

## **Wendy J. Powers, PhD**

Associate Vice President, Division of Agriculture and Natural Resources  
University of California

### **GENERAL INFORMATION**

#### **a. Education**

- B.S., Animal Science, Cornell University
- M.S., Dairy Science, University of Florida
- Ph.D., Animal Science, University of Florida

#### **b. Academic Appointments**

- Assistant Professor, Animal Science, Iowa State University, 1997-2003.
- Courtesy Appointment, Ag & Bio Engineering, Iowa State University, 1999.
- Associate Professor, Animal Science, Iowa State University, 2003-2006.
- Director of Environmental Stewardship, Michigan State University, 2006-2016.
- Professor, Animal Science and Biosystems & Agriculture Engineering, Michigan State University, 2006-2016.

#### **c. Administrative Appointments**

- Director, Agriculture and Agribusiness Institute, Michigan State University Extension, 2010 – 2014.
- Associate Vice President, Agriculture and Natural Resources, University of California, 2016 – present.

### **A. ADMINISTRATIVE ACCOMPLISHMENTS**

#### **1. Partnership Development**

A key responsibility of the Associate Vice President (AVP), University of California Agriculture and Natural Resources (UC ANR), is to develop and maintain partnerships across the UC system. AVP Powers worked with long term partners at UC Berkeley, UC Davis, and UC Riverside to develop the first MOUs that defined the relationship between UC ANR and the campus for campus management of Cooperative Extension (CE) Specialists that are funded by the UC ANR budget. While the practice had been in place for decades, there was lack of clarity in the relationship and expectations. During her 5 years with UC ANR, AVP Powers has established new partnerships with UC Santa Barbara to house a UC ANR CE Specialist on that campus, while managing the position through UC ANR. She has developed relationships with two other UC campuses (Merced and Santa Cruz) to develop agreements to partner in funding additional CE Specialists on those campuses with co-management of the positions (2 at UC Merced, 1 at UC Davis, and 1 at UC Santa Cruz). One of those agreements at UC Merced includes a third commodity organization partner who provides the bulk of the position funding for the first 5 years.

AVP Powers has extensive experience developing partnerships with external partners, to fund academic positions and programs. In a 5-year timeframe, she has established funding for 14 county-based academic positions, partnering with 3 county governments, 4 commodity groups, 3 state agencies, and 1 private donor. Each agreement is unique and requires identifying common goals and objectives, understanding each partner's barriers, and establishing a level of trust that translates into a long-term relationship and financial support of career positions. During this same period of time, AVP Powers has

been instrumental in securing funding from a state agency for 40+ program support positions, located throughout the state and addressing three different program topics (climate smart agriculture, small farms support, and produce food safety education). Four additional academic positions are under active discussion with a new state agency partner, and four staff positions have been funded by a group of commodity boards.

Cooperative Extension represents a partnership between federal, state, and county government. Annual support from each partner varies and can be challenging when budgets are tight. AVP Powers supports UC ANR directors of county programs in their negotiations with county governments. It is not uncommon that she is instrumental in renegotiating agreements and financial support from county partners when conflict arises. AVP Powers works closely with donors, UC ANR program directors, and the Development Services team to build program support. In particular, AVP Powers interacts with donors without a direct programmatic point of contact and supports program directors in their interactions with donors for whom they have a relationship. Success continues to grow. AVP Powers is directly responsible for securing a program endowment (initially \$1M) that is expected to grow as additional partners join the effort and a recent donor gift of \$2.3M as a beneficiary IRA with current use of annual payout in the interim.

## **2. Academic Review and Success**

AVP Powers serves as the decision maker in annual merit and promotion decisions, including awarding of indefinite status. With input from supervisors, a Peer Review Committee, ad hoc review committees, and external evaluators, AVP Powers determines actions (approval, denial, alternate action) for 65 to 100 academics, annually.

In support of academic success, AVP Powers works closely with the Academic Assembly Council and Academic Human Resources to develop and deliver trainings and guidance documents for successful career advancement. Office hours and webinars scheduled throughout the year are key aspects of maintaining open communication and providing academics the support needed for advancement while maintaining academic rigor. Working closely with Academic Human Resources, AVP Powers has revised hiring practices to ensure a diverse applicant pool and unbiased review of applications, and is taking steps to ensure all academics have the support they need to perform to their potential.

## **3. Administrative Leadership**

Dr. Powers has served in national leadership positions throughout her academic careers, in professional societies and in technical committees to develop policy guidance. Over the last 5 years, during AVP Powers' time with UC, she has served in the following leadership positions for the Cooperative Extension System:

- Western Extension Directors Association (WEDA) secretary, chair, past-chair (1-yr term, each)
- Extension Committee on Organization and Policy member (representing the Western Region; 3-yr term), chair-elect (1-yr term) chair (upcoming 1-yr term, beginning October 2021)

A key accomplishment during this time period is development of a strategic directions document and implementation of an annual plan of work by WEDA.

Within UC ANR, AVP Powers was a key contributor and leader in development and implementation of a 2016-2021 UC ANR Strategic Plan (owner for 3 of 15 goals), a 2020-2025 Strategic Plan update (owner of 1 of 12 goals), and a 2020 Research and Extension Center Strategic Framework. As a result of these efforts, Dr. Powers inspired creation of 7 public value statements that now frame how UC ANR talks about its work and contributions. In addition, the Research and Extension Center (REC) system

and UC ANR are piloting different models of leadership of Centers and county offices. Furthermore, a new model program management for two of UC ANR's largest programs (4-H and CalFresh) are underway, to alleviate administrative burden on academics and better support program staff. Finally, the REC system is three years into a new model of providing financial support to projects with a long-term view of financial sustainability for the REC system.

Recently, Powers was named to the National Academies of Science, Engineering, and Medicine *Enhancing Coordination Between Land-Grant Universities and Colleges* Blue Ribbon Panel. This work, initiated in November 2021, is expected to wrap up summer 2022.

## B. ACADEMIC EXCELLENCE IN DISCOVERY

Dr. Powers has integrated research discovery with outreach and implementation to provide the livestock industries with information and tools essential to their decision-making related to minimizing environmental impact while sustaining competitiveness and meeting challenges of growing demand for animal protein production coupled with changing and variable climate and natural resource limitations. Dr. Powers' research program compliments her Extension program by providing readily available research-based answers to environmental challenges on the farm. In particular, Dr. Powers' research program focuses on the impact of dietary strategies on nutrient excretions and air emissions.

### 1. Research Publications (including those with Extension component, through 2016):

#### a. Book Chapters

- Lorimor, J., W. Powers and A. Sutton 2000. Manure characteristics. MWPS-18 Manure Management Systems Series. Midwest Plan Service, Ames, Iowa.
- University of Iowa and Iowa State University. 2002. Iowa concentrated animal feeding operations air quality study. A peer-reviewed report submitted to Director Vonk, Iowa Department of Natural Resource. Developed at the request of Gov. Vilsack.
- Van Horn, H.H. and W. J. Powers. 2003. Agricultural and environmental issues in the management of animal manures. In: Perspectives in world food and agriculture 2004, ed. C. G. Scanes and J.A. Miranowski. Iowa State Press, Ames, IA.
- Iowa Department of Natural Resources. 2004. Animal feeding operations technical workgroup report on: air emissions characterization, dispersion modeling, and best management practices. <http://www.iowadnr.com/air/afo/files/finalaforeport.pdf>
- American Society of Agriculture Engineers. 2005. Manure production and characteristics standard D384.2. American Society of Agricultural and Biological Engineers; St. Joseph, MI.
- Meyer, D., J. Menke, W. Powers, and J. Harner, III. 2005. Dairy cattle: waste management. In: Encyclopedia of animal science. Marcel Dekker, Inc., New York.
- Applegate, T. J., W. Powers, and R. Angel. 2007. Protein and amino acid nutrition in poultry: impacts on performance and the environment. In: Gaining the Edge in Pork and Poultry Production. Edit. J. A. Taylor-Pickard and P. Spring, Wageningen Academic Publishers, Wageningen, Netherlands. Pg. 139-151.
- Powers, W., B. Auvermann, N. A. Cole, C. Gooch, R. Grant, J. Hatfield, P. Hunt, K. Johnson, A. Leytem, W. Liao, J. M. Powell. 2014. Chapter 5: Quantifying greenhouse gas sources and sinks in animal production systems. In: *Quantifying greenhouse gas fluxes in agriculture and forestry: methods for entity-scale inventory*. Technical Bulletin 1939. Office of the Chief Economist, U.S. Department of Agriculture, Washington, D.C. 606 pages. M. Eve, D. Pape, M. Flugge, R. Steele, D. Man, M. Riley-Gilbert, and S. Biggar (Eds).

b. Refereed Research Papers

- Van Horn, H. H., A. C. Wilkie, W. J. Powers, and R. A. Nordstedt. 1994. Components of dairy manure management systems. *J. Dairy Sci.* 77:2008-2030.
- Powers, W. J., R. E. Montoya, H. H. Van Horn, R. A. Nordstedt, and R. A. Bucklin. 1995. Separation of manure solids from simulated flushed manures by screening or sedimentation. *Appl. Engin. In Agric.* 11(3):431-436.
- Powers, W. J., H. H. Van Horn, B. Harris, and C. J. Wilcox. 1995. Effects of variable sources of distillers dried grains plus solubles on milk yield and composition. *J. Dairy Sci.* 78:388-396.
- Tomlinson, A. P., W. J. Powers, H. H. Van Horn, R. A. Nordstedt, and C. J. Wilcox. 1996. Dietary protein effects on nitrogen excretion and manure characteristics of lactating cows. *Trans. of the ASAE* 39(4):1441-1448.
- Powers, W. J., A. C. Wilkie, H. H. Van Horn, and R. A. Nordstedt. 1997. Effects of hydraulic retention time on performance and effluent odor of conventional and fixed-film anaerobic digesters fed dairy manure wastewaters. *Trans of the ASAE* 40(5): 1449- 1455.
- Powers, W. J., H. H. Van Horn, A. C. Wilkie, C. J. Wilcox and R. A. Nordstedt. 1999. Effects of anaerobic digestion and additives to effluent or cattle feed on odors and odorant concentrations. *J Anim. Sci.* 77(6):1412-1421.
- Powers, W. J. 1999. Odor control for livestock operations. *J. Anim. Sci.* Vol 77, Suppl. 2/*J. Dairy Sci.* Vol. 82, Suppl. 2.
- Powers, W. J. and H. H. Van Horn. 2001. Nutritional implications for manure nutrient management planning. *Appl. Engng. In Agric.* 17(1):27-39.
- Gralapp, A. K., W. J. Powers, and D. S. Bundy. 2001. Comparison of olfactometry, gas chromatography and electronic nose technology for measurement of indoor air from swine facilities. *Trans of the ASAE* 44(5):1283-1290.
- Gralapp, A. K., W. J. Powers, M. A. Faust and D. S. Bundy. 2002. Effects of dietary ingredients on manure characteristics and odorous emissions from swine. *J. Anim. Sci.* 80(6):1512-1519.
- Van Kempem, T. A. T. G., W. J. Powers, and A. Sutton. 2002. Technical note: Fourier transform infrared (FTIR) spectroscopy as an optical nose for predicting odor sensation. *J. Anim. Sci.* 80(6):1524-1527.
- Powers, W. J. and L. A. Flatow. 2002. Effects of flocculent and flocculation rates on solids and phosphorus precipitation in dilute swine manure. *Appl. Engng. in Agric.* 18(5):609-614.
- Powers, W. J. 2003. ADSA Foundation Lecture: Keeping science in the environmental regulatory process; the role of the animal scientist. *J.Dairy Sci.* 86(4): 1045-1051.
- Bicudo, J. R., Clanton, C. J., Schmidt, D. R., Jacobson, L. D., Powers, W. J., and Tengman, C. L. 2004. Geotextile covers to reduce odor and gas emissions from swine manure storage ponds. *Applied Engineering in Agriculture.* Vol. 20(1): 65-75.
- T. A. T. G. van Kempem, H. H. Stein, W. J. Powers, P. R. Ferket, and I. B. Kim. 2004. Effects of different dietary acidifier sources of calcium and phosphorus on ammonia, methane and odorant emission from growing-finishing pigs. *Asian-Australas. J. Anim.Sci.* 17(8):1131-1138.
- Angel, C. R., W. J. Powers, T. J. Applegate, N. M. Tamim, and M. C. Christman. 2005. The influence of dietary phytase on water soluble phosphorus in broiler chickens, turkeys, and growing swine. *J. Environ. Qual.* 34(2):563-571.

- Panetta, D. M., W. J. Powers, and J. C. Lorimor. 2005. Management strategy impacts on ammonia volatilization from swine manure. *J. Environ. Qual.* 34(4):1119-1130.
- Powers, W. J., R. Angel, T. Applegate. 2005. Air emissions in poultry production: current challenges and future directions. *Journal of Applied Poultry Research* 14:613-621.
- Angel, R., W. W. Saylor, A. S. Dhandu, W. Powers, and T. J. Applegate. 2005. Effects of dietary phosphorus, phytase, and 25-hydroxycholecalciferol on performance of broiler chickens grown in floor pens. *Poult. Sci.* 84:1031-1044.
- Powers, W. J., E. R. Fritz, W. Fehr, and R. Angel. 2006. Evaluation of low-phytate soybeans on performance and excretions from swine. *J. Anim. Sci.* 84(7):1907-1915.
- Panetta, D. M., W. J. Powers, H. Xin, B. J. Kerr, and K. J. Stalder. 2006. Nitrogen excretion and ammonia emissions from pigs fed reduced crude protein diets or yucca extract. *J. Environ. Qual.* 35(4):1297-1308.
- Angel, R., W. W. Saylor, A. Mitchell, W. Powers, T. J. Applegate and A. S. Dhandu. 2006. Effect of dietary phosphorus concentration, and inclusion of phytase and 25-hydroxycholecalciferol on broiler chicken bone mineralization, litter total and water soluble phosphorus, and processing yields and losses. *Poult. Sci.* 85(7):1200-1211.
- Haan, M. M., J. R. Russell, W. J. Powers, J. L. Kovar, and J. L. Benning. 2006. Grazing management effects on sediment and phosphorus in surface runoff. *Rangeland Ecology and Management* 59(6):607-615.
- Custodio, M. G., W. J. Powers, E. Huff-Lonergan, M. A. Faust, and J. Stein. 2006. Growth performance, pork quality, and excretion characteristics of pigs fed Bt corn or non-genetically modified corn. *Can. J. Anim. Sci.* 86(4):443-455.
- Wu-Haan, W., W. J. Powers, C. R. Angel, C. E. Hale, III, and T. J. Applegate. 2007. Effect of an acidifying diet combined with zeolite and slight protein reduction on air emissions from laying hens of different ages. *Poult. Sci.* 86:182-190.
- Wu-Haan, W., W. J. Powers, C. R. Angel, C. E. Hale, III, and T. J. Applegate. 2007. Nutrient digestibility and mass balance in laying hens fed a commercial or acidifying diet. *Poult. Sci.* 86: 684-690.
- Haan, M. M., J. R. Russell, W. J. Powers, J. L. Kovar, and J. L. Benning. 2007. Effects of forage management on pasture productivity and phosphorus content. *Rangeland Ecology and Management* 60:311-318.
- Powers, W. J., S. Zamzow, and B. J. Kerr. 2007. Reduced crude protein effects on aerial emissions from swine. *Applied Engineering in Agriculture.* 23(4): 539-546.
- Siegford, J. M., W. Powers, H. G. Grimes-Casey. 2008. Environmental aspects of ethical animal production. *Poult. Sci.* 87:380-386.
- Applegate, T. J., W. J. Powers, R. Angel, and D. Hoehler. 2008. Effect of amino acid formulation and acid supplementation on performance and nitrogen excretion in turkey toms. *Poult. Sci.* 87:514-520.
- Powers, W. And C. R. Angel. 2008. A review of the capacity for nutritional strategies to address environmental challenges in poultry production. *Poult. Sci* 2008 87: 1929-1938.
- Applegate, T. J., S. A. Adedokun, W. J. Powers, and R. Angel. 2008. Determination of nutrient mass balance in turkeys. *Poult Sci.* 87:2477-2485.
- Johnson, A. K., L. J. Sadler, K. J. Stalder, and W. Powers. 2008. Influence of corn co-products on the behavioral repertoire of grow-finish swine. *Acta Agri. Scand Animal Sci.* 58:4:209-213.

- Burkett, J. L., K. J. Stalder, W. J. Powers, J. L. Pierce, T. J. Baas, T. B. Bailey, B. L. Shafer, and K. Bregendahl. 2009. Effect of inorganic and organic trace mineral supplementation on the performance, carcass characteristics, and fecal mineral excretion of phase-fed, grow-finish swine. *Aust. J. Anim. Sci.* 22:1279-1287.
- Applegate, T. J., E. M. Onyango, R. Angel, and W. Powers. 2009. Effect of amino acid formulation and dietary direct-fed microbial supplementation on egg production and egg characteristics in laying hens. *J. Appl. Poult. Res.* 18:552–561.
- Webber, D. F., S. K. Mickelson, S. I. Ahmed, J. R. Russell, W. J. Powers, R. C. Schultz, and J. L. Kovar. 2010. Livestock grazing and vegetative filter strip buffer effects on sediment, nitrate, and phosphorus losses with runoff. *J Soil Water Cons. Soc.* 65(1):34-41.
- Wu-Haan, W., W. J. Powers, C. R. Angel, and T. J. Applegate. 2010. The use of distillers dried grains plus soluble as a feed ingredient on performance and air emissions from laying hens. *Poult. Sci.* 89:1355-1359.
- Liu, Z., W. Powers, D. Karcher, R. Angel, and T. Applegate. 2011. Effect of amino acid formulation and supplementation on air emissions from turkeys. *Trans. ASABE* 54:617–628.
- Liu, Z., W. Powers, D. Karcher, R. Angel, and T. Applegate. 2011. Effect of amino acid formulation and supplementation on nutrient mass balance in turkeys. *Poult. Sci.* 90: 1153-1161.
- Li, W., W. Powers, and G. M. Hill. 2011. Feeding DDGS to swine and resulting impact on air emissions. *J. Anim. Sci.* 89:3286-3299.
- Romero, C., E. M. Onyango, W. Powers, R. Angel, and T. J. Applegate. 2012. Effect of a partial replacement of limestone by a CaSO<sub>4</sub>-zeolite mixture combined with a slight protein reduction on production indices, egg quality and excreta pH in laying hens. *J Appl. Poult. Res.* 21:325-334.
- Hollman, M., W. Powers, A. Fogiel, N. Bello, J. Liesman, D. Beede. 2012. Enteric methane emissions and lactational performance of Holstein cows fed different concentrations of coconut oil. *J. Dairy Sci.* 95:2602-2615.
- Romero, C., M. Abdallh, W. Powers, R. Angel, and T. J. Applegate. 2012. Effect of dietary adipic acid and corn dried distillers grains with solubles on laying hen performance and nitrogen loss from stored excreta with or without sodium bisulfate. *Poult. Sci.* 91:1149-1157.
- Li, W. and W. Powers. 2012. Effects of saponin extracts on air emissions from steers. *J. Anim. Sci.* 90:4001-4013.
- Liu, Z., W. Powers., B. S. Oldick, J. A. Davidson, and D. Meyer. 2012. Air emissions from dairy cows fed typical diets of Midwest, South, and West U.S. *J. Environ. Qual.* 41(4):1228-1237.
- Hollman, M., W. Powers, A. Fogiel, J. Liesman, D. Beede. 2013. Response profiles of enteric methane emissions and lactational performance during habituation to dietary coconut oil in dairy cows. *J. Dairy Sci.* 96:1769-1781.
- Liu, Z., W. Powers, and H. Liu. 2013. Meta-analysis of greenhouse gas emissions from swine operations. *J. Anim. Sci.* 91:4017-4032.
- Wu-Haan, W., L. Guo, W. J. Powers, C. R. Angel, and T. J. Applegate. 2013. Effect of feeding a commercial laying hen diet containing distillers dried grains plus solubles on nutrient mass balance. *Appl. Engng. In Agric.* 29:423-429.
- Karcher, E. L., E. Wandschneider, and W. J. Powers. 2013. Emerging issues and sustainability in international agriculture: a study abroad program to Vietnam. *NACTA* 57:69 – 73.

- Liu, Z. and W. Powers. 2013. Greenhouse gases emissions from multi-species animal operations and potential diet effects. *Trans. of ASABE*. 57(1):219-227.
- Li, W., Q. Li, W. Powers, D. Karcher, C. R. Angel, and T. J. Applegate. 2014. Effects of distillers dried grains with solubles and mineral sources on gaseous emissions. *J. Appl. Poult. Res.* 23:41-50.
- Liu, Z., W. Powers, P. Murphy, and R. Maghirang. 2014. Ammonia and hydrogen sulfide emissions from swine production facilities in North America: a meta-analysis. *J. Anim. Sci.* 92:1656-1665.
- Liu, Z., W. Powers, and S. Mukhtar. 2014. A review of practices and technologies for odor control in swine production facilities. *Appl. Engng. in Agric.* 30(3):477-492.
- Newbold, J. R., S. M. van Zijderveld, R. B. A. Hulshof, W. B. Fokkink, R. A. Leng, P. Terencio, W. J. Powers and H. B. Perdok. 2014. The effect of incremental levels of dietary nitrate on methane emissions in Holstein steers and performance in Nelore bulls. *J. Anim. Sci.* 92:5032-5040.
- Chiavegato, M. B., N. Palumbo and W. Powers. 2015. Ammonia and greenhouse gas emissions from housed Holstein steers fed different levels of dietary crude protein. *J. Anim. Sci.* 93(1):395-404.
- Li, Q.-F, N. Trottier, W. Powers. 2015. Feeding reduced crude protein diets with crystalline amino acids supplementation reduce air gas emissions from housing. *J. Anim. Sci.* 93:721-730.
- Chiavegato, M. B., J. Rowntree, D. Carmichael, and W. Powers. 2015. Enteric methane from lactating beef cows. *J. Anim. Sci.* 93:1365-1375.
- Chiavegato, M. B., J. Rowntree, D. Carmichael, and W. Powers. 2015. Pasture derived greenhouse gas emissions in cow-calf production systems. *J. Anim. Sci.* 93:1350-1364.
- Chiavegato, M. B., J. Rowntree and W. Powers. 2015. Carbon flux assessment in cow-calf grazing system. *J. Anim. Sci.* 93:4189-4199.
- Liu, Z., J. Harmon and W. Powers. 2016. Estimating ventilation rates of animal houses through CO<sub>2</sub> balance. *Trans. ASABE*. 59(1): 321-328.
- Powers, W. and M. Capelari. 2016. Analytical methods for quantifying greenhouse gas flux in animal production systems. 94(8):3139-3146.
- Li, Q. F., W. Powers, D. Rozeboom, Y. Liu, and W. Liao. 2016. Mitigate air emissions from animal feeding operations and recover nutrients using an integrated water curtain-microalgal culture system. *Algal Research*, 18: 166-174.
- Powers, W. and M. Capelari. 2017. Measurement and mitigation of reactive nitrogen species from swine and poultry production. *J. Anim. Sci.* 95(5) 2236–2240, <https://doi.org/10.2527/jas.2016.1187>.
- Powers, W., N. Crockett, and G. Lardy. 2017. Getting the most out of your extension appointment and still having a life. *J. Anim. Sci.* 95(4):1827-1835.
- Li, Q., Liu, Y., Liao, W., Powers, W. 2017. Microalgal cultivation using animal production exhaust air: technical and economic feasibility. *CLEAN - Soil, Air, Water* 45(4) 1500309.
- Capelari, M., & Powers, W. (2017). The effect of nitrate and monensin on in vitro ruminal fermentation. *J. Anim. Sci.* 95(11)5112-5123.
- Capelari, M., K. A. Johnson, B. Latack, J. Roth, and W. Powers. 2018. The effect of encapsulated nitrate and monensin on ruminal fermentation using a semi-continuous culture system. *J. Anim. Sci.* 96(8): 3446–3459.

c. Manuscripts in Press

- Capelari, M., B. Latack, J. Roth, and W. Powers. 2018. Nitrate and monensin effect on enteric methane emissions from growing steers. *J. Anim. Sci.* (revision submitted 19Jun2018; second revision not yet submitted).

d. Research Abstracts

- Powers, W.J., H.H. Van Horn, and R.A. Nordstedt. 1993. Separation of manure solids and nitrogen from simulated flushed manures by screening or sedimentation. *J. Dairy Sci.* 76(Suppl 1):256.
- Powers, W.J., H.H. Van Horn, and B.Harris, Jr. 1993. Effects of variable sources of distillers dried grains plus solubles on milk yield and composition. *J. Dairy Sci.* 76(Suppl. 1):308.
- Powers, W.J., A.C. Wilkie, H.H. Van Horn and R.A. Nordstedt. 1995. Effect of anaerobic digestion on odorous compounds in liquid dairy manures. *J. Anim. Sci.* 73(Suppl 1):248.
- Powers, W.J., A.C. Wilkie, H.H. Van Horn and R.A. Nordstedt. 1995. Development of techniques to evaluate commercial additives for the reduction of odors from liquid dairy manure. *J. Anim. Sci.* 73 (Suppl 1):248.
- Powers, W.J., A.C. Wilkie, H.H. Van Horn and R.A. Nordstedt. 1996. Performance characteristics of anaerobic digesters fed liquid dairy manures. *J. Anim. Sci.* 74(Suppl 1):126.
- Powers, W.J., H.H. Van Horn, A.C. Wilkie and R.A. Nordstedt. 1996. Chemical and panel evaluation of odors from dairy manure treated with commercial additives and anaerobic digestion. *J. Anim. Sci.* 74(Suppl 1):126.
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- Powers, W.J. and M.A. Faust. 1998. Effects of dietary bloodmeal on manure odor from weaned pigs. *J. Anim. Sci.*, Vol 76(Suppl 1):173.
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- Powers, W.J., D.S. Bundy, T. van Kempen, A. Sutton and S.J. Hoff 1999. Objective measurement of odors using gas chromatography/mass spectrometry and electronic nose technologies. Accepted for presentation at the Second International Conference on Air Pollution from Agricultural Operation 2000.
- Gralapp, A.K. and W.J. Powers. 2000. Impact of dietary distillers dried grains with solubles on performance, manure characteristics, and odorous emissions of finishing pigs. *J. Anim. Sci.*, Vol 78(Suppl 1):37.
- Gralapp, A.K., W.J. Powers, and D.S. Bundy. 2000. Comparison of olfactometry, gas chromatography, and electronic nose technology for measurement of indoor air quality. Presented at the 2000 ASAE Annual International Meeting July 9-12, Milwaukee, WI, Paper No. 004045. ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659 USA.
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- Bicudo, J.R., D.R. Schmidt, C.L. Tengman, W. Powers, L.D. Jacobson, and C.J. Clanton. 2001. Odor and gaseous emissions from a naturally crusted swine manure storage. Presented at the 2001 ASAE Annual International Meeting July 29 – Aug 1, Sacramento, CA, Paper No. 014092. ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659 USA.
- Van Kempem, T.A.T.G., W.J. Powers, and A. Sutton. 2002. Infrared spectroscopy as an optical nose for predicting odor sensation. *J. Anim. Sci.* 80(Suppl 1):203.
- Hill, B.E., D.C. Kendall, S.L. Hankins, S.A. Trapp, B.T. Richert, D.T. Kelly, A.L. Sutton, G.L. Allee, T.A. van Kempem, and W.J. Powers. 2002. Effects of dietary crude protein reduction on pig performance, manure composition, aerial ammonia, hydrogen sulfide, and odor levels in swine buildings. *J. Anim. Sci.* 80(Suppl 1):201.
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- Powers, W. 2010. Diet Impacts on Air Quality Measures. Eastern Nutrition Conference, Guelph, Ontario, May 12.
- Powers, W. 2010. Feeding to meet current and pending air quality challenges". Penn State Dairy Workshop, Harrisburg, PA, November 11.
- Powers, W. 2011. Managing Air Quality on the Dairy with the National Air Quality Site Assessment Tool (NAQSAT). Western Dairy Management Conference. Reno, NV. March 9-12, 2011.
- Powers, W. 2011. Managing Air Quality on the Dairy with the National Air Quality Site Assessment Tool (NAQSAT). Western Dairy Air Quality Conference. Sacramento, CA. April 20-21, 2011.
- Liu, Z. and W. Powers, and J. Harmon. 2011. CO<sub>2</sub> Balance and Estimation of Ventilation Rates in Animal Studies. ASABE Paper No. 1110880. ASAE Annual International Meeting, Louisville, KY, Aug 7 – 10. St. Joseph, Mich.: ASABE.
- Liu, Z. and W. Powers. 2011. Meta-analysis of greenhouse gas emissions from swine operations. ASABE Paper No. 1111369. ASAE Annual International Meeting, Louisville, KY, Aug 7 – 10. St. Joseph, Mich.: ASABE.

- Vaddella, V., H. Liu, and W. Powers. 2012. Influence of Three Tannin Extracts Treatments on Air Emissions from Stored Steer Manure. Paper number 121338327. ASAE Annual International Meeting, Dallas, Texas, July 29 - August 1, 2012.
- Liu, Z. and W. Powers. 2012. Meta-Analysis of Greenhouse Gas Emissions from Swine Manure Land Application. Paper number 121338478. ASAE Annual International Meeting, Dallas, Texas, July 29 - August 1, 2012.
- Liu, Z. and W. Powers. 2013. Emissions of NH<sub>3</sub>, H<sub>2</sub>S, VOC, PM<sub>10</sub> and PM<sub>2.5</sub> from swine production facilities in North America: a meta-analysis. Paper number 131594405, ASAE Annual International Meeting, Kansas City, Missouri, July 21 - July 24, 2013. St. Joseph, Mich.: ASABE.
- Li, Q.-F., Y. Liu, W. Liao, W. Powers. 2014. Microalgae cultivation from animal production exhaust air: mitigate air emissions and recovery nutrients. Paper number 141904843. ASAE Annual International Meeting, Montreal, Quebec Canada July 13 to July 16, 2014. St. Joseph, Mich.: ASABE.
- Li, Q.-F., D. Rozeboom, Y. Liu, W. Liao, W. Powers. 2015. Microalgae cultivation from animal production exhaust air: mitigate air emissions and recovery nutrients. Paper number 152189103. ASAE Annual International Meeting, Montreal, New Orleans, LA. July 26-29, 2015.
- Powers, W., M. Eve and A. Leytem. 2015. What are the best tools developed to predict GHG? Dairy environmental systems and climate change conference and tour, Ithaca, NY. July 29-31.
- Powers, W. J. 2015, June. Managing odor on the dairy farm. 5th Forage Conference, US Grains Council, Tai'an, China. June 24-25.
- Powers, W. J. 2015, June. Nutritional Strategies to Minimize Nutrient Excretions. 5th Forage Conference, US Grains Council, Tai'an, China. June 24-25.
- Powers, W. J. 2015, June. Making the Most Out of Manure Nutrients. 5th Forage Conference, US Grains Council, Tai'an, China. June 24-25.

f. Thesis/Dissertations

- Powers, W. J. 1993. Effects of variable sources of distillers dried grains plus solubles on milk yield, composition and manure characteristics of lactating dairy cows. M.S. Thesis. University of Florida, Gainesville, FL.
- Powers, W. J. 1997. Effects of anaerobic digestion and commercial additives on dairy manure wastewater odors and odorants. Ph. D. Dissertation. University of Florida, Gainesville, FL.

## 2. Graduate, Undergraduate, and Post-doctoral Research Involvement

a. Completed Students (as Major Advisor)

- Amanda (Gralapp) Sill (M.S. earned 1999)
- Maareen (Custodio) Kineman (M.S. earned 2001)
- Kelli (Borman) (M.S. earned 2004)
- Diane Panetta (M.S. earned 2004)
- Sarah Lowry (M.S. earned 2004)
- Wei (Wu) Wu-Haan (M.S. earned 2006)
- Wenting Li (Ph. D. earned 2011)
- Marilia Barbosa Chiavegato (Ph. D. earned 2014)

- Brooke Latack (M.S. earned Dec 2016)
- Matheus Capelari (Ph.D. earned January 2018)

1. Undergraduate Research Involvement (as Primary Mentor)

- Jennifer Rediske
- Sarah Bastyr (1 research publication as first author)
- Laura Flatow (1 research publication as first author)
- Eric Fritz (1 research publication co-authored)
- Natalie Palumbo (1 research publication co-authored)
- Brooke Latack

2. Post-Doctoral and Visiting Scientist Research Involvement

- Zifei Liu, July 2009 – June 2012 (assistant professor at Kansas State at present)
- Venkata Vadella, January 2010 – July 2012 (research scientist at Agricultural Research Service, Florence, SC at present)
- Hauwei Liu, October 2011 – April 2012 (research scientist at Chinese Agricultural Sciences at present)
- Li Guo, July – December 2012 (associate professor at China Agricultural University at present)
- Qian-Feng Li, July 2102 – August 2015; Researcher at Argonne National Laboratory 29 Feb 2016

3. **Grant Activities (including those with Extension component; most recent listed first)**

- Powers-Schilling, W. J. 2015. Improvements to NAQSAT. National Pork Board. \$45,050. September 1, 2016 - August 31, 2017.
- Powers-Schilling, W. J., D. Rozeboom, D., and B. C. Latack. 2015. Development of a producer decision aide tool for managing swine manure. National Pork Board. \$91,477. April 1, 2016 - March 31, 2017.
- Powers, W. 2015. Review of Site Selection GAAMP effectiveness. Michigan Pork Producers Association. \$10,000. Jan 1, 2016 – Dec 31, 2016.
- Powers-Schilling, W. J., G. A. May, and J. A. Andresen. 2015. Improving Michigan's Ability to Site Livestock Facilities. MSU-Michigan Alliance for Animal Agriculture. \$50,000. Project Period: January 1, 2016 - December 31, 2016.
- Powers, W. J. 2015. Matching funds to support NAQSAT training grant awarded by NRCS. MSU-Michigan Alliance for Animal Agriculture. \$25,000. Sept 1, 2015 – Dec 31, 2016.
- Bailey, N., J. May, S. Archibeque, and W. Powers. 2015. NAQSAT training grant. \$75,000 awarded to Florida A&M University. Sept 1 – 2015 – Aug 31, 2016.
- Meyer, D., B. Auvermann, J. Classen, E. Cortus, R. DeOtte, J. Ogejo, E. Kick, J. Koziel, W. Powers, M. Rhoades, A. Schmidt, and J. Zhu. 2015. Integrated Use of System-Dynamics Tools, Standardized Data-Sharing Mechanisms, and Professional-Development Strategies to Build a Research N. USDA-AFRI Global Food Security: Agricultural Production Systems Program, \$5,000,000. Not funded (ranked high priority).
- Powers, W. 2014. Clinical Study (GCP): Effect of LY488756 (provided as LSN591281) on Environmental Emissions when fed to Beef Cattle for the Last 14 Days of Finishing. 1/1/2014 – 12/31/2017. \$816,088.

- Powers, W. 2013. Post Approval Study: Effect of Ractopamine Hydrochloride on Environmental Emissions from Finishing Swine when Fed an Equal Protein Diet for 35 Days 10/1/2013 – 9/30/2014. \$39,551.40.
- Powers, W. 2013. NSRA: MSU-AAQRF Test System Evaluation using Beef Cattle by Measuring Baseline Environmental Emissions when fed a Finishing Ration for the Last 14 Days of Finishing. Elanco Animal Health. 9/20/2013; \$157,188.
- Trottier, N. and W. Powers. 2013. Impact of dietary protein reduction and amino acid balance on the efficiency of nitrogen utilization and heat production in lactating sows exposed to thermal stress. USDA NIFA. 7/1/2013-6/30/2016, \$498,921.
- Trottier, N., W. Powers and C. Wolf. 2013. Improving milk production efficiency and mitigating feed costs in lactating sows through dietary crude protein abatement and crystalline amino acid supplementation under thermo neutral and thermal stress environment model. National Pork Board. 5/1/13 – 4/30/15. \$126,930.
- Q-F. Li and W. Powers. 2013. Towards Sustainable Animal Agriculture: an Integrated Wet Scrubber and Algal Cultivation System for Air Emission Mitigation and Value-Added Products. USDA NIFA Fellowship. 9/1/13 – 8/31/16. \$150,000.
- Karcher, D. and Powers, W. 2013. Proprietary work. Dow Chemical. \$47,500
- Powers, W. 2013. NSRA: MSU-AAQRF Test System Evaluation using Beef Cattle Heifers by Measuring Baseline Environmental Emissions when fed a Finishing Ration for the Last 14 Days of Finishing. Elanco Animal Health. 8/16/2013 – 8/15/2014; \$52,863
- Powers, W. 2013. Pilot Efficacy Study: Effect of LY529547 on Environmental Emissions from Broiler Chickens for 14 Days. Elanco Animal Health. 4/12/2013 – 4/11/2014; \$53,859
- Powers, W. 2012. Effect of LY488756 (provided as LSN591281) on Environmental Emissions and Selected Biomarkers When Fed to Finishing Beef Steers for 42 Days. Elanco Animal Health. 2/15/2012 – 2/14/2013; \$70,402.
- Powers, W. 2012. Feeding amino acids to reduce air emissions and the carbon footprint of swine production. National Pork Board. 10/1/12 – 9/30/13. \$61,610.
- Liu, Z. and W. Powers. 2012. Meta-Analysis of Hydrogen Sulfide, Particulate and Ammonia Emissions from Swine Operations. National Pork Board. 5/1/12 – 4/30/13. \$35,565.
- Rowntree, J., Barbosa-Chiavegato, M., W. Powers, and K. Steinke. 2012. Quantifying a carbon footprint for pasture-based animal production. MSU Animal Agriculture Initiative. 7/1/12 – 6/30/13 \$54,697.
- Powers, W. 2011. Feeding amino acids to reduce air emissions and the Carbon footprint of swine production. MSU Animal Agriculture Initiative. 7/1/12 – 6/30-13 \$62,470.
- Powers, W., M. Barbosa-Chiavegato, N. Palumbo, J. Rowntree, and K. Steinke. 2011. Mitigating steer diets to reduce nitrous oxide emissions in confined and pasture systems. MSU Animal Agriculture Initiative. 7/1/11 – 6/30-12 \$57,998.
- Powers, W. 2012. Proprietary work. Elanco Animal Health. \$80,190.
- Powers, W. 2011. Proprietary work. Elanco Animal Health. \$70, 402.
- Liu, Z. and W. Powers. 2010. Meta-Analysis of Greenhouse Gas Emissions from Swine Operations. National Pork Board. 10/1/10 – 4/30/11. \$29,555.
- Powers, W. 2010. Provimi. Silver Bullet Experiment. 6/1/10 – 6/1/11. \$78,619.
- Powers, W. 2010. Planning Grant: A Regional Approach to Climate Change Planning for Dairy and Beef Production Systems. USDA NIFA Climate Change Program. \$50,000. 9/1/10 – 8/31/11.

- Karcher, D., J. Siegford, G. Tonsor, C. Wolf, and W. Powers. 2010. Sustainability and Laying Hen Well-Being in Alternative Housing Systems. USDA NIFA Foundation Program. \$699,487. 6/1/11 – 5/31/14.
- Powers, May, Grobbel, Cullens. 2009. Development of an ASABE Standard for Air Emissions from Livestock Operations. Kirkpatrick Endowment. \$9,000 7/1/09 – 6/30/10.
- Rozeboom, D., W. Powers and A. Fogiel. Comparison of efficacy, emissions, compost characteristics, and costs of in-vessel rotating drum and open static pile composting of swine carcasses, whole and ground. National Pork Board. \$35,512. 5/1/09 – 4/30/10.
- Rust, S. and W. Powers. Effects of Feeding Distiller's Grains on Hydrogen Sulfide Emissions. Corn Marketing Board of Michigan. \$79,045. 6/1/09 – 5/31/10.
- Powers, W.J. and G. Hill. Investigation of DDGS feeding effects on sulfur emissions from swine manure. Michigan State University Animal Ag Initiative. \$51,862. 7/1/09 – 6/30/10.
- Powers, W.J. C.R. Angel, and T.A. Applegate. Development of a matrix tool for livestock emissions mitigation. USDA-NRI Air Emissions Continuation. \$348,140. 7/1/08 – 6/30/013.
- Powers, W.J. C.R. Angel, and T.A. Applegate. Development of a matrix tool for livestock emissions mitigation. USDA-NRI Air Emissions. \$251,842. 7/1/08 – 6/30/09.
- Powers, W.J. 2007. Development of a National Air Quality Self-Assessment Tool (National AQSAT) for Livestock producers. USDA-NRCS Conservation Innovation Grant. 9/1/07 – 8/31/09, \$443,410.
- Animal Ag and the Environment AoE Team. Matching funds for Development of a National Air Quality Self-Assessment Tool (National AQSAT) for Livestock producers. Michigan Milk Producers Association. 9/1/07 – 8/31/09, \$20,000.
- Animal Ag and the Environment AoE Team. Matching funds for Development of a National Air Quality Self-Assessment Tool (National AQSAT) for Livestock producers. Michigan Pork Producers Association. 9/1/07 – 8/31/09, \$20,000.
- Animal Ag and the Environment AoE Team. Matching funds for Development of a National Air Quality Self-Assessment Tool (National AQSAT) for Livestock producers. MSUE. 9/1/07 – 8/31/09, \$10,000.
- Powers, W.J., G. May, D. Rozeboom, and N. Rector. 2007. Development of a Air Quality Self-Assessment Tool (AQSAT) for Livestock producers. National Pork Board. 9/1/07 – 8/31/08, \$37,534.
- Animal Ag and the Environment AoE Team. Communities and AFO's in coexistence: Conference on the risks and rewards of AFO's in the community and the Animal Ag Emerging Issues Handbook. Animal Ag Initiative, MSU. 7/1/07-6/30/08, \$25,000.
- Animal Ag and the Environment AoE Team. Communities and AFO's in coexistence: Conference on the risks and rewards of AFO's in the community and the Animal Ag Emerging Issues Handbook. Animal Ag Initiative, MSUE. 7/1/07-6/30/08, \$10,000.
- Beede, D. K., M. Hollmann, and W. J. Powers. 2007. Management tools to reduce methane and ammonia generation pre- and post-excretion from livestock farms. Grant awarded from MSU Animal Industry Coalition. (\$30,000).
- Russell, J., W. Powers, D. Morrical, J. Kovar, T. Isenhardt. Pasture management effects on nonpoint source pollution of Midwestern watershed. USDA National Integrated Water Quality Program 406. 10/1/06 – 9/30/10, \$598,461.
- Powers, W.J., B.J. Kerr, and K.J. Stalder. Oxygen consumption and energy digestibility of soybean meal and corn or corn co-product diets fed to grow-finish swine. 11/1/06 – 10/31/07, \$46,463.

- Powers, W.J., B.J. Kerr, and K.J. Stalder. Influence of corn co-products on air emissions and nutrient excretions from grow-finish swine. National Pork Board. 7/05 – 6/06, \$40,000.
- Powers, W., T. Applegate, R. Angel. Dietary effects on laying hen emissions. Iowa Egg Council. 11/05 – 10/06, \$48,839 (\$29,078).
- Russell, J., W. Powers, J. Kovar, J. Lawrence, D. Strohbehn, D. Morrical. Use of grazing management to limit sediment and phosphorus pollution of pasture streams from stream bank erosion and manure deposition. Iowa Department of Natural Resources. \$337,439, 2/1/04 – 1/31/07.
- Powers, W.J. J.R. Russell, and T.A. Applegate. Source reduction and mitigations strategies for air emissions from turkeys, laying hens, and growing cattle. USDA NRICGP. 5/1/05 – 4/30/09. \$482,424 (\$291,173 ISU portion).
- Powers, W.J. Humates as a feed additive for controlling odor and gaseous emissions from swine. Merle's Humates for Livestock and IPRT. 1/1/05 – 6/30/05, \$28,055.
- Stalder, K. J., T. J. Baas, W. Powers and J. W. Mabry. Growth comparison of traditional inorganic trace mineral supplementation to response of bioplex™ trace mineral supplementation in swine funding source. Alltech, Inc. \$78,000. 9/1/03 – 8/31/05.
- Stalder, K., M. Hogberg, W. Powers, A. Rieck-Hinz. Development of a user-friendly database and decision tree for selecting air quality BMPs. National Pork Board. \$47, 711. 9/1/04 – 8/31/05.
- Sapp, S., K. Larson, W. Powers, K. J. Stalder, M. G. Hogberg, P. Lasley. Exploring Social Capital Relationships Among Producers and Local Communities. Iowa Pork Producers Association. \$35,791. 7/1/04 – 6/30/05.
- Powers, Angel, Kohn, Meyer. Modeling emissions from animal agriculture. USDA NRICGP. \$479,956, (\$412,000 ISU portion, 7/1/04 – 6/30/08).
- Powers, Applegate, Angel. Development of turkey excretion and retention models for nutrient management planning purposes. Iowa Turkey Federation. \$7300, 5/1/04 – 4/30/05.
- Powers, Applegate, Angel. Development of turkey excretion and retention models for nutrient management planning purposes. Midwest Poultry Consortium (via USDA), 5/1/04 – 4/30/05, \$21,796
- Russell, Powers, Kovar, Lawrence, Strohbehn, Morrical. Use of grazing management to limit sediment and phosphorus pollution of pasture streams from stream bank erosion and manure deposition. Iowa Department of Natural Resources. \$337,439, 2/1/04 – 1/31/07.
- Powers, W., W. Fehr. 2003. Impact of low-phytate soybean meal on the amount and forms of phosphorus excreted by swine. United Soybean Board. 7/1/04 – 6/30/05, \$50,800.
- Powers, Huff-Lonergan. 2003. Comparison of growth and carcass traits for pigs fed Bt (Bt11) and conventional corn. 12/1/03 – 12/1/04. \$33,534.
- Powers, W.J., J.C. Lorimor, H. Xin. 2003. Direct measurement of dietary and management strategy impacts on ammonia volatilization. Iowa Pork Producers Association, 4/30/03 – 10/31/04, \$25,500.
- Applegate, T., W. Powers. 2003. Development of mass balance models for estimation of nutrient excretions from broilers, turkeys, layers, and ducks. Midwest Poultry Consortium (via USDA), 5/1/03 – 4/30/04, \$19,867.
- Powers, W. 2003. Characterization of VOCs and particulates from swine finishing facilities and relationship of these compounds to human health. National Pork Board, 5/1/03 – 4/30/04, \$67,050.

- Powers, W.J., R. Koelsch, A. Sutton. A joint FASS and ASAE effort to review *ASAE Standard D384.1 Manure Production and Characteristics* standard. National Center for Manure and Animal Waste Management. \$100,000. 1/1/03 –1/30/04.
- Meyer, D., W. Powers, T. Cassell, E. Tooman. 2002. Technical Proposal #P2002-28 Establishment of testing protocols for manure treatments' air emission reduction effectiveness. California South Coast Air Quality Management District, \$47,163.38.
- Powers, W.J. 2002. Characterization of VOCs and particulates from swine finishing facilities and relationship of these compounds to human health. Iowa Pork Producers Association, \$75,911.
- Powers, W.J. Characterization of air in and around poultry and livestock facilities. 2002. Midwest Poultry Research Program, \$24,074
- Colletti, J.P., W. Powers, M. Bell, M. Honeyman. 2001. Shelterbelts and Livestock Odor Mitigation: A Socio-Economic Assessment of Pork Producers and Consumers. NRICGP \$350,000.
- Bundy, D.S., S.J. Hoff, W.J. Powers. 2001. Research support for environmental work plan for Premium Standard Farms. \$326,858.
- Schulte, R., J. R. Russell, W.J. Powers, J. Kovar, S. Mickelson. 2000. Upland Grazing Study, \$650K committed by IDNR, \$35K committed by the Leopold Center for Sustainable Agriculture; \$60K committed by the Iowa State Water Research Initiative
- Beede, D.K. and W.J. Powers. 2001. Investigation of Innovative Stratagems and Models to Reduce and to Predict Phosphorus (P) Excretion by Dairy Cattle. Six-state Animal Waste Consortium, \$175,000 (\$52000 ISU portion).
- Saylor, W., T. Simms, R. Angel, W. Powers. 2000. A holistic evaluation of phosphorus management practices for animal agriculture. Submitted to IFAFS, \$892, 000 funded. (\$144,782 ISU portion).
- Powers, W. 2000. Odor Solutions: Manure Covers. NPPC, \$35680
- W.J. Powers. 2000. Odor characterization from dairy, swine, and poultry facilities. Animal and Poultry Waste Management Center. (\$29,000 over 2 years).
- Richard, T.L., W.J. Powers, M. Burkhart. 2000. Methane from Manure: Biorenewable Energy Potential of the Iowa Livestock Industry. IDNR, \$41228.
- W.J. Powers. 1999. Protocol development for measurement of trace gases associated with odor. National Pork Producers Council, \$20,200.
- W.J. Powers. 1999. Evaluation of Electronic Nose Technology for Livestock Odor Assessment. IAHEES, \$10,000.
- Powers, W.J., D.S. Bundy, T. van Kempen, A. Sutton. Development of an objective approach to odor characterization while assessing diet as a tool to manage odor emission, \$160,000 (\$51,500 ISU total; \$27400, Year 1) Multi-state Animal Waste Consortium.
- Powers, W.J. and M.A. Faust. 1998. Dairy manure quantification and characterization in grazing systems. Leopold Center for sustainable Agriculture (\$35,666 Year 1, \$33,772 Year 2)
- Powers, W.J. and D.S. Bundy. 1997. Impact of dietary inclusion of distillers dried grains with solubles on performance and manure characteristics of finishing pigs. USDA -Biotechnology Byproducts Consortium, \$31,959.
- Powers, W.J. and D.S. Bundy. 1997. Evaluation of the impact of dried distillers grains with solubles on swine manure odor. National Pork Producers Council, \$24700.
- W.J. Powers. 1997. Influence of dietary incorporation of byproduct feedstuffs on nursery pig manure composition and odor. Animal and Poultry Waste Management Consortium, \$10,000.

## C. ACADEMIC EXCELLENCE IN ENGAGEMENT

Dr. Powers' knowledge, leadership, translational research program and effective communication with multiple stakeholder groups for the livestock industry has been instrumental in forming multidisciplinary teams that provide timely cutting-edge information to sustain the competitiveness of the livestock industry while reducing environmental impact.

### 1. Major Programs in Extension

- a. Nutrient Management: One of the biggest challenges faced by livestock producers is managing excreted nutrients to minimize environmental risk and comply with applicable regulations. Dr. Powers' Extension program focuses on taking research findings and communicating those findings to on-farm decision makers. Audiences include nutritionists who formulate livestock diets, farm managers and owners, and Extension staff and service providers. Topic areas include precision nutrition to reduce nutrient excretion and air emissions, odor control and air emission mitigation strategies for animal production facilities. More recent programming includes approaches to reduce greenhouse gas emissions. As part of her program, Dr. Powers has lead the development of decision tools that are available nationally for use by producers, consultants/advisors, and policymakers to help guide decision making for farm-specific situations. Example tools include the National Air Quality Site Assessment Tool ([www.naqsat.tamu.edu](http://www.naqsat.tamu.edu)) and the Air Management Practices Assessment Tool (v.1; [www.agronext.iastate.edu/ampat/](http://www.agronext.iastate.edu/ampat/)).
- b. Peer Education: Dr. Powers provides annual training to company nutritionists for two large nutrition companies. Training for one company includes feeding principles and training related to dairy, beef, and swine nutrition while training for the second company is for the swine nutritionists, only. Dr. Powers coordinates and teaches in twice annual training for Extension field staff and provides regular training for Michigan Department of Agriculture and Rural Development field staff that are involved in the Michigan Agriculture Environmental Assurance Program. In addition, Dr. Powers is often invited to provide training to staff in other states. Topics often include advanced nutrition principles for precision nutrition, regulation implications, air quality mitigations options on the farm.
- c. Informing Policy: Sound policy depends upon translation of research findings to policymakers. Dr. Powers' Extension program involves regular interaction with policymakers at state and national levels. She has lead and been a member of a number of committees that have directly influenced regulations (state of Iowa, state of Michigan) and policy recommendations (USDA Ag Air Quality Task Force member for 2 terms, US EPA Science Advisory Board member, state of Michigan MDARD GAAMP committees). Policymakers are a key audience for Dr. Powers' Extension efforts.

### 2. Extension Publications (not included in listings above)

- Powers, W. 1998. What Iowa's manure law means to the dairy industry. In: 1997 Dairy Research Report, DSL-1 16. Iowa State University, Ames.
- Powers, W. 1998. Odor management: principles and practices. In: 1997 Dairy Research Report, DSL-1 17. Iowa State University, Ames.
- Powers, W.J. and M.A. Faust. 1999. Influence of dietary incorporation of bloodmeal on nursery pig manure composition and odor. 1998 Swine Research Report, ASL-R1594. Iowa State University, Ames.



- Powers, W.J. and M.A. Faust. 1999. Dairy manure quantification and characterization in grazing systems. 1998 Dairy Research Report, DSL-153. Iowa State University, Ames.
- Gralapp, A.K., W.J. Powers, and D.S. Bundy. 2000. Comparison of Olfactometry, Gas Chromatography, and Electronic Nose Technology for Measurement of Indoor Air from Swine Facilities. In: 2000 Swine Research Report, ASL -683. Iowa State University, Ames.
- Gralapp, A.K., W.J. Powers, and D.S. Bundy. 2000. Effects of Feeding Distillers Dried Grains with Solubles to Finishing Swine on Animal Performance, Manure Characteristics, and Odorous Emissions. In: 2000 Swine Research Report, ASL -656. Iowa State University, Ames.
- W.J. Powers and L.A. Flatow. 2001. Flocculation of swine manure: influence of flocculant, rate of addition and diet. 2001 Iowa State University Swine Research Report ASL-1787A.
- W.J. Powers and S.B. Bastyr. 2001. Effects of manure storage time and filling scheme on odor and headspace analysis using simulated manure storage pits. 2001 Iowa State University Swine Research Report ASL-1787B.
- Powers, W. J., K.J. Bormann, and W. Miller. 2003. Developing whole-farm nutrient plans for feedlots. Iowa State University Extension PM 1931.
- Haan, M. M., J. R. Russell, W. Powers, S. Mickelson, S. I. Ahmed, J. Kovar, and R. Schultz. 2003. Effects of grazing management on pasture production and phosphorus content of forage (a progress report). Beef Research Report, Iowa State Univ., Ames.
- Haan, M. M., J. R. Russell, W. Powers, S. Mickelson, S. I. Ahmed, J. Kovar, and R. Schultz. 2003. Effects of grazing management on sediment and phosphorus losses in run-off (a progress report). Beef Research Report, Iowa State Univ., Ames.
- Haan, M. M., J. R. Russell, W. Powers, J. Boehm, S. Mickelson, R. Schultz, J. Kovar, and 2004. Impacts of Cattle Grazing Management on Sediment and Phosphorus Loads in Surface Waters. 2004 Iowa State University Animal Industry Report. ASL-R1921.
- Bormann, K.J., W.J. Powers, and J.R. Russell. 2004. Effects of Forage Maturity on Phosphorus Digestion in Beef Cows. 2004 Iowa State University Animal Industry Report. ASL-R1880.
- W.J. Powers. 2004 Revision of ASAE Standard D384.1: A New Approach to Estimating Manure Nutrients and Characteristics. 2004 Iowa State University Animal Industry Report. ASL-R1923.
- W.J. Powers and S. Bastyr. 2004. Downwind Air Quality Measurements From Poultry and Livestock Facilities. 2004 Iowa State University Animal Industry Report. ASL-R1927.
- Custodio, M., W.J. Powers, E. H-ff-Loneragan, M.A. Faust, J. Stein. 2004. Growth and Carcass Characteristics of Pigs Fed Bt and Non-Bt Corn and Harvested at US and European Market Weights. 2004 Iowa State University Animal Industry Report. ASL-R1953.
- Powers, W.J. 2004. Practices to Reduce Odor from Livestock Operations. Iowa State University Extension PM 1970a
- Powers, W.J. 2004. Practices to Reduce Odor from Livestock Operations Flowchart. Iowa State University Extension PM 1970b
- Powers, W.J. 2004. Practices to Reduce Ammonia Emissions from Livestock Operations. Iowa State University Extension PM 1971a
- Powers, W.J. 2004. Practices to Reduce Ammonia Emissions from Livestock Operations Flowchart. Iowa State University Extension PM 1971b
- Powers, W.J. 2004. Practices to Reduce Hydrogen Sulfide from Livestock Operations. Iowa State University Extension PM 1972a
- Powers, W.J. 2004. Practices to Reduce Hydrogen Sulfide from Livestock Operations Flowchart. Iowa State University Extension PM 1972b

- Powers, W.J. and J.C. Lorimor. 2004. Practices to Reduce Dust and Particulates from Livestock Operations. Iowa State University Extension PM 1973a
- Powers, W.J. 2004. Practices to Reduce Dust and Particulates from Livestock Operations Flowchart. Iowa State University Extension PM 1973b
- Powers, W.J. 2004. The science of smell, part 1: odor perception and physiological response. Iowa State University Extension PM 1963a
- Powers, W.J. 2004. The science of smell, part 2: odor chemistry. Iowa State University Extension PM 1963b
- Powers, W.J. 2004. The science of smell, part 3: odor detection and measurement. Iowa State University Extension PM 1963c
- Powers, W.J. 2004. The science of smell, part 4: principles of odor control. Iowa State University Extension PM 1963d
- Panetta, D.M., W.J. Powers and J.C. Lorimor. 2005. Management strategy impacts on ammonia volatilization from swine manure. Iowa State University Animal Industry Report, ASL-R2014.
- Panetta, D.M., W.J. Powers, H. Xin and B. Kerr. 2005. Dietary strategies to reduce ammonia emissions from swine. Iowa State University Animal Industry Report, ASL-R2015.
- Powers, W.J., D. Loy, A. Trenkle and R. Martin. 2006. Distillers grains in feedlot diets: impact on phosphorus excretion (IBC-29) (electronic access only: <http://www.extension.iastate.edu/Publications/IBC29.pdf>)
- Powers, W.J. 2007. Impacts on Michigan communities of air emissions from livestock and poultry farms. MSUE Animal Agriculture and the Environment series.
- Russell, J., Bisinger, J., & Powers-Schilling, W. J. 2015. Grazing system effects on enteric methane emissions from cows in southern Iowa pastures. Iowa State University 2016 Animal Industry Report.

## D. ACADEMIC SERVICE

### 1. Selected Committees and Other Service

- American Dairy Science Association (ADSA) representative for FASS *Environment, Waste Management, and Ecosystems* committee (1999-2007)
- ADSA Advisory Council representative for the *Eighth International Symposium on Animal, Agricultural and Food Processing Wastes* (October 7-11, 2000)
- Program committee for a National Symposium on “Addressing Animal Production/Waste Management Issues”
- Iowa State University College of Agriculture CAFO response team; Chair Chapter 7 response
- Iowa State University College of Agriculture/ University of Iowa Dept. of Public Health/ State of Iowa Air Quality Task Force
- State of Iowa Nutrient Management Task Force
- EPA Safe Harbor Monitoring Plan Committee
- FASS DISCOVER Conference Chair (2006-2007)
- USDA Agricultural Air Quality Task Force (2006 – 2008; 2008-2010)
- Michigan Agriculture Environmental Assurance Program, co-chair (2007 - 2010)
- Michigan Generally Accepted Site Selection and Odor Management Practices, Chair (2007 - )
- Michigan Generally Accepted Manure Management Practices, Chair (2007 -2010); member (2007 – present)
- MSUE Animal Agriculture and the Environment Area of Expertise Team, co-chair (2006 – 2008)

- Guest lecturer for classes in Animal Science (1998 – 2012)
- MSU College Promotion & Tenure Committee (2007 – 2010)
- MSU Animal Science Departmental Advisory Committee (2007 – 2010)
- US EPA Scientific Advisory Board (2011 – present)
- World Wildlife Fund Blue Ribbon Panelist, Sustainable Food Production for the 21st Century Project (2014-2015)
- Study Abroad Course co-instructor (2013, 2015) – course to Vietnam that includes undergraduates and Extension staff.
- MSU Strategic Partnership Grant program sub-committee co-chair (2015-2018)
- ASAS Policy Committee (2015-2018)

## **2. Select Reviewer Activities (grants, publications, programs)**

- Journal of Environmental Quality section editor (2007 – 2010)
- Journal of Animal Science peer reviewer (1999-2015)
- Applied Engineering in Agriculture peer reviewer (2000 - 2014)
- Journal of Dairy Science peer reviewer (2001 – 2013)
- Journal of Environmental Quality peer reviewer (2001 - 20013)
- Transactions of ASAE peer reviewer (2001 - 2015)
- USDA SBIR Program – ad hoc reviewer(2000, 2001), panel member (2002, 2004, 2006)
- USDA NRICGP Nutrient Growth and Utilization ad hoc reviewer (2001, 2004)
- USDA Section 406 CGP panel member (2002)
- USDA NRICGP Managed Ecosystems panel member (2004)
- EPA SBIR Program – panel member (2005)
- North Central Region of Sustainable Agriculture Research and Education (SARE) external grant reviewer (1998)
- External Reviewer for Chesapeake Bay Foundation (1999)
- University of Maryland College of Agriculture Non-Point Source funding program reviewer (2000)
- International Symposium on Animal, Agricultural, and Food Processing Wastes 2000 Conference paper reviewer (2000)
- ARS Byproduct Utilization program reviewer (2005)
- National Academy of Science Committee on Air Emissions from Animal Feed Operations, commissioned to the Board on Agriculture and Natural Resources by EPA (2002, nominated for committee, served as an interim report reviewer)
- University of Georgia College of Agriculture CSREES review team member, environmental programs (2007)
- ARS Program Review panel manager. Program 206 Manure and Byproduct Utilization (2008)
- Purdue University Department of Animal Science Program Review (2013)
- National Pork Board grant reviewer (2001, 2003, 2006, 2007, 2009, 2012, 2013)
- Ontario Pork Producers grant reviewer (2014)