specific Cooperative Agreement with USDA-ARS (ADODR: R. L. Brown) working on "Identification and evaluation of proteins/genes associated with aflatoxin-resistance in soybean and maize."  
Collaborate with my colleague Dr. Raymond W. Schneider in our Department on identifying *Cercospora kikuchii* from soybean leaves before *Cercospora* leaf blight disease symptoms appear, and co-advise one Ph. D. graduate student, Mr. Ashok K. Chanda.

Collaborate with my colleague Dr. Clayton Hollier and his associates (Rose Berggren and Patricia Bollich) on identifying soybean rust in leaf samples collected from sentinel plots.

Collaborate with Dr. Ahmad M. Fakhoury at Department of Plant, Soil and Ag. Systems, Southern Illinois University (Carbondale, IL) on the characterization of some other resistance associated proteins.

Provide technical support and training to faculty (or their students) on adopting proteomics techniques into their research programs (Drs. Jeff Hoy, Marc Cohn, and Kenneth E. Damann from our department and Dr. Gregg Pettis from Department of Biological Sciences, LSU).

## **12. Community involvement (as it relates to the AgCenter mission)**

Participated in AgMagic (2006, 2007).

## **13. Overall program impact**

I have gained a national and international reputation for research on host resistance in maize against *Aspergillus flavus* and in soybean against *Phakopsora pachyrhizi*. I have worked in the former area for over 11 years and the latter for 3 years, during which time I have authored or coauthored 106 papers and abstracts [32 peer-reviewed papers (4 in press), 10 book chapters, 3 proceedings and 63 abstracts]. The identification of trypsin inhibitor protein (from maize), pathogenesis-related protein 10 (from both maize and soybean), and chalcone isomerase (from soybean) as some of the host resistance-related proteins will help the development of future crops resistant to fungal diseases. Recognition for my contributions has resulted in: (a) invited review articles, (b) invited presentations at numerous regional, national, and international meetings and conferences, including the 2007 APS Soybean Rust Symposium, and the 2004 International Plant Protection Congress in Beijing, (c) technical editorial board appointment for the Asian Journal of Biochemistry (2006-2008), and (d) over a dozen competitive grants totaling over \$1,000,000 awarded over the past six years.

The following is a detailed list of accomplishments and their impacts:

1. Accomplishment: I identified and characterized a maize endosperm 14 kDa trypsin inhibitor protein (TI) quantitatively associated with resistance to *A. flavus* infection/aflatoxin production (Chen et al., 1998) and demonstrated that TI has antifungal activities against *A. flavus* and other fungal pathogens (Chen et al., 1999a). Further investigation indicated that TI inhibits *A. flavus*  $\alpha$ -amylase activity, suggesting a possible mechanism of antifungal activity by limiting the availability of simple sugars for growth (Chen et al., 1999b). This accomplishment represents one of the very first identifications of an antifungal protein associated with resistance to aflatoxin contamination (RAPs). In order to further examine the TI's role in control of *A. flavus*

infection and in medical application as a Hagman factor/trypsin inhibitor, two collaborations were initiated. One was with Dr. Rajasekaran at SRRC, USDA-ARS to introduce this gene into tobacco and cotton through transgenic engineering. Dr. Rajasekaran demonstrated successful transformation of cotton and expression of the maize 14 kDa trypsin inhibitor. Crude extracts from transgenic cottonseed tissue showed about 60% reduction of *Verticillium dahliae* colonies (Rajasekaran et al., 2008). The other collaboration was with Dr. William A. Banks at Saint Louis University School of Medicine. Using the TI overexpressed in and purified from *Escherichia coli*, he reported that the maize TI can cross the brain blood barrier easily and may be a useful antifungal agent in the treatment of central nervous system disease (Banks et al., 2002). **Role:** I conceived, performed all experiments and authored the three manuscripts summarizing the findings. In addition, I also provided the cloned TI gene and overexpressed protein to my collaborators for use in their projects, and confirmed TI protein expression in the transgenic materials. **Impact:** The importance of TI in plant disease resistance and in control of fungal infection has been widely shared. Transgenic cotton plants showed enhanced resistance to fungal pathogens (Rajasekaran et al., 2008). TI has also been shown to possess potential pharmacological applications (Banks et al., 2002).

2. **Accomplishment:** I demonstrated, for the first time, a role for both constitutive and inducible kernel proteins in resistance to *Aspergillus flavus* infection and aflatoxin contamination in maize. I designed a freeze-thaw treatment to kill embryos to stop the biosynthesis of inducible proteins and used this treatment to investigate the importance of constitutive and inducible kernel proteins in host aflatoxin resistance. I found that freeze-thaw treated kernels, although they contained all the constitutive proteins, supported significantly higher levels of aflatoxin when inoculated with *A. flavus* compared to non-freeze-thaw treated kernels, suggesting the importance of inducible kernel proteins in maize aflatoxin resistance. However, the freeze-thaw treated resistant maize kernels still supported significantly less aflatoxin than the susceptible maize kernels, indicating the significance of constitutive kernel proteins in host resistance (Chen et al., 2001). **Role:** I designed and conducted the research project, and wrote the manuscript, in which a model summarizing factors contributing to kernel resistance or susceptibility was first proposed. **Impact:** These findings provide a renewed understanding of kernel aflatoxin-resistance mechanisms: expressing a constitutive arsenal of antifungal proteins as a first layer of defense, followed by inducible proteins as a second layer of defense.
3. **Accomplishment:** I established a new proteomics facility for identifying resistance associated proteins as potential markers. I demonstrated that resistant maize lines differed from susceptible ones in the elevated constitutive production of stress-related proteins, storage proteins and antifungal proteins using the comparative proteomics approach (Chen et al., 2002; Chen et al., 2007). Although the objective of the proteomics investigation was to identify antifungal proteins associated with host



resistance, the repeated identification of stress-related proteins suggests their importance in maize aflatoxin resistance. Possession of unique or higher levels of these constitutively expressed, stress-related proteins may put resistant lines in an advantageous position over susceptible ones in the ability to synthesize proteins, protect the plant from stress-related damages, and defend against pathogens while under stress, when high levels of aflatoxin contamination were usually observed (Chen et al., 2004a). Based on this research progress, I conceived and wrote the USDA-NRI grant titled "Characterization of proteins associated with resistance in maize against *Aspergillus flavus* infection/ aflatoxin production" and received an award of \$240,087 for 3 years (2002-35201-12541) (Due to regulations that a post-doctorate could not serve as a leading PI, Dr. R. L. Brown at SRRRC sponsored the proposal). **Role:** I adopted the proteomics approach and applied it for the first time in the identification of aflatoxin resistance associated proteins (RAPs). I wrote the successful competitive USDA-NRI proposal. **Impact:** The USDA-NRI funding allowed me to continue the characterization of RAPs and lead to a better understanding of maize aflatoxin resistance mechanisms.

**The following accomplishments were made after becoming tenure-track (October, 2005):**

4. Accomplishment: I characterized three aflatoxin resistance-associated proteins: glyoxalase I (GLX I), peroxiredoxin antioxidant (PER 1) and the pathogenesis-related protein 10 (PR 10). I demonstrated that glyoxalase I (GLX I), an embryo protein, had elevated activity in resistant lines compared to susceptible, both before and after *Aspergillus flavus* infection. I also discovered that methylglyoxal, a common metabolic byproduct found in plant cells and the GLX I enzyme substrate, induces aflatoxin production in *A. flavus* culture and upregulates *aflR*, an aflatoxin biosynthesis regulatory gene (Chen et al., 2004b). I also demonstrated that another stress-related protein, peroxiredoxin (PER 1), had peroxidase activity *in vitro* and that *per 1* expression was significantly higher in a resistant than in a susceptible maize genotype during the late stage of kernel development and was induced upon *A. flavus* infection (Chen et al., 2007). The third protein I characterized was a resistance-associated pathogenesis-related protein 10 (PR10), which was shown to be bioactive against *A. flavus* growth and possess RNase activity. Its transcript increased 5-fold during kernel development and was induced upon *A. flavus* infection only in the resistant genotype (Chen et al., 2006). These biochemical and molecular studies indicated that PR10 protein plays an important role in enhancing maize kernel aflatoxin resistance. **Role:** I conceived, planned, and executed the comparative proteomic identification project and the characterization studies. I also directed the work of my research associate Ms. Hazard on this project. I authored 3 manuscripts summarizing the discoveries (Chen et al., 2004b, 2006, and 2007). **Impact:** My research discoveries clearly indicated that expression of high levels of stress-related proteins is part of the host resistance mechanism, which may provide additional targets for manipulation to enhance resistance.

5. **Accomplishment:** In an effort to determine the importance of the expression of GLX I, PR10 and TI in maize host resistance against *Aspergillus flavus* infection and aflatoxin production, I constructed three RNAi (RNA interference) gene silencing vectors. Through collaboration with Dr. Kan Wang at Iowa State University, I introduced these RNAi vectors into maize using bombardment and *Agrobacterium* infection. The transgenic callus tissues produced from bombardment with the PR10 RNAi vector showed a 65-99% reduction in *pr10* gene expression compared to non-silenced controls, confirming the constructed vector is functioning properly. Forty-five transgenic plants with reduced levels of *pr10* expression in leaf tissues were also regenerated, and mature kernels were produced. Preliminary study of these transgenic kernels showed that some of the transgenic lines were more susceptible to *A. flavus* infection, compared to non-silenced control maize kernels, and the increase in susceptibility corresponds to the reduction in PR10 protein levels as determined in proteomics, demonstrating a direct role of PR10 protein expression in host aflatoxin resistance (Chen et al., 2006 abstract). A manuscript describing these results has been submitted to Plant Biotechnology (Chen et al., 2008, submitted). Mature transgenic maize kernels with reduced levels of TI or GLX protein levels have also been produced. Preliminary study of TI RNAi silenced kernels showed a clear negative correlation between the level of TI and the degree of *A. flavus* fungal colonization on the transgenic kernels (Chen et al. 2007 and 2008, abstracts; Chen et al., 2008, to be submitted). **Role:** I designed and constructed three RNAi vectors, characterized the transgenic materials and demonstrated a significant increase in susceptibility in RNAi silenced kernels with reduced levels of TI or PR10. I also directed the work of my graduate student, Ms. Han, on this project. I wrote two manuscripts (one submitted and one to be submitted shortly) describing the characterization of RNAi silenced kernels and their change in aflatoxin resistance. **Impact:** Upregulating the expression of key proteins that play important roles in aflatoxin resistance may provide a solution to control the aflatoxin contamination problem, and therefore, reducing economic losses that corn growers are facing annually, especially in the southern U.S.
  
6. **Accomplishment:** The regulation of genes encoding resistance-associated proteins through promoter analysis is currently being investigated by Dr. Yurong Xie, a postdoctoral research associate who joined my laboratory in June 2007. He identified and cloned a second gene from maize encoding the PR10 protein (called zmPR10.1). He has compared the differences between zmPR10.1 and the previously identified PR10 in temporal and spatial expression patterns, in response to biotic and abiotic stresses, and in enzymatic and antifungal activities. A manuscript describing these research accomplishments has been submitted to Planta (Xie et al., 2008, submitted). Dr. Xie has also cloned the promoters of both *pr10* genes, and is analyzing them using transgenic Arabidopsis. **Role:** I conceived and directed the research project, and I have been heavily involved in the revision of the manuscript. I also designed a novel approach based on the principle of ChIP (chromatin immunoprecipitation) on Chip (microarray) method to identify regulatory proteins that bind to the promoter region of host-resistance related

genes. Dr. Xie is currently testing the feasibility of this approach with a known gene and a known regulatory protein that binds to the promoter region. **Impact:** Identifying a common regulatory protein that can regulate the expression of multiple resistance associated proteins will enhance our ability to develop aflatoxin resistant commercial maize lines through either genetic engineering or conventional breeding.

7. **Accomplishment:** I developed a detached leaf method for year-round culture of the soybean rust fungus, *Phakopsora pachyrhizi*, an obligate parasite. This method uses whole leaves instead of sections of leaves and it does not require agar medium or kinetin as in earlier methods (Chen et al., 2006, abstract; Park et al., 2008a). Using this detached leaf assay, my graduate student, Sunjung Park, and I carried out laboratory investigation of soybean rust spore viability under simulated southern Louisiana winter conditions to determine the possibility of it overwintering in southern Louisiana. We found that about 5% of soybean rust spores remained viable even after treatment under simulated winter conditions [ 12 °C for 14 h with light (day) and 1 °C for 10 h in the dark (night) under 75% constant humidity] for over 2 months. These spores produced pustules when inoculated onto soybean leaves. Our data indicated it is likely that soybean rust spores will survive the mild winter conditions seen in southern Louisiana and pose a new threat in the next growing season (Park et al., 2006, abstract; Park et al., 2008a). The recovery of viable soybean rust spores from overwintered kudzu leaves further supported our conclusion (Park et al., 2008a). **Role:** I participated and directed Ms. Park and research associate Ms. Hazard in collecting soybean rust spores from various locations across Louisiana. I developed the detached leaf method. **Impact:** The detached leaf method is very simple and easy to use. This assay proved very useful not only in determining spore infectivity in a short time, but also in maintaining live soybean rust cultures all year round under laboratory conditions. This assay could also be used to evaluate host resistance levels of different soybean varieties under laboratory conditions. Our study also indicates that the soybean rust fungus will likely survive the winter in southern Louisiana. Therefore, it is necessary to develop long-term measures to control the soybean rust disease.
8. **Accomplishment:** We compared different protein extraction methods and optimized procedures for extracting and separating proteins from soybean leaves to produce the well-resolved and reproducible 2-D protein profiles (Chen et al., 2006, abstract; Park et al., 2007, abstract). Leaf proteins were isolated from *Phakopsora pachyrhizi* inoculated and non-inoculated soybean leaves of a susceptible soybean line (at the time of research, lines with resistance to soybean rust spores from Louisiana were not available), separated using 2-D gels, and compared for differentially expressed proteins. We identified over two dozen differentially expressed proteins (at least 2-fold) between control soybean leaves and leaves inoculated with rust spores. Seventeen proteins were recovered and sequenced using tandem mass spectrometry. Based on sequence similarities to proteins with known functions in the databases, some of the up-regulated

proteins appeared to be involved in host defense (such as the PR10 protein and chalcone isomerase [CHI]) or in response to stress (such as ascorbate peroxidase). We have also found that induction of some of these proteins after soybean rust infection can be observed as early as 10 hr after inoculation using proteomics. These findings were presented at the 2007 National Soybean Rust Symposium. The PowerPoint of the talk is available online

(<http://www.plantmanagementnetwork.org/infocenter/topic/soybeanrust/2007/presentations/Chen.pdf>). A manuscript summarizing this accomplishment will be submitted to Plant Molecular-Microbe Interactions (Park et al., 2008b). **Role:** I directed Ms. Park on this project and was involved in data analysis and manuscript writing and revision. **Impact:** Determining the identities and functions of these differentially expressed proteins will shed light on how rust infects soybean and how the host responds to rust infection, which can provide new control measures for our soybean growers.

9. **Accomplishment:** We have obtained 18 soybean lines from Dr. Nelson at the US Soybean Germplasm collection. Most of them have shown levels of resistance to soybean rust in studies conducted by others. Ms. Park screened a batch of eight lines twice both in the greenhouse and using the detached soybean leaf assay against Louisiana soybean rust spores. Our data showed that PI417089A was the most resistant line. After comparing protein profile differences between this line and one susceptible commercial soybean line, Ms. Park found that PR10 and chalcone isomerase (CHI) were among those proteins that were differentially expressed under either control or rust infection conditions. Preliminary data were presented at the 2007 National Soybean Rust Symposium (available at <http://www.plantmanagementnetwork.org/infocenter/topic/soybeanrust/2007/presentations/Chen.pdf>). A manuscript summarizing this research is being prepared (Park et al., 2008c). **Role:** I directed Ms. Park on this project and was involved in germplasm evaluation, data analysis and manuscript writing. **Impact:** Identification of proteins differentially expressed between rust resistant and susceptible soybean lines will increase our chance of identifying proteins directly involved in rust disease resistance.

#### D. SERVICE ACTIVITIES

##### 1. Organizations advised

Provided input to the APS Public Policy Board regarding the 2007 APS microbial genome sequencing priority list.

Served as an outside member of the Southern Regional Research Center Biosafety Committee (2006-2008).

##### 2. Recruitment of students and faculty

**Recruitment of Faculty**

Member, Search Committee: Phyto bacteriologist Position (Spring/Summer 2007)

**Recruitment of Research Associate, Postdoctorate, and Graduate Students**

Recruited Ms. Peipei Han as Graduate Assistant (Spring 2008)

Recruited Dr. Meng Luo as Postdoctoral Research Associate (Fall 2007)

Attended the 2007 Career Expo hosted by LSU College of Agriculture on campus to promote the research work conducted in the department and answer student questions about future prospects of being a plant pathologist (Spring 2007)

Recruited Dr. Yirong Xie as Postdoctoral Research Associate (Spring 2007)

Attended Career Fair at University of Louisiana at Lafayette (Fall 2006)

Recruited Ms. Sunjung Park as Graduate Assistant (Fall 2006)

Recruited Mr. Ashok Chanda as Graduate Assistant (Fall 2006)

Recruited Nicole Hazard as Research Associate (Spring/Summer 2006)

**3. University service (department, region, station, parish, committees, etc.)**

**Department**

Member of the Departmental CSREES Project Review Committee (2008)

Member of the Departmental Seminar Committee (2007-2008)

Member of the Graduate Student Recruitment Committee (2006-2007)

Took a leading role in the Flagship Agenda graduate assistantship proposal

Took a leading role in preparing and reporting the Physiology section of the department CSREES Review

**AqCenter**

Member of the Agricultural Center Biotech Interest Group committee

**4. Professional service**

**Journals Edited and Manuscripts Refereed**

2008, Reviewed 1 manuscript for Micropathologia

Reviewed 1 manuscript for Journal of Toxicology, Toxin Reviews

Reviewed 1 manuscript for Journal of Agriculture and Food Chemistry

2007, Reviewed 1 manuscript for Phytopathology

2006, Reviewed 1 manuscript for Journal of Phytopathology

Reviewed 1 manuscript for Micropathologia



2005, Reviewed 1 manuscript for *Micropathologia*  
Reviewed 1 manuscript for *Journal of Cotton Science*  
Reviewed 1 manuscript for *Planta*  
2004, Reviewed 1 manuscript for *Journal of Food Protection*  
2000, Reviewed 1 manuscript for *Comparative Biochemistry and Physiology*  
1999 to 2008: Reviewed over 25 manuscripts submitted by USDA-ARS scientists for internal reviews

**Proposals Reviewed**

Reviewed 1 Hatch project proposal for LSU Ag Center, July, 2008  
Served as an ad hoc reviewer for 1 NSF proposal, October, 2007  
Served as an ad hoc reviewer for 2 USDA-ARS Aflatoxin Elimination Workshop proposals, February, 2007  
Reviewed 1 Hatch project proposal for LSU Ag Center, April, 2006  
Served as an ad hoc reviewer for 1 NSF proposal, February, 2006  
Served as an ad hoc reviewer for 2 USDA-ARS Aflatoxin Elimination Workshop proposals, February, 2006  
Served as an ad hoc reviewer for USDA/CSREES/National Research Initiative Competitive Grants Program in the Food Safety subprogram, March 2005  
Served as an ad hoc reviewer for 2 USDA-ARS Aflatoxin Elimination Workshop proposals, February, 2005  
Served as an ad hoc reviewer for 1 NSF proposal, February, 2005  
Served as an ad hoc reviewer for 2 USDA-ARS Aflatoxin Elimination Workshop proposals, February, 2004  
Served as an ad hoc reviewer for 2 USDA-ARS Aflatoxin Elimination Workshop proposals, February, 2003

**5. Other external and community service**

President of the Parents Association at the Greater New Orleans Chinese School 2005-2006  
Board member of the Greater New Orleans Chinese School Council 2006-2008  
Organizer for China Earthquake Fundraising Party, June, 2008