AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, LEXINGTON, KY, 40546

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UNIVERSITY OF KENTUCKY
College of Agriculture, Food and Environment

The Kentucky Agricultural Experiment Station

126th

Annual Report
2013

UKAg RESEARCH **University of Kentucky • Lexington, Kentucky 40546**

To His Excellency
The Honorable Steven L. Beshear
Governor of Kentucky

I herewith submit the one hundred and twenty-sixth annual report of the Kentucky Agricultural Experiment Station for the period ending December 31, 2013. This is done in accordance with an act of Congress, approved March 2, 1887, titled "An act to establish Agricultural Experiment Stations, in connection with the Agricultural Colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," and also the act of the Kentucky State Legislature, approved February 20, 1888, accepting the provisions of the act of Congress.

Very respectfully,

Nancy M. Cox

Nancy M. Cox
Dean, College of Agriculture, Food and Environment
Director, Agricultural Experiment Station
Lexington, Kentucky
June 30, 2014

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Purpose of the Kentucky Agricultural Experiment Station

The University of Kentucky, the state's flagship land-grant institution, is responsible for serving the people of the Commonwealth of Kentucky. The College of Agriculture, Food and Environment, with its research, teaching, and Extension activities, has developed a structure and organization to provide the mandated land-grant services in agriculture and related areas.

As the research arm of the College of Agriculture, Food and Environment, the Kentucky Agricultural Experiment Station has been providing research results to farmers and rural residents for more than 130 years. The continued progress of Kentucky agriculture attests to the benefits of applying new knowledge and technology. College researchers also have successfully addressed problems of agribusiness, consumers, international trade, food processing, nutrition, community development, soil and water resources, bioenergy, and the environment.

Experiment station research spans both basic and applied sciences. The ability of Kentucky producers to be competitive in domestic and world markets requires an expanded base of knowledge in emerging areas of research applicable to agriculture, food, and natural resources. This annual report lists experiment station research projects and publications completed during 2013. The research programs of the Kentucky Agricultural Experiment Station have benefited Kentucky's agriculture over the past century, and the results of present and future research will continue to serve Kentucky's primary industry.

Statewide Research

In 2013, research activities of the Kentucky Agricultural Experiment Station were conducted at Lexington, Princeton, Quicksand, and Owenton and in counties throughout the state. Efforts are constantly made to ensure that the research studies have application to the problems of all Kentucky farmers and other clientele groups. Locations of the experimental facilities provide conditions representative of most sections of the state.

Map Position 1

- **Campus**—Laboratories and specialized equipment for all research program areas
- **Coldstream**–**Maine Chance**–**Spindletop Farms**—Dairy cattle, poultry, and horses; forages and grain crops, tobacco, and turf
- **Horticulture Research Farm**—Fruits, vegetables, and ornamentals, including organic production
- **UK Animal Research Center** (Woodford County)—Purchased in late 1991 as a location for development of state-of-the-art food animal (beef cattle, sheep, and swine) research programs

Map Position 2

- The **Research and Education Center** facilities and the **West Kentucky Substation Farm** (Caldwell County) are devoted to research on grain crops, beef cattle, fruits, ornamentals and vegetables, forages, and tobacco.

Map Position 3

- At Quicksand (Breathitt County), the **Robinson Center for Appalachian Resource Sustainability** is the location of research on fruits and vegetables, ornamentals, forages, grain crops, tobacco, and wood utilization. Quicksand is also the headquarters of **Robinson Forest,** which spreads over parts of Breathitt, Perry, and Knott counties and is the site of forestry and watershed management research.

Map Position 4

- At the **Eden Shale Farm,** located in Owen County near Owenton, experimental and demonstration studies are conducted on forage crops, tobacco, fruits and vegetables, and beef management.

Kentucky Tobacco Research and Development Center

The mission of the Kentucky Tobacco Research and Development Center (KTRDC) is to utilize plant-based technology to benefit Kentucky agriculture. The focus is on the use of science, including molecular biology, genomics, plant genetic engineering, plant breeding/field research, and other advanced technologies to improve agriculture. Research focuses on applied research in support of Kentucky tobacco production, including the enhancement of tobacco and other *Nicotiana* species as production systems for plant-based products (including pharmaceuticals and industrial materials) and the discovery of new plant natural products having potential for commercialization. Facilities include research laboratories, greenhouses, and contained growth facilities for plant disease and genetic engineering research. The goal is to utilize these resources to preserve and strengthen agriculture in Kentucky and, in particular, tobacco agriculture.

Research Program

KTRDC research is helping to prepare Kentucky farmers for the new regulatory environment that is emerging as a result of FDA regulation of tobacco products. Major changes are occurring in the tobacco industry due to the evolving regulation. KTRDC research highlights technologies being developed and utilized at the University of Kentucky that have the potential to significantly impact the way tobacco will be grown in the future. We have upgraded our analytical capability and transitioned other tobacco research groups into the KTRDC building, creating an environment where new ideas and collaborations are being developed and supported. Pilot research projects have transitioned into much bigger efforts as KTRDC leverages research support into externally funded projects. The uncertainty of how federal regulation will impact Kentucky tobacco producers underscores the critical need for sound science as we continue to adapt our programs to support current tobacco research needs. In addition, KTRDC continues to explore industrial applications for plant-based production of materials from tobacco and other plants.

Several KTRDC projects focus on tobacco-specific nitrosamines (TSNAs). As one of the 93 compounds identified by the FDA as harmful or potentially harmful compounds (HPHCs) in tobacco products or tobacco smoke, the TSNA N-nitrosonornicotine (NNN) will likely be an initial target for regulation. The LC screening process (used to develop low converter lines) was established at the University of Kentucky to screen Foundation seed and eliminate high converter plants, which lowers the NNN content in subsequent generations and in the cured leaf. KTRDC continues to provide the analytical and field support for the development of LC Foundation seed, which ultimately impacts all burley tobacco producers in the United States and throughout much of the world. Additional research compares tobacco lines with reduced TSNAs developed using various technologies, including genetic modification using biotechnology and newly developed mutant lines that are moving toward commercial production.

Advanced technology is also being utilized for more traditional tobacco research topics with several projects aimed at combating tobacco diseases including blue mold, black shank, tomato spotted wilt, frog-eye, and target spot. Some of these efforts have moved from proof of concept to field evaluation and testing. The FT early flowering trait and creation of molecular markers provide additional tools to improve and accelerate the development of tobacco germplasm. Elite tobacco varieties with improved traits for Kentucky tobacco producers will be the direct result of this research. The use of these and other technologies will play an increasingly important role in tobacco research as the industry adapts to FDA regulations.

Many of the KTRDC tobacco research projects rely on analytical capability; with the anticipated FDA regulation, the ability to conduct detailed chemical analysis of HPHCs will be required. The KTRDC tobacco laboratory provides support to University of Kentucky tobacco Extension, breeding, and research personnel and will support new initiatives related to the KTRDC Reference Cigarette program. The lab also provides support for forage research at the University of Kentucky. KTRDC has responded to a need for upgraded equipment by adding a UPLC triple quadrupole MS, a GC triple quadrupole MS, and a linear smoking machine in a controlled environment room. The goal is to develop a state of the art academic laboratory for conducting research and to participate in studies on method development for analyzing tobacco products. We work collaboratively with other academic institutions, the commercial tobacco industry, private research institutes, and other tobacco research groups in these efforts. In 2013, a total of 16,029 tobacco analyses and 7,279 forage and seed analyses were conducted. Most tobacco samples had several different constituent determinations. Because validated methods are not available for many of the HPHCs, research in the area of method development is a priority as tobacco regulations are being established.

The Tobacco Summit special grants program, which is directed toward the science of tobacco regulation and the impact this regulation will have on Kentucky tobacco producers, is in its third year. The program emphasizes collaboration among basic research and applied tobacco researchers, who are more familiar with current tobacco research needs. Funding decisions include input from both University of Kentucky scientific reviewers and representatives from the Kentucky Tobacco Research Board (KTRB). Several of the projects funded for this year relate to TSNAs and tobacco analysis. The following list of funded projects provides an indication of some of our new research being initiated. Research results from the 2012–2013 projects are included in

this report; results from the newly funded projects will be included in the 2013–2014 annual report.

Tobacco Summit Projects

- Advancing the development of a non-GM tobacco plant with endogenous resistance to frog eye, target spot, and blue mold
- Alkaloid and TSNA stereo-isomers in TN 90 low converter, high converter, demethylase mutants, and transgenics
- Determination of enantiomers of TSNAs in altered alkaloid tobacco lines
- Determination of optimal storage conditions of reference cigarettes
- Develop a greenhouse screening for resistance to fusarium wilt in tobacco
- Development of tobacco varieties with novel chemical characteristics
- Effect of ethephon application on quality and TSNAs in dark fire-cured tobacco
- Evaluation of the efficacy of hp400 in reducing TSNAs
- On farm production of a purified nicotine concentrate from green tobacco
- Seed production of specialty tobacco lines for reference cigarettes
- The effects of pre-harvest quercetin application on the production of tobacco-specific nitrosamines

Highlights

- Supported 29 research projects/programs in addition to Tobacco Summit grants. Progress reports can be found in the KTRDC Annual Report for 2012-2013.
- Continued to explore new opportunities for tobacco as a production system for industrial and pharmaceutical materials. For example, the FOLIUM project is a joint project with the Lawrence Berkeley National Laboratory; The University of California, Berkeley; the Joint Genome Institute; and KTRDC. The project is progressing and was highlighted at the 2014 ARPA-e Energy Summit in Washington, D.C.
- Renovated and upgraded six laboratories as part of a major transition of tobacco breeding and research capability into the KTRDC building. The Kentucky-Tennessee Tobacco Improvement Initiative (KTTII) has moved their research equipment and personnel into KTRDC, and the tobacco analytical lab equipment has been upgraded to allow for constituent analysis and method development. The lab will provide support to University of Kentucky tobacco Extension, breeding, and research personnel and will support new initiatives related to the Reference Cigarette program. In addition, the analytical lab provides support for the Regional Variety Testing program.
- Submitted a grant to the FDA related to the KTRDC Reference Cigarette program and the analytical laboratory. If awarded, the grant would greatly enhance the tobacco laboratory and establish KTRDC as a center of excellence in tobacco product analysis. The University of Kentucky has provided reference tobacco products for 45 years as a service to the tobacco research industry, both in the United States and globally, with shipments to 40 countries in the past five years. Through this grant, KTRDC would participate in the development and distribution of new reference tobacco products in conjunction with the FDA. In addition, coordination of research and training of new tobacco researchers would be included in the project.
- Continued efforts to establish Kentucky reference tobacco products as the standard for FDA regulation. Kentucky reference tobacco products have been the foundation of tobacco product scientific research, and our goal is to play a significant role in the science of FDA regulation and future tobacco research. There will be numerous opportunities available if we are established as the provider of reference tobacco products and can initiate the center of excellence as a focal point for research related to the evaluation, analysis, and regulation of tobacco products.
- Conducted four USDA-regulated field tests of transgenic tobacco as part of the field research program.

Regulatory Services

The Division of Regulatory Services is committed to consumer protection and service to Kentucky citizens, businesses, and industries. Our regulatory programs monitor and analyze feed, fertilizer, milk, and seed products, and our milk, seed, and soil service programs are administered using a cooperative, science-based approach.

The division administers four state laws pertaining to ingredients, manufacturing, processing, labeling, and marketing of feed, fertilizer, seed, and raw milk. Our primary objectives are to protect consumers of these products from poor-quality, mislabeled, or misrepresented products, and to protect businesses marketing these products from unfair competition.

We monitor feed, fertilizer, and seed for compliance from ingredients through manufacturing and retail channels. Label review, product and facility inspections, product sampling by our inspectors, and analysis in our laboratories are important steps in the process. Raw milk is monitored during marketing to ensure (1) accurate and equitable exchange between dairy producers and processors and (2) integrity of milk from farm to processor.

Eight regulatory inspectors and one auditor cover the state collecting samples, inspecting facilities, reviewing labels, and auditing records. Audits of sales and fee payments are conducted on feed, fertilizer, seed, and milk firms in Kentucky to verify reports, records, and fee payments. One additional inspector is dedicated to the milk program for auditing payment records and monitoring activities of sampler-weighers, handlers, lab personnel, and lab facilities.

The activities in the division are performed by a dedicated and professional staff that conduct laboratory analyses, provide administrative and computer support, process data, and

compile reports in addition to various other duties necessary to carry out and administer effective programs.

Feed Regulatory Program

The feed regulatory program provides consumer protection for livestock feed and pet food according to provisions of the Kentucky Commercial Feed Law. The program ensures safety, suitability, and quality of animal feed in producing meat, milk, and eggs for human consumption and products for companion animals. The program provides standards of quality, safety, efficacy, and labeling for feed products. A statewide program of inspection, sampling, and laboratory analysis is used to monitor feed ingredients and feed products. Feed labels are evaluated to identify purpose, guaranteed composition, ingredient list, feeding directions, and the need for any warning or caution statements.

The feed program enhances food safety efforts that promote consumer confidence in the nation's food supply. We work cooperatively with the U.S. Food and Drug Administration (FDA) in assessing compliance with the ruminant-to-ruminant feeding ban to prevent any establishment or amplification of bovine spongiform encephalopathy (BSE, or mad cow disease).

Highlights

- Performed official inspections on 1,365 feed manufacturers and dealers
- Collected 3,054 official and 74 unofficial samples that resulted in 21,558 lab analyses
- Collected 1,074 specialty pet food samples for analysis
- Under a new contract with FDA for the 2013–2014 fiscal year, inspectors will conduct a total of 79 inspections for compliance with the ruminant-to-ruminant feed ban, including 20 inspections of medicated feed mills for compliance with current good manufacturing practices
- Registered approximately 3,200 feed products of the nearly 18,500 registered feed products for sale in Kentucky
- Analyzed and reported 30 feed samples from quality control programs
- Used 47 different approved analytical methods in providing results
- Collected income from inspection fees and product registration of $1,194,926.56 during the period of July 1, 2012, to June 30, 2013 (inspection fees assessed at $0.35/ton; annual registration of $50.00 for products sold exclusively in 10-pound or smaller packages)

Fertilizer Regulatory Program

The fertilizer regulatory program ensures that Kentucky farmers and urban consumers have access to quality fertilizer while promoting fair and equitable competition among fertilizer manufacturers and dealers through inspection and analysis of products in the marketplace. The division administers and implements the Kentucky Fertilizer Law requiring proper labeling of fertilizer, including the grade and guaranteed analysis of fertilizer offered for sale. The division also maintains registration of fertilizer products.

Highlights

- Conducted 1,353 visits to perform inspections and to sample agricultural, lawn, turf, and garden fertilizer at Kentucky processing, wholesale, and retail locations
- Administered actions on 3,031 official and 20 unofficial samples of fertilizer involving more than 7,000 chemical tests, with official samples representing about 57,000 tons of the approximately 981,000 tons of fertilizer distributed in Kentucky during 2013 (approximately 5.8%)
- Reviewed labels and registered 5,123 products from 1,382 firms and issued licenses to 140 companies that manufacture custom-blended fertilizers
- Analyzed laboratory check sample materials from Magruder®, UAN, AFPC phosphate rock, AFPC phosphate, and AFPC specials for the fertilizer regulatory program
- Provided support for 15 different analytical methods that yield results for 28 analytes and contaminants
- Substantiated cash receivables from fertilizer reports and collected income from registration fees, inspection fees and licenses of $613,366 from July 1, 2012, to June 30, 2013 (fertilizer products assessed inspection fee of 50 cents/ton)

Milk Regulatory Program

The mission of the milk regulatory program is to ensure that raw farm milk produced and marketed in Kentucky is bought and sold using accurate weights and tests. The program's primary function is to monitor milk handling systems from the time a producer's milk is sampled and weighed through delivery and laboratory testing until producer payments are calculated. The program provides support to the producers and processors of Kentucky's $238 million a year dairy industry. Industry participants are trained, licensed, and subsequently monitored to maintain compliance with the law.

In addition to regulatory functions, the milk program cooperates with other agencies in educational projects to provide a variety of services to Kentucky dairy producers, processors, and allied industries. The milk program also operates a laboratory that is available for Kentucky producer, processor, and handler service testing.

Highlights

- Reviewed applications and issued licenses to 2 transfer stations, 24 milk handlers, 17 laboratories, 82 technicians, and 314 sampler-weighers (milk-haulers, receivers, and samplers)
- Trained and examined 29 new sampler-weighers and 8 new technicians (processor receiving personnel) in collaboration with Kentucky Cabinet for Health Services Milk Safety Branch
- Conducted 8 pay-record and 11 raw milk receiving audits
- Conducted 31 milk laboratory inspections
- Conducted 418 sampler-weigher inspections and analyzed 3,328 milk samples to evaluate sampler-weigher performance and ensure accurate producer payments
- Administered a monthly milk lab quality control check sample program through the distribution of 1,640 samples

to the 17 licensed laboratories and 2 other labs to ensure accurate component-analysis procedures
- Analyzed 2,953 samples for university research projects pertaining to dairy cattle management and feeding practices effects on milk composition
- Analyzed 164 samples for Kentucky small processor cheese makers
- Analyzed milk samples from 73 cows in conjunction with cattle judging at North American International Livestock Exposition in Louisville
- Collected income from fees and licenses of $170,294.50 from July 1, 2012, to June 30, 2013 (milk handlers and producers assessed one-half cent [$0.005] per hundredweight of milk)

Seed Regulatory Program

The seed regulatory program ensures Kentucky farmers and urban consumers of quality seed while promoting fair and equitable competition among seed dealers through inspection and analysis of products found in the marketplace. The division administers and implements the Kentucky Seed Law, which requires proper labeling of seed, including kind, variety, lot designation, purity percentages, noxious weeds, origin, test date, and a germination guarantee. The division promotes compliance through facility inspections, sampling, and analysis of seed offered for sale and maintains registration of seed labelers, seed conditioners, and seed dealers in the state.

Highlights

- Conducted 1,230 visits to perform inspections and to sample agricultural, lawn, turf, and garden seeds at Kentucky seed processing, wholesale, and retail locations
- Collected and tested 2,078 official seed samples
- Issued stop-sale orders on 259 official seed samples and 179 violative seed lots at seed dealer and seed processor locations
- Cooperated with the USDA Seed Branch regarding shipments of seed into the state that were in violation of the Federal Seed Act
- Reviewed and issued 229 permits to label agricultural seed and 57 permits to label vegetable and flower seed
- Registered 612 seed dealers and 21 non-certified custom seed conditioners
- Provided training to firms on labeling requirements, retail sales procedures, stop-sale release procedures, and record keeping requirements
- Substantiated cash receivables on more than 800 seed reports and income from fees, permits, and licenses of $409,584 from July 1, 2012, to Jun 30, 2013 (seed products assessed at 4–24 cents per unit)

Seed Testing Laboratory

The division maintains the only certified seed testing facility in Kentucky. This facility handles all official samples collected by inspectors and provides service testing for seed producers, dealers, retailers, research projects, and homeowners for a fee. More than 90 percent of the service samples accepted into the laboratory were submitted by Kentucky firms or individuals.

The laboratory analyzes seed for purity, identifies weed and crop seed, conducts germination, counts seed, determines test weight, performs accelerated aging, conducts fluorescence testing on ryegrass, determines moisture content, conducts tetrazolium analysis, assesses herbicide tolerance, determines presence of endophyte, and conducts many other analyses. Our analysts keep abreast of changes through participation in regional and national referee testing with the Association of Official Seed Analysts (AOSA) and the USDA Federal Seed Laboratory and by attending special scheduled and regular workshops at the AOSA annual meeting. All analysts are AOSA-certified in areas of purity and germination.

Highlights

- Analyzed 4,225 service samples
- Collaborated with researchers to analyze 33 seed samples
- Supported the equine and livestock pasture management programs in analyzing 185 plant samples for endophytes
- Analyzed 51 seed samples under the provision that allows one free sample for testing each year from Kentucky residents
- Collected income of $50,828 from service samples from July 1, 2012, to June 30, 2013

Soil Testing Laboratory

The soil testing laboratory provides farmers, homeowners, greenhouse operators, and others with scientific information about the fertility status of their soils or greenhouse media. In partnership with the Cooperative Extension Service, it also provides lime and fertilizer recommendations based on laboratory results. We also offer analyses of animal wastes, nutrient solutions, and special research solutions. The program received $258,510 in income for service testing during the period July 1, 2012, through June 30, 2013.

The soil test web site is found at http://soils.rs.uky.edu. The number of samples analyzed and the percent change from 2012 is shown in the table below.

Soil samples analyzed

Type	Number	% change
Agriculture	32,701	-24
Home lawn and garden	9,855	-4
Commercial horticulture	989	2
Greenhouse media	89	74
Research	7,000	-16
Atrazine residue in soil	41	46
Animal waste	660	48
Nutrient solution	56	44
Soil nitrate	98	36
TOTAL	51,489	-19

Robinson Center for Appalachian Resource Sustainability

At Quicksand in Breathitt County, the Robinson Center for Appalachian Resource Sustainability (RCARS) is the eastern location for research on fruits and vegetables, ornamentals, livestock forage and grazing systems, grain crops, biomass crops, tobacco, and wood utilization. The Robinson Center is also the administrative headquarters of the Robinson Forest, which spreads over parts of Breathitt, Perry, and Knott counties and is the site of forestry, wildlife, surface mine reclamation, and watershed management research.

Established in 1925, the RCARS has budgetary and physical responsibility for managing the research facilities at Quicksand, the Wood Utilization Center, and Robinson Forest. The mission of this unit is to increase the long-term, value added, sustainable income and sustainable flow of economic, ecological, and social goods and services from the lands, natural resources, and people of Eastern Kentucky and the Appalachian Region.

Research Activities

ROBINSON CENTER (QUICKSAND)

Plant and Soil Sciences

- The RCARS is the east region location for the livestock forage variety testing program. Results from orchardgrass, tall fescue, and red clover trials are published annually.
- In a corn-liquid N fertilizer trial, evaluated a nitrification inhibitor product at two different times of N application and at two different N application rates. Though there was a strong response to improved N nutrition, the inhibitor was not effective at either N rate at either time of N application.

Plant Pathology

- Evaluation of post-infection applications of thiophanate-methyl for suppression of fusarium on asparagus. An experiment was conducted to test three rates of thiophanate-methyl for curative activity on established asparagus affected by Fusarium. Treatments were made in early spring, and had no impact on reducing severity of disease on the previously infected plants.
- Cucurbit downy mildew sentinel plots. In collaboration with Horticulture personnel at RCARS, sentinel plots were established to allow for early detection of downy mildew and to determine which cucurbit crops (watermelon, cucumber, pumpkin, and melon) would be affected. Information gathered from the RCARS sentinel plots was shared with researchers across the country and was used in forecasting the predicted movement of downy mildew during the summer and fall of 2013.
- Evaluation of experimental fungicides for foliar disease control on burley tobacco. An experimental naturally derived compound was tested for efficacy against blue mold of tobacco and tobacco hornworm. Results were inconclusive about activity against the disease; however, the experimental compound was highly effective against hornworms and may prove to be an alternative to synthetic pesticides if registered.

Horticulture

- Asparagus variety and fungicide trial. Funded by Kentucky Specialty Crop Block
- Hops variety trial. Funded by Kentucky Horticulture Council
- Broccoli variety trial. Funded by Kentucky Horticulture Council
- Rhubarb variety trial. Funded by Kentucky Specialty Crop Block Grant
- Primocane bearing black raspberry variety evaluation. Funded by the Horticulture Council/gifts in kind from Nourse Farms/Peter Tallman–Niwot
- Persimmon variety trial. Funded by Kentucky Specialty Crop Block Grant
- Hybrid filbert variety trial in collaboration with Kentucky State University and Dr. Kirk Pomper

Biosystems and Agricultural Engineering

- Conductivity Sensor Accuracy and Temporal Stability: A Laboratory and Field Study
- The Guy Cove Stream Restoration Project: Recreating a Headwater Stream System on a Head-of-Hollow Fill
- Biosystems and Agricultural Engineering, Horticulture, Plant and Soil Science, and the Center for Applied Energy Research (CAER) are investigating the potential energy production from alternative crops on marginal agricultural land. Plots were established in 2010; measurements taken include changes in soil carbon, biomass production, and potential energy production (as a liquid or solid fuel) from miscanthus, switchgrass, black locust, and cottonwood.

ROBINSON FOREST

Entomology

- Research continues on the effects of the highly invasive hemlock woolly adelgid on headwater streams and associated riparian zones, including stream characteristics, terrestrial and benthic riparian macroinvertebrate communities, litter fall, and litter colonization.
- A common garden of six hemlock species of varying geographic origin is being used to evaluate hemlock woolly adelgid behavior ecology, including potential species-specific differences in host suitability and physiological effect of adelgid colonization.

Biosystems and Agricultural Engineering

- Specific conductivity sensor performance: I. Laboratory evaluation

Geography

- Spatial modeling of biomechanical weathering by trees
- Soil microbial community of a tree throw

Forestry

- Effect of soil scarification on *Quercus* seedling establishment within upland stands of the Northern Cumberland Plateau.
- Effect of gap size on mid-rotation stand structure and species composition in a naturally regenerated mixed broadleaf forest.

- Effect of timber harvesting on invasive species colonization relative to disturbance, site, and soil conditions.
- Cow elk survival, cause-specific mortality, and social dynamics. Rocky Mountain Elk Foundation. Radio-collared cow elk are studied to determine survival, cause of mortality, and social dynamics including dominance behavior and hierarchies that may influence disease transmission.
- Resource selection, survival, and cause-specific mortality of bull elk in southeastern Kentucky. Kentucky Department of Fish and Wildlife Resources and Rocky Mountain Elk Foundation. Radio-collared bull elk are studied to determine survival, causes of mortality, and resource selection patterns.
- Ecology of the timber rattlesnake in a mixed-mesophytic forest. Timber rattlesnakes are implanted with radio-transmitter implants to understand spatial patterns and den site selection of the increasingly threatened pit viper.
- Effects of timber harvest on salamanders in a mixed mesophytic forest. The impacts of different timber harvest streamside management zone treatments on salamander abundance and diversity are studied.
- Effects of timber harvest breeding bird communities in a mixed-mesophytic forest. The impacts of different timber harvest streamside management zone treatments on breeding bird abundance and diversity are studied.
- Prevalence of chytrid fungus on select salamander species in southeastern Kentucky. Salamanders within a mixed-mesophytic forest system are sampled for the presence of the chytrid fungus, a pathogen implicated in global amphibian declines.
- Factors controlling carbon distribution on reforested minelands and regenerating clearcuts in Appalachia.
- Evaluating best management practices for ephemeral channel protection following forest harvest in the Cumberland Plateau.
- Protecting water resources with streamside management zones.
- Development and deployment of a bioreactor for the removal of sulfate and manganese from circumneutral coal mine drainage.
- Evaluating reforestation success on a surface mine in Eastern Kentucky.

Kentucky Department of Fish and Wildlife Resources, U.S. Fish and Wildlife Service, Corps of Engineers

- Population estimation and microhabitat characterization of *Etheostoma spilotum Gilbert* (Kentucky arrow darter) in Clemons Fork, Breathitt County, Kentucky
- Development of a rapid assessment models for measuring stream function using the hydrogeomorphic (HGM) approach to ecosystem assessment
- Morphological divergence in *Etheostoma spilotum Gilbert* (Kentucky arrow darter) along a stream gradient with known barriers, both natural and anthropogenic
- Patterns of genetic variation and gene flow in the imperiled Kentucky arrow darter, *Etheostoma spilotum* (Percidae)

Extension Activities

- U.S. Forest Service Forest Inventory and Analysis Regional Wide Training for Hardwood Tree Grading. Conducted by UK Forestry Extension for Kentucky, Virginia, Tennessee, North Carolina, and USFS.
- U.S. Forest Service Certified Silviculture Training. Conducted by UK Forestry Extension.
- Win With Wood Youth Event. Annual youth program focused on forestry and forest industry, October 17, 2013.
- The University of Kentucky's Department of Forestry at RCARS with the Kentucky Division of Forestry maintain a Wood Industries Directory of the wood products companies in the state.
- Tooling Design Program for the Secondary Wood Industry. Templates for 26 different products were developed, resulting in an estimated $65,000 in earned or saved revenue to the secondary wood industry.
- UK Wood Utilization Center Entrepreneur Development Program. Three entrepreneurs are currently participating in this program to develop new wood products businesses.
- Mountain Monday Series. Monthly Extension programs on a variety of topics are held at the RCARS the second Monday of each month.
- 4-H Natural Resource and Environmental Sciences Academy. A three-year program for seventh and eighth graders based on their academic achievements and teacher recommendations. Students study water, forestry, and wildlife resources at the Robinson forest.

Teaching Activities at Robinson Forest

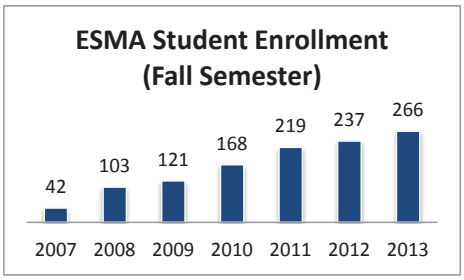
- NRE 320—Natural Resources and Environmental Analysis
- FOR 355—Forest Fire Control and Use
- FOR 356—Landscape Assessment
- FOR 357—Inventory and Measurements II
- FOR 358—Silviculture Practices
- FOR 359—Forest Operations and Utilization

UK Ag Equine Programs

University of Kentucky's Ag Equine Programs is a framework that encompasses everything equine in UK's College of Agriculture, Food and Environment. The Equine Initiative was launched in 2005 when the College of Agriculture set out to radically change how it served Kentucky's signature equine industry and provide a suite of services appropriate for a land-grant university. The college adopted the name UK Ag Equine Programs in early 2012 to better position its equine programs for continued success. UK Ag Equine Programs serves as the front door to equine in the college and represents the breadth of equine offerings at UK and the college's long-term commitment to serving the state's signature equine industry. Dr. C. Jill Stowe, associate professor in Agricultural Economics, became the third director of the Equine Programs in May 2013.

Student Opportunities

The Equine Science and Management (ESMA) undergraduate degree was officially instituted in 2009, but even before that, 42 students were enrolled in "individualized studies" pending official approval of the program. In fall 2013, enrollment had climbed to 266 students. About 35 percent of these students are in-state. Out-of-state students represented 33 different states and the District of Columbia, and five international students are enrolled. Currently, 85 percent of students enrolled are female. The following graph shows the rapid growth in enrollment:



A curriculum revision is awaiting approval by the University Senate.

Internship Program

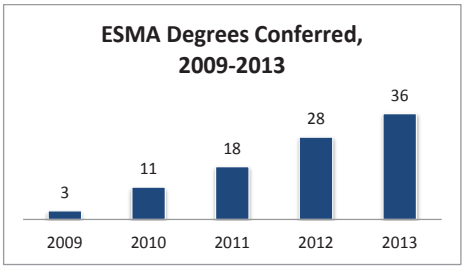
ESMA students completed 35 internships in 2013. Of those, 30 internships were in Kentucky and 5 were out of state; notably, the first international internship was completed. In addition, the Lexington Mounted Police Unit accepted its first intern, an ESMA student was one of ten in the United States to be selected for the prestigious Legacy of Legends internship, and one intern presented her research at a national meeting.

Clubs and Teams

Equine clubs and teams continue to be popular, and the college now boasts seven: the Dressage and Eventing Team, the Equestrian Team (western and hunt seat), the Horse Racing Club, the Polo Team, Research in Equine and Agricultural Disciplines Club, the Rodeo Team (added in late 2013), and the Saddle Seat Team.

Alumni

The ESMA program has conferred degrees to 96 graduates to date. Number of degrees conferred by calendar year is illustrated in the following chart:



New efforts at tracking and engaging ESMA alumni are under way. In a recent survey of these graduates, 72 percent of respondents indicated that they were currently employed in the equine industry, 21 percent were pursuing further training, and 7 percent were employed outside industry. The response rate was 86 percent.

Equine Research

Results from one of the largest collaborative projects in recent history, the 2012 Kentucky Equine Survey, were released September 6, 2013. A number of resources are now available online at http://equine.ca.uky.edu/kyequinesurvey, including the executive summary, the full report, and equine fact sheets for all Kentucky counties.

More than 40 faculty and about 40 graduate students are involved in equine-related research in the UK Ag Equine Programs. During calendar year 2013, faculty were awarded 20 new research grants for a total of more than $1.95 million. In addition, equine-related faculty published about 110 peer-reviewed journal articles and seven books and book chapters. Areas of research represented within the UK Ag Equine Programs include economics, entomology, environmental stewardship, genetics and genomics, horse-human connection, immunology, infectious diseases, musculoskeletal science, nutrition, parasitology, pasture management, and reproductive health.

Outreach and Service

UK Ag Equine Programs offers a rich set of outreach programs, including both adult and youth Extension programming, as well as a variety of other programs.

Adult Extension Programs

- Horse College, more than 280 participants from 16 counties across the state
- Farm and Facilities Expo in Scott County, 181 participants
- Western Kentucky Equine Program held in cooperation with the U.S. Forest Service at the Wrangler Campground in Western Kentucky, 92 participants
- Asbury Draft Horse Field Day held in partnership with Asbury University, about 250 participants

Youth Extension Programs

The Kentucky 4-H Horse Program delivers educational programs to youth and adult leaders and volunteers across the state. Five thousand youth registered in the Kentucky 4-H Horse Program. Some of the activities included:

- Kentucky Equine Youth Festival, about 3,000 youth from across the state
- State 4-H Horse Show, 650 youth
- State 4-H Horse Program contests, more than 350 youth
- Leader Certification Program, 50 leaders

In addition to Extension programming, UK's Ag Equine Programs offered a variety of other outreach programs, including:

- Diagnostic services. UK's Veterinary Diagnostic Laboratory (UKVDL) performed almost12,000 EVA tests, almost 21,000 equine infectious anemia (EIA) tests, and nearly 1,500 necropsies
- Department of Veterinary Science Equine Diagnostic and Research Seminar Series. Monthly seminars for internal and external participants, recorded by *The Horse* and made available internationally
- Horse Pasture Evaluation Program, 18 evaluations, 1,869 acres, 4,452 farm acres, six counties
- Pastures Please, Fayette County, 125 participants
- UK Equine Research Showcase and UK Breeders' Short Course, about 135 participants from five states and three countries

Communications

EP Communications produced and/or distributed 23 equine-related news releases and had displays at the Kentucky Horse Park's Kids Barn as well as three other events.

Two monthly online newsletters are produced by the Equine Programs office. The *Bluegrass Equine Digest* has 63,500 subscribers from 50 states and 106 countries and click-through/open rates of 20 to 30 percent, among highest of *The Horse*'s e-newsletters. The *Wildcat Canter* was redesigned in 2013 and now includes an alumni section. Other equine-related newsletters in the college include *Equine Disease Quarterly, Equine Research and Service Report,* and *Board Bits* from the Gluck Center.

The Equine Program maintains a Web presence and has a new equine landing page from the redesigned College of Agriculture, Food and Environment homepage. In addition, various EP groups are active on social media, including Facebook, LinkedIn, and Twitter.

Ads appeared in the Kentucky Thoroughbred Farm Managers' Club annual directory, Lane Report's *Market Review of the Bluegrass,* and *KyForward* online newspaper.

UK Research and Education Center at Princeton

The University of Kentucky Research and Education Center (UKREC) holds a unique position as part of the Kentucky Agricultural Experiment Station and the Kentucky Cooperative Extension Service and remains dedicated to sustaining the heritage of impact and achievement by these great institutions and the rapidly changing issues and challenges associated with them. Its vision is to be recognized at the local, state, and national level for excellence in agricultural research, education, leadership, and service to the Commonwealth.

Established in 1925, the West Kentucky Substation at Princeton has functioned as a center of agricultural activities in western Kentucky. Great advancements have been made in Kentucky's leading industry—agriculture—with considerable progress being made in improving use and conservation resources, increasing yields of crops and livestock, improving management of capital and labor, expanding markets, and finding solutions for problems facing rural people and communities. Increased returns to Kentucky farmers and livestock producers total millions of dollars annually just from the use of new production technologies resulting from research findings and educational programs of the College of Agriculture, Food and Environment.

UKREC is fundamentally interdisciplinary, applying the biological and social sciences to challenges in agricultural, food, and environmental systems. Our scholarship encompasses human and natural resources and their interaction.

As part of the University of Kentucky, the center:

- Facilitates life-long learning, informed by scholarship and research
- Expands knowledge through creative research and discovery
- Serves Kentucky communities by disseminating, sharing, and applying knowledge

The UKREC is the headquarters for more than 50 faculty and staff members representing six different academic departments (Animal and Food Sciences, Biosystems and Agricultural Engineering, Entomology, Horticulture, Plant and Soil Sciences, and Plant Pathology) and three units (Ag Communications Services, Facilities Management, and Regulatory Services) in the college. Its faculty and staff conduct research, provide diagnostic testing services, and develop educational programs on topics of concern to Kentucky farmers, livestock producers, agribusinesses, and families.

The UKREC Experiment Station Farm consists of almost 1,300 acres, including soils of both sandstone and limestone origins that are characteristic of soil types throughout the state. Researchers conduct approximately 100 different research/demonstration projects each year at the Experiment Station Farm or on farms in western Kentucky. Information derived from these projects or research conducted elsewhere is delivered to farmers, livestock producers, and the general public through county offices of the Cooperative Extension Service. Extension specialists located at the center have expertise in a broad spectrum of food and agriculture topics.

Crops such as corn, wheat, soybeans, tobacco, fruit, vegetables, and ornamentals are studied for ways to increase yields and income, improve handling and storage, protect the environment, and address other problems farmers may have. Research, demonstrations, and educational programs are also conducted in the areas of beef and swine production.

Agricultural engineering specialists conduct research and educational programs related to both crop and livestock production. In addition, an aquaculture program is conducted in cooperation with Kentucky State University.

Service laboratories located at the center provide information needed to make management decisions in the following areas:

- Soil testing, which enables farmers to develop nutrient management plans for growing crops
- Plant disease diagnosis, which helps identify plant health problems and provides recommendations for disease prevention and control
- Insect and plant pest identification, which helps specialists advise clients on integrated pest management strategies

The manager for Extension Information Technology Support for Cooperative Extension has been based at the UKREC since 2006. This position provides leadership for the Extension IT unit and directs all state projects from Princeton. Work is focused on electronic services, VoIP systems, data communications and processing, project management, remote and data center operations, policy development, and customer service. The IT manager for Extension supports six IT professionals who provide onsite and remote support, training, and development and maintain the overall IT infrastructure for the 12-county Extension offices in Kentucky.

The following additional learning opportunities and resources are provided through the UKREC:

- The Rottering-Kuegel Agricultural Research and Extension Building is available to large and small groups for classes and meetings in agriculture, home economics, and 4-H. It is also used for a wide variety of meetings by government agencies, industry, and the general public. Each year there are approximately 450 different meetings held in this building, attended by about 14,000 people. Many of these visitors come from other states and foreign countries.
- Commodity-specific and joint commodity field days that showcase the work of the UKREC attract about 3,000 people annually. Visitors observe research, educational displays, and demonstrations representing work conducted at the center and throughout the state.
- Individuals and small groups visit throughout the year to observe specific projects and talk with specialists.

Research Activities

Animal and Food Sciences

Beef Cattle

- Long-term effects of form of selenium on multigenerational physiological capacity
- Year-round mineral intake in beef cattle
- Grazing beef cattle on wheat grown for grain

Swine

- Development, implementation, and evaluation of within-production facility (under-slat) manure composting for finishing swine
- Development and evaluation of liquid-solid separation system for nursery and finishing swine
- Development and evaluation of an automated "compost-a-matic" system for composting manure from a swine wean-to-finish operation
- Evaluation of composting of separated swine manure solids with wood chips

Biosystems and Agricultural Engineering

- Improving energy efficiency on Kentucky farms
- Energy assessments for grain and livestock farms
- Energy assessments for solar PV installations
- Nationwide study on packing factors of six different grains
- Providing food security in Nigeria by reducing post-harvest losses of grains during storage at the farm and small-holder (warehouse) level
- Assessment of needed research and Extension programs in Ghana to reduce post-harvest losses of grains along the value chain
- Revision of the *Midwest Plan Service Handbook on Grain Drying, Handling and Storage*

Entomology

- Using insect pheromone traps to predict outbreaks
- Survey of exotic insects in soybeans, corn, and wheat
- Spotted wing drosophila orchard and small fruit survey

Horticulture

Nursery/Landscape

- Irrigation controller design and evaluation
- Landscape plant evaluations
- Landscape plant establishment based on production container
- Plantable container evaluation for sustainable production
- Efficient fertilization of nursery crops
- Maintaining water quality and efficient irrigation of nursery crops
- Kentucky native plant evaluation, production protocols, and use
- Development and maintenance of Kentucky provenance stock plants
- Integrated pest management (IPM) monitoring

Fruit

- Rootstock trials: apple and peach
- Cultivar trials: peach, wine grape, and blackberry
- Small fruit demonstration plots
- Pecan variety demonstration
- Evaluations of crosses of vinifera and Muscadine grape selections

Plant and Soil Sciences

Forages

- Alfalfa variety test
- Red clover variety test
- Tall fescue variety test
- Orchardgrass variety test

Grain Crops

- No-till wheat management
- Corn variety trial
- Wheat variety trials (2)
- Soybean variety trial
- Testing of breeding lines
- Wheat fusarium head blight nursery
- Canola variety trial

Manure Management and Use

- Development and implementation of within-production facility (under-slat) manure composting for finishing swine
- Liquid-solid separation of swine manure and composting of separated manure solids
- Development and evaluation of an automated "compost-a-matic" system for composting manure from a swine wean-to-finish operation
- Poultry litter, biosolids, and composted swine manure used for winter wheat production (cooperative study with USDA-ARS-AWMRU)
- Poultry litter use for corn and soybean production
- The use of gypsum and/or poultry litter to increase rooting depths in fragipan soils

Soils

- Greenhouse trials examining the effects of wheat, ryegrass, sodium fluoride, sodium nitrate, and sodium chloride on the fragipan
- Field trials examining the effect of wheat, ryegrass, sodium fluoride, and sodium nitrate on the fragipan
- Poultry litter, biosolids, and composted swine manure used for winter wheat production (cooperative study with USDA-ARS-AWMRU)
- Poultry litter use for corn and soybean production
- The use of gypsum and/or poultry litter to increase rooting depths in fragipan soils
- Evaluation of alternative liming materials
- Evaluation of processed biosolids as a deer deterrent

Tobacco

- Dark fire-cured variety tests
- Dark air-cured variety tests
- Burley commercial variety trial
- Burley regional quality trial
- Carryover potential of corn herbicides to tobacco
- Tobacco transplant production management
- Insecticide performance for tobacco hornworm and budworm control
- Dark fire-curing systems utilizing forced air during early stages of curing
- Dark fire-cured and dark air-cured tobacco pesticide residue tests
- Correlation of curing conditions and tobacco-specific nitrosamine accumulation in dark air-cured tobacco
- Effect of post-cure ordering methods on tobacco-specific nitrosamine accumulation in burley and dark tobacco
- Evaluation of burlap as a field wilting tool in dark-fired tobacco

Weed Science

- Burndown control in corn
- Pre- and post-emergence weed control in corn
- Interactions of herbicides and fungicides in corn
- Marestail (horseweed) control in no-till soybeans
- Palmer amaranth control in full-season soybean (4 studies, Fulton County)
- Waterhemp control in full-season soybean (3 studies, Hancock County)
- Volunteer corn control in no-till wheat
- Using wheat as a tool to manage Palmer amaranth (studies in Fulton and Warren counties)
- Marestail (horseweed) control in wheat
- Managing Italian ryegrass in wheat
- Wild garlic control in no-till wheat
- Common chickweed control with herbicides applied in late spring
- Wheat tolerance to PPO herbicides
- Clearfield canola tolerance to beyond
- Testing for ALS-resistant Italian ryegrass
- Testing for ALS-resistant common chickweed
- Testing for glyphosate-resistant Italian ryegrass

Plant Pathology

- Soybean fungicide efficacy testing
- Wheat fungicide efficacy testing
- Effect of poultry litter on soybean cyst nematode populations
- Soybean rust monitoring
- Soybean vein necrosis-associated virus seed transmission studies (in cooperation with the University of Tennessee)

UK Veterinary Diagnostic Laboratory

Overview

The University of Kentucky Veterinary Diagnostic Laboratory (UKVDL) continues to strive to be one of the premier veterinary diagnostic laboratories in the United States, providing timely and accurate services in support of the practicing veterinary profession, Kentucky animal agriculture, the signature equine industries, companion animals, and public health. As the state's flagship veterinary diagnostic laboratory, the UKVDL's primary goal is to develop, apply, and utilize state-of-the-art veterinary diagnostic testing methods and scientific knowledge to improve animal health and marketability, preserve the human-animal bond, and help protect and improve public health through the early and accurate identification of zoonotic diseases. The laboratory is fully accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD) and is a member of the USDA National Animal Health Laboratory Network (NAHLN) and the FDA Veterinary Laboratory Investigation Response Network (Vet-LIRN).

In addition to its clinical diagnostic role, the UKVDL provides surveillance for emerging and endemic diseases such as equine infectious anemia (EIA), equine piroplasmosis, West Nile virus, chronic wasting disease of deer, contagious equine metritis, bovine spongiform encephalitis (mad cow disease), Johne's disease, bovine leukosis, avian influenza, rabies, and many other diseases of agricultural, public health, and companion animal importance. Furthermore, the laboratory is always on the watch for the emergence of foreign animal diseases (FADs) such as foot and mouth disease and classical swine fever. In 2013, UKVDL continued its proficiency testing programs as part of the National Animal Health Laboratory Network.

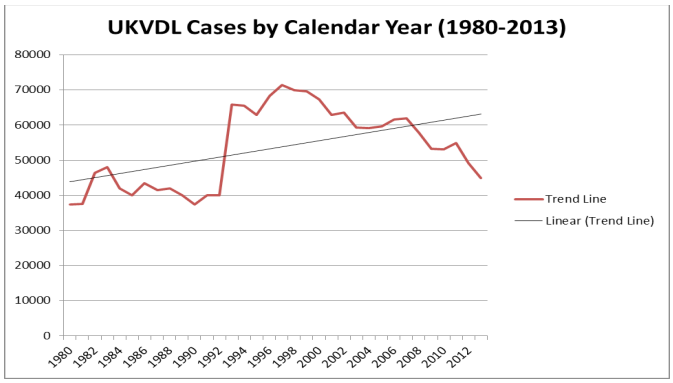
Farmers and animal owners use the UKVDL's services primarily through their practicing veterinarians. These professionals have expertise in selecting, preparing, shipping, and submitting the proper specimens for testing when needed to assist in making a clinical diagnosis. Laboratory findings are reported back to the submitting veterinarian, who then consults with the clients to implement a treatment protocol or a preventative solution to disease problems on the farm. The UKVDL utilizes a state-of-the-art laboratory information management system (LIMS) and provides the most professional, accurate, and timely accessioning, order entry, results capture, and clinical case reporting for clients.

UKVDL faculty, scientists, and technical staff are specialists in several diagnostic medical disciplines directly related to animal health, including bacteriology, clinical pathology, epidemiology, molecular biology, pathology, serology, toxicology, virology, and informatics. Genomics and metagenomics are disciplines that are being developed to improve diagnostics in the future. Disease diagnostic efforts are coordinated and handled by specialists in the appropriate disciplines. Complex clinical cases involving multiple sections are monitored by appropriate case coordinators. During surge testing periods and disease outbreaks, trained technicians are redistributed across sections to assure that the increased workload can be managed in a timely and accurate fashion.

The UKVDL received 44,902 cases in calendar year 2013 (a 9% decrease from calendar year 2012), including 3,147 necropsies (7% decrease from calendar year 2012). The decrease in the general caseload is attributed primarily to a shift of EIA testing to private laboratories recently approved in Kentucky and the elimination of the requirement for piroplasmosis testing in Kentucky and other states. The necropsy load fluctuates in relation to disease outbreaks. Individual section reports contain the total tests run in each laboratory section.

Outreach

The UKVDL continues to build and enhance outreach programs around Kentucky. The Kentucky VetLabNet listserv continues to distribute animal health bulletins and has grown to more than 600 UKVDL clients, scientists, farmers, and stakeholders. The UKVDL director continues



to contribute articles quarterly to the Kentucky Veterinary Medical Association (KVMA) magazine and the Kentucky Cattleman Association *Cow Country News* (since 2009). The UKVDL director, faculty, and staff continue to deliver lectures at scientific and lay meetings, and they have participated in the monthly Equine Diagnostic-Research Seminar Series at the UKVDL since 2006. These seminars are filmed by *The Horse* magazine and are edited and made available as webinars. They have been viewed in more than 60 countries as well as by soldiers in Iraq and Afghanistan.

Equine Diagnostic and Research Seminar Series

- University of Kentucky Equine Showcase, a program highlighting the university's current equine programs and findings relevant to the industry, January 18 and 19
- 4th Annual Kentucky Breeders' Short Course, an in-depth program on equine reproduction and horse management issues, January 18 and 19
- Seminar I: Placentitis, Barry Ball, UK Gluck Equine Research Center; Karen Wolfsdorf, Hagyard Equine Medical Institute, February 28
- Seminar II: Case Studies in Foal Problems, Nathan Slovis, Hagyard Equine Medical Institute; Peter Morresey, Rood and Riddle Equine Hospital, February 28
- Field Anesthesia, Nora Matthews, Texas A&M University, June 27
- Podiatry, Scott Morrison, Rood and Riddle Equine Hospital, July 25
- Respiratory Endoscopy, Gary Priest, Harthill and Priest Equine Surgery, August 22
- Seminar I: The Role of Nutrition in Modulating the Immune and Metabolic Responses of Geriatric and EMS Horses, Amanda Adams, UK Gluck Equine Research Center, September 26
- Seminar II: Nutrition and Disease Interactions: Feeding the Sick Horse, Ginger Rich, Rich Equine Nutrition Consulting, September 26
- Cardiology, Michelle Barton, University of Georgia, October 24
- Endocrine and Genetic Disorders Symposium, Teri Lear, UK Gluck Equine Research Center; Dianne McFarlane, Oklahoma State University; Donald Thompson, Louisiana State University, November 21

Other Outreach Events

- Food Animal Practitioner Conference, attended by approximately 40 veterinarians and other guests, February 28.
- Continuous Animal Health Monitoring, presented to the Animal Identification and Information Systems Council of the National Institute of Animal Agriculture meeting, Louisville, April 17.
- The director attended the Kentucky Poultry Federation Avian Influenza Surveillance meeting at the office of the state veterinarian, Frankfort, April 29.
- The director coordinated planning for the World Association of Veterinary Laboratory Diagnosticians (WAVLD) meeting and attended as executive director and invited presenter, Berlin, Germany, June.
- Food Animal Practitioner Conference, attended by 45 veterinarians and other guests, August 29.
- The Life and Career of Dr. James Steele: Contributions to Veterinary Public Health and One Health, presented to the American Veterinary History Society, 40th Mid-America Veterinary Conference, Louisville, September 28.
- The director and seven UKVDL employees attended the AAVLD annual meeting for continuing education and delivering scientific presentations, San Diego, CA, October 17 through 23.
- The director delivered a lecture on the Livestock Care Standards Commission to an Animal Science class, October 30

Major Disease Outbreak Responses

2012

- Equine leptospirosis abortion outbreak testing and prophylactic treatment recommendations, 2011-2012 reproductive season
- Resistant strains of *Mannheimia haemolytica* discovered in association with outbreaks of respiratory disease killing cattle on several Kentucky farms, January through October
- Responded to an outbreak killing 22 cattle on a Kentucky farm, diagnosed chlorate poisoning in toxicology section, reported to OSV/USDA/EPA, January
- Added a new diagnostic test for *Tritrichomonas foetus,* which causes abortion and infertility in cattle, March
- Implemented problem-based testing panels for the horse to include diarrhea and respiratory problems, March
- Responded to a spring frothy bloat outbreak killing several cattle, alerting, April
- Responded to an outbreak killing several calves on a Kentucky farm, diagnosed lead poisoning in toxicology, May
- Responded to the death of two dogs dying acutely, diagnosed as acetaminophen intoxication in toxicology, May
- Ongoing cELISA testing in support of the equine piroplasmosis outbreak in southwest U.S.
- Responded to an outbreak killing at least one steer, diagnosed as *Taxus* poisoning by toxicology, July
- West Nile virus outbreak alerting, August
- Potomac horse fever outbreak alerting, August
- Responded to an outbreak killing at least four cows, diagnosed as nitrate poisoning by toxicology, August
- Responded to an outbreak killing 3 out of 110 sheep, diagnosed as ***haemonchosis,*** September
- *Lawsonia intracellularis* seasonal trends, October
- Responded to an outbreak killing several sheep, diagnosed as copper poisoning due to feed manufacturing problem, October
- Equine herpes virus-1 abortion outbreak alerting, December
- Responded to an outbreak killing one calf, diagnosed as copper poisoning (source unknown) by toxicology, December

2013

- Equine leptospirosis abortion outbreak alerting, January
- Responded to an outbreak killing several cattle, diagnosed as *Mycoplasma* pneumonia, January
- Responded to an outbreak killing several neonatal calves, diagnosed as selenium deficiency, March
- Responded to an outbreak killing 16 out of 60 in a herd of cattle, diagnosed as enteritis, likely due to bovine virus diarrhea (BVD), April
- Responded to an outbreak killing 2 out of 28 Boer goats, diagnosed as polioencephalomalacia, April
- Responded to an outbreak killing 3 out of 24 calves, diagnosed as *E. coli* septicemia, May
- Equine Infectious Anemia/Equine Viral Arteritis panel offered by UKVDL, July
- Potomac Horse Fever outbreak alerting, July
- Rocky Mountain Spotted Fever IFA test put online to help detect this zoonosis in dogs, July
- After-hours specimen drop box added near the UKVDL receiving door, July
- Blue-green algae outbreak alerting related to cattle deaths, August
- Neospora cattle abortion outbreak alerting and information distribution, August
- New PCR diagnostic assay implemented for Potomac Horse Fever, September
- Responded to an outbreak causing blindness and killing 17 out of 80 mixed-breed cattle, diagnosis undetermined, October
- Responded to an outbreak killing 3 out of a group of 10 macaws—diagnosed as *Mycoplasma gallisepticum* infection, November
- Responded to an outbreak killing 2 out of 113 head of cattle, diagnosed as blackleg, December

Personnel Actions

- New hires—9
- Promotions—8
- Reclassifications—2
- Dossiers prepared for P&T—3
- Several mission-critical positions upgraded from 37.5 hours per week to 40 hours per week to provide better coverage for UKVDL clientele

Visiting Scientists/Distinguished Guests

- Dr. Ed Bower, veterinary diagnostician from the Virginia Department of Agriculture and Consumer Services, January
- Georgetown University Equine Scholars, August
- Louisville Zoo veterinary team, August
- Dr. Ahmed Althabhawee, Dean of Veterinary Medicine, Kufa University, Iraq, October
- Harrison County 4-H Club, October

Notable Achievements or Advancements

- Director served as executive director of the World Association of Veterinary Laboratory Diagnosticians (WAVLD). (Future meetings are being planned in Saskatchewan in 2015 and Italy in 2017.)
- Director served as the executive director of the American Veterinary Epidemiology Society (AVES).
- Director co-chaired the planning for the James H. Steele Challenge scientific session, which included 17 internationally distinguished speakers, held in conjunction with the American Veterinary Medical Association scientific program, Chicago, July.
- Maintained AAVLD accreditation and NAHLN (USDA) and VetLIRN (FDA) member laboratory status through the oversight of proficiency testing and quality control programs, faculty and staff continuing medical education initiatives and participation in outbreak response and emergency exercises.
- Implemented a planning strategy to prepare the UKVDL for its next AAVLD accreditation team visit (which will occur in August 2014).
- Director provided leadership and guidance for faculty and staff to enhance the UKVDL outreach programs through one-day symposia and seminars on such topics as food animal, equine, poultry, toxicology, and CWD. The Equine Diagnostic Research Seminars reach a global audience through our partnership with *The Horse* magazine.
- Provided vision and oversight for a UKVDL strategic and marketing plan to improve client services and to enhance testing and collection of fees.
- Served as key liaison with Lincoln Memorial University leaders to explore the possibilities for a cooperative agreement to provide training for veterinary medical students in exchange for funds that can be used to improve UKVDL services and research capability in support of Kentucky animal agriculture.
- Q-Pulse QA/QC software implemented at UKVDL in preparation for the upcoming AAVLD accreditation visit.
- Equine leptospirosis awareness and vaccine initiative national seroepidemiological survey; ongoing discussions and collaboration with Zoetis Animal Health (formerly Pfizer) and Texas A&M University.
- Genomics diagnostic laboratory section for UKVDL; ongoing discussions with Columbia University, Texas A&M University, and the Kentucky Horse Racing Commission.
- Continue to oversee the operation of a real-time animal disease cluster detection system for Kentucky.
- Continue to provide UKVDL professional exhibits for display at local, state, and national meetings.
- Manage KY-VetLabNet listserv bulletins to approximately 600 subscribed clients to maintain a high level of situational awareness for veterinarians and farmers.
- Oversee field investigations/research studies for clients as requested/needed, epidemiology section (more than 500 information/graphics/statistical requests in 2012–2013).
- Oversee weekly reportable disease reports distributed to the office of the Kentucky state veterinarian's office.
- Implemented a visiting foreign scientist program at the UKVDL; visited by one scientist from Turkey and one from Pakistan in 2012–2013.

Initiatives and Programs

- The director worked to develop a cooperative agreement to assist with training of veterinary students as part of a new veterinary school at Lincoln Memorial University, Harrogate, Tennessee, January through December.
- The new UKVDL fee schedule went into effect July 1. Overall, 77 test fees out of 233 total tests were increased (33%) with the strategy to increase fee income by $129,495 (10%).
- As part of the UKVDL marketing plan, business office staff compiled a database of equine practices in an eight-state area, and a mailing was sent to 270 clinics to encourage the use of the laboratory.
- The director discussed a possible meta-genomics diagnostic laboratory for the UKVDL with Mr. John Ward and Dr. Mary Scollay that could be funded by the EDRC, November through December.

Major Issues and Challenges

- Our management team will propose another set of fee increases to our advisory committee to help offset the impact of recurring cuts to the UKVDL budget over the last several years. Our marketing plan will continue to assist in increasing fee income.
  - Enhance and improve test offerings and service for equine and small animal medicine.
  - Develop a national reputation as an equine diagnostic testing laboratory.
- Cost accounting initiative mandated by Vice President Tracy and Dean Cox scheduled to be completed by June 30, 2014.
- Upcoming five-year AAVLD national accreditation team visit scheduled for August 2014.
- Incentive-based budgeting model for the University of Kentucky begins in parallel mode July 1, 2014.

Future Initiatives

- Plan, fund, build, and operate a high throughput sequencing and metagenomics diagnostic laboratory section for UKVDL to assist in the identification of emerging and new pathogens related to animal disease
- Begin planning for the training of veterinary students in the LMU DVM program and effective utilization of funds generated by this project
- Complete cost accounting of UKVDL services in time for the new UK budget model implementation

- Achieve reaccreditation by the AAVLD accreditation team in 2014
- Pursue endowed funding to expand post-doctoral residency programs and applied research
- Pursue operational and maintenance funding from the Kentucky legislature to sustain the expanded UKVDL facilities
- Pursue funding to replace aging instrumentation for UKVDL laboratory sections
- Continue to explore outreach and continuing educational programs utilizing the UKVDL auditorium
- Pursue funding to plan and construct historical exhibits in the hallways of the new UKVDL administration wing

Section Reports

Bacteriology/Mycology

Dr. Erdal Erol, Mr. Steve Locke

The bacteriology/mycology section of the UKVDL receives specimens to culture for the isolation and identification of potentially pathogenic bacteria and fungi from livestock, companion and other animals. The section performs susceptibility testing on isolates for the treatment of specific pathogens to safeguard the health of animals in Kentucky and many other states. In 2013, this section began offering MIC susceptibility testing for *Clostridium perfringens*. This section performs cultures for *Taylorella equigenitalis* and *T. asinigenitalis* for the federal/state contagious equine metritis (CEM) regulatory program in equines. This section performs cultures for the National Poultry Improvement Plan and participates in annual proficiency testing and regular training. Other specialized cultures and testing techniques include anaerobic culture, mycoplasma culture, mastitis culture, and fluorescent antibody testing for leptospires and clostridia (blackleg).

Highlights

- 8,727 aerobic cultures were performed on samples submitted to the UKVDL; significant bacterial pathogens such as nocardioform bacteria, coliforms, beta-hemolytic Streptococci, Salmonella, Pasteurella, Mannheimia, Arcanobacterium, Mycoplasma and Staphylococci were found in these samples.
- 7,749 CEM cultures were performed for the CEM regulatory screening program.
- 2,624 antimicrobial susceptibilities were performed to determine the antimicrobials that could be used for their treatment in exposed animals (MIC broth microdilution method).
- 1,418 specimens were tested for leptospires by fluorescent antibody testing.
- 667 specimens were cultured for NPIP Salmonella testing. Our participation in NPIP helps poultry industry improve infectious disease control and eradication programs.
- 334 anaerobic cultures were performed with predominant focus on *Clostridium perfringens* and *C. difficile* screening.
- 312 ruminant mastitis cultures were performed, often in collaboration with Extension veterinarian Dr. M. Arnold for communication of treatment options to client.
- 194 specimens were tested for fungal pathogens.
- 90 *Clostridium chauvoei* (blackleg) tests were performed.

Virology

Dr. Erdal Erol, Ms. Kristin Pfahl

The virology section aids veterinarians and animal owners in diagnosing viral infections and treating and protecting their animals. Our section also works closely with UKVDL pathology section to examine necropsy specimens for evidence of viral infections.

This section also performs a large volume of regulatory testing for national sales and international and national movement of animals. The virology section provides information to the field veterinarians and animal owners regarding sample selection, preservation, shipping procedures, and interpretation of results.

Highlights

In this section, several thousands of fluorescent antibody (FA) tests, virus neutralization tests, ELISA tests, and virus isolation tests were performed to support Kentucky animal agriculture.

Major tests performed in virology section

Disease	Test	Number
Bovine corona virus	FA	154
Bovine respiratory syncytial virus	FA	304
Bovine respiratory syncytial virus	VN	24
Bovine rotavirus	FA	100
Bovine viral diarrhea	ELISA	1,0836
Bovine viral diarrhea	FA	815
Bovine viral diarrhea 1	VN	111
Bovine viral diarrhea 2	VN	111
Canine adenovirus	FA	28
Canine corona virus	FA	25
Canine distemper virus	FA	263
Canine herpes virus	FA	37
Canine parainfluenza 2	FA	25
Canine parvovirus	FA	117
Equine adenovirus	FA	4
Equine herpes virus 1	FA	836
Equine herpes virus 1	VN	221
Equine influenza A1	HI	35
Equine influenza A2	HI	37
Equine rotavirus	FA	21
Equine viral arteritis	VN	11,298
Feline herpes virus	FA	30
Feline infectious peritonitis	FA	61
Feline panleukopenia	FA	52
Infectious bovine rhinotracheitis	FA	418
Infectious bovine rhinotracheitis	VN	107
Parainfluenza-3 virus	FA	287
Potomac horse fever	IFA	246
Vesicular stomatitis IN	VN	753
Vesicular stomatitis NJ	VN	753
Virus isolation	VI	822
West Nile IgM capture	ELISA	122

Molecular Diagnostics

Dr. Erdal Erol

Nucleic acid–based tests are utilized to identify the presence of closely related organisms that can be differentiated, and small numbers of pathogens can be detected in complex samples. Several diagnostic PCR assays are being utilized because of their speed and specificity. This section performs several PCR, real-time PCR, and DNA sequencing assays from the specimens submitted by animal owners, veterinarians, and pathologists. This section also analyzes specimens received from the virology and bacteriology sections to obtain confirmatory diagnoses.

Highlights

- The molecular diagnostics section successfully demonstrated its ability to provide accurate, rapid, high-volume testing.
- This section became an accredited member of the USDA's National Animal Laboratory Health Network and passed several federal proficiency tests such as foot and mouth disease, classical swine fever, avian influenza and exotic New Castle disease. The membership enables this unit to actively participate in national veterinary disease surveillance and provide rapid coordinated diagnostic response in the event of future outbreaks within the veterinary industry.
- This section was involved in the planning and development of an interlaboratory comparisons of equine herpesvirus 1PCR in North American eiagnostic facilities. Molecular section also participated in this ring trial.
- A real-time PCR assay for Potomac horse fever, an important enteric disease of horses, was developed, validated, and offered to the equine industry in 2013.
- The section tested several thousands of molecular tests; the major tests are listed in the following table.

Major tests performed in molecular diagnostics section

Test	Number
Bovine viral diarrhea	57
Calf diarrhea panel	117
Equine herpes virus-1 (EHV-1)	1071
Equine herpes virus (HV-1 pathotyping)	32
Equine herpes virus-2	85
Equine herpes virus-4	138
Equine herpes virus-5	52
Equine influenza	200
Lawsonia intracellularis	170
Johne's disease	65
Potomac horse fever	494
Rhodococcus equi	32
Salmonella spp.	573
Streptococcus equi	511
Tritrichomonas foetus	77
West Nile virus	41

General Pathology

Neil M. Williams

The UKVDL pathology section is composed of seven faculty pathologists, a staff laboratory animal pathologist, two post-doctoral scholars (pathology residents), four histology technicians, four full-time necropsy technicians, and three part-time necropsy student workers. The pathologists perform complete necropsy examinations on animals, histopathology on necropsy cases, surgical biopsies, and cytological examinations, all submitted by veterinarians, producers, and pet owners. The pathologists are supported by the other laboratory sections. As part of the comprehensive necropsy examination, additional laboratory tests are ordered by the pathologist to aid in confirming a diagnosis. The abnormal findings on necropsy are correlated with other laboratory tests, including microscopic examination of the tissues, and a comprehensive report is prepared for every pathology case. Utilizing the abundant cases submitted to the VDL and the faculty expertise, post-doctoral scholars (DVM) are trained in veterinary anatomic pathology in a three-year program. Visiting senior veterinary students have extern rotations, and surgical residents visit to fulfill the pathology requirement for the American College of Veterinary Surgeons.

Necropsy

Postmortem examinations (necropsies) are conducted on animals submitted to the VDL to identify any pathologic changes in the tissues that would indicate disease, injury, toxicosis, or any other abnormal process resulting in illness.

Necropsy cases

Species	Number
Avian	79
Bovine	805
Caprine	104
Equine	1,457
Ovine	87
Porcine	18
Small animal	313
Miscellaneous	28
Laboratory animal	244
TOTAL	3,147

Histopathology

Tissues are prepared and processed to produce glass slides for microscopic examination conducted by the pathologists. Tissues from the necropsy and surgical biopsy cases were processed and 34,182 microscopic slides produced. In addition to the routine hematoxylin and eosin stained tissue sections, special and immunohistochemical stains were done, resulting in 1,970 slides produced for the purpose of identifying microscopic organisms/agents that may cause disease or tissue antigens that define or identify cell structures.

Biopsy

Abnormal areas or lesions are often removed surgically or portions biopsied from live animals and sent to the laboratory for determination of the type of process, recommended treatment, and potential prognosis. These tissue specimens are processed and microscopic slides prepared for the pathologists to examine by microscopy. Tissue specimens representing 3,466 cases were processed and examined. A report with diagnosis was produced for each case. Typical turn-around on these cases is 24 to 48 hours.

Cytology

Preparations of cells harvested from abnormal lesions or abnormal fluids are placed on microscopic slides and stained for examination under the microscope by the pathologists. Cytopathological examinations were performed, diagnoses made, and reports generated for 444 cases.

Research Animal Pathology

Kathyrn (Casey) Coyle

The research animal pathology service sees mostly small rodents with occasional dogs, rabbits, nonhuman primates, and pigs. More than 256 submissions were received from research animals during 2013, including clinical pathology samples, biopsies, and necropsies. In addition to research animal work, Dr. Coyle handles the diagnostic pathology caseload for the agricultural research animals housed at the various UK farms.

Quality Control/Quality Assurance

Mary Harbour

The goal of the quality assurance program is to ensure quality results and continuous improvement of service to clients. The design of the program is on based American Association of Veterinary Diagnostic Laboratory (AAVLD) requirements, International Standards Organization (ISO) guidelines, and Organization of International Epizootics (OIE). The UKVDL quality program also helps fulfill the university's mission of improving service delivery while achieving excellent human relations (internally and externally), sound leadership, and effective communications. The requirements for maintaining the quality system and management practices are continuously updated. To maintain conformance to all requirements, the QA manager attended Quality Assurance and Quality Management Training sponsored by USDA/NAHLN at the annual AAVLD meeting.

In addition to the continuous improvement of service, the quality assurance section implemented new quality system software, Q-Pulse. This software will improve document control, equipment inventory, and other aspects of the Quality Program. Quality Assurance will continue to monitor and update policies and procedures to meet the AAVLD requirements. The quality assurance section is currently preparing for the AAVLD accreditation team visit scheduled for August 2014. Weekly meetings are held with section chiefs to track quality and completeness of standard operating procedures for their sections.

Ruminant Extension

L. Michelle Arnold

The ruminant Extension veterinarian specializes in recognition of disease and tailoring specific prevention and control strategies to improve animal health, including being acutely aware of problems as they occur at the diagnostic laboratory and pushing this information out to veterinarians, Extension agents, and producers quickly where it can make a difference in the field. Ultimately, this practice results in high quality Kentucky meat and milk, increased production, and greater profitability through open communication with food animal veterinarians, county Extension personnel, producers, state and federal authorities, and university faculty and staff in a progressive and responsive manner. Current health topics, including disease risk and occurrence, diagnosis, treatment, prevention, and control, form the core of the information disseminated. Knowledge generated from university research, governmental directives, and other stakeholder contributions are also gathered centrally then communicated broadly for discussion and action to ultimately benefit producers throughout Kentucky.

Highlights

- Updated and presented the herd health portion of Master Cattlemen in six regions and one Master Grazer session. These programs directly affected approximately 250 farming enterprises.
- Participated in the Master Cattlemen Field Day demonstrating techniques to age cattle by dentition (teeth) and proper injection techniques, Versailles, Kentucky.
- Hosted two well-attended food animal veterinary continuing education meetings at the diagnostic laboratory (UKVDL) and one at the Breathitt Veterinary Center (BVC). A total of 21 hours of continuing education was made available to food animal veterinarians at no cost to them. Outside sponsors covered the costs of the events. The winter CE meeting at the UKVDL was sponsored by Novartis and Merial Animal Health. Forty-three food animal veterinarians attended the winter meeting. A summer meeting was held at the Breathitt Veterinary Center in June. Elanco sponsored the event that was attended by 29 food animal veterinarians from the western portion of the state. The final CE meeting was held in August at the UKVDL and was sponsored by Zoetis Animal Health. Attended by 53 veterinarians.
- Co-sponsored the Small Ruminant Grazing Conference in Morehead that drew 57 participants despite adverse weather conditions. This conference strives to recruit top national speakers in small ruminant topics to keep producers on the forefront of grazing issues as they pertain to sheep and goats. Each year this conference changes to a different location in Kentucky to reach producers in all areas of the state.
- Worked with the Madison County Extension intern on the development and implementation of a pinkeye research project conducted throughout the summer of 2013.
- Served as a non-voting member on the graduate committees for two students in the UK dairy section, both of whom received their masters degrees in 2013.

- Continued to teach the health portion of the undergraduate classes in beef and dairy science and to offer a veterinary lecture to the careers class.
- Continued development of the new Extension program called Improving Reproductive Efficiency in Beef Cattle in Northern Kentucky with Drs. Les Anderson, Jeff Lehmkuhler, and Darrh Bullock. Several meetings were held as well as a field day targeting reproductive issues exclusively.
- Developed and delivered an Extension agent informational meeting about animal disease traceability via internet (Microsoft Lync) to keep Extension personnel abreast of new regulations regarding animal identification.
- Provided a statewide Lync session on the basics of beef herd health.
- Served as chairperson of the committee formed to rewrite the herd management section for the *Southern Dairy Resource Manual.* This revision involved updating information from the previous manual and changing it to a web-based format with links to relevant pages of information.
- Participated in numerous field days, producer meetings, and farm visits throughout the state to educate producers in best management practices as well as to identify existing problems and find ways to promote prevention through realistic on-farm changes.
- Worked closely with the state veterinarian's office to inform producers of the new animal disease traceability regulations.
- The ruminant Extension veterinarian was instrumental in educating producers, Extension personnel, and veterinarians about the new federal directives regarding the judicious use of antibiotics (Guidances 209 and 213). This new government strategy will affect the way antibiotics administered through the feed or water are sold to the public and the labeled indications for these products. Attended the only FDA meeting in the Eastern U.S. soliciting public dialog and feedback regarding these new initiatives.
- Took over as the attending IACUC veterinarian for the UK swine unit.
- Continue to expand the database of food animal veterinarians that will allow rapid communication in the event of an animal emergency situation or disease outbreak. This database is continually updated with email addresses and cell phone numbers to enhance the speed of communication and currently contains approximately 400 veterinarians.
- Participated in conference calls, meetings, and program development with the multi-state committee funded by the Southeast Quality Milk Initiative (SQMI) grant. This is a multi-state grant including six southeastern land-grant institutions for 3 million dollars over a 5-year funding period that began in February. Also attended the two-day Quality Milk Production Seminar at the American Association of Bovine Practitioners Convention to develop a program to teach the most current approach to practical milk quality for southeastern dairy practitioners.

Kentucky veterinarians, Extension agents, producers, government entities, and the university benefit from a strong livestock sector of which health is a major consideration. In 2013, this position reached each of these groups of stakeholders for the overall improvement of livestock health and sustainability of the food animal veterinary profession.

Serology

Meg Steinman

The mission of the serology section is to provide accurate and timely results for both diagnostic and regulatory testing. The results generated provide veterinarians and regulatory personnel with data upon which to base their decisions. This section also performs testing for movement of animals within the United States and for international export purposes. In 2013 staff from this section attended training for poultry testing. This section offers a wide variety of tests by various types of methodologies; the tests and numbers listed below are just a sampling.

Poultry

This section participates in annual audits to maintain status as a National Poultry Improvement Plan (NPIP)–approved laboratory. Personnel from this section attended NPIP-approved training course covering avian influenza. In 2013 the serology laboratory tested 5,443 samples for antibody to avian influenza; 18,448 samples for antibody to *Salmonella pullorum*; 22,167 samples for antibody to both *Mycoplasma gallisepticum*, and *Mycoplasma synoviae.*

Equine

This section successfully passed the USDA-APHIS inspection to continue to offer equine infectious anemia (EIA) antibody testing and piroplasmosis testing. In 2013, we ran 19,077 EIA tests. The serology section continues to monitor equines moving through the state stockyards for EIA antibody, testing 3,469 specimens. All employees of this section passed the required NVSL proficiency testing for piroplasmosis testing (*Babesia caballi* and *Theileria equi*) and tested 4,137 specimens for antibodies to *Babesia caballi* and 2,091 specimens for *Theileria equi*. We tested 1,155 serum samples for antibody to contagious equine metritis (CEM-CF). Serology also performs antibody screening tests for leptospira in equines for diagnostic and regulatory purposes. (In 2012, we tested approximately 6,000 serums.)

Bovine

The serology section offers a variety of antibody tests performed on serum from bovines and other ruminant species. In 2013 we tested 253 specimens for antibodies to *Anaplasma marginale*; 87 specimens for antibody to bluetongue virus; 188 specimens for antibodies to the bovine leukemia virus; 1,317 serums for Johne's (*Mycobacterium paratuberculosis*) antibodies; approximately 400 samples for leptospira antibodies; and 307 specimens for antibody to *Neospora caninum.* This lab is also active in regulatory screening for antibodies to *Brucella abortus.*

Small ruminants

The serology section runs testing on small ruminants, including 57 tests for *Brucella melitensis* and 285 for small lentivirus virus antibody.

Canine and feline

This section offers a variety of tests on dogs and cats. A few examples of the testing done in 2013 include 119 tests for antibodies to histoplasmosis and 129 samples for antibodies to blastomyces. Serology also offers ***Brucella canis*** testing, an important test for breeding, and tested 47 samples.

Porcine

This section also offers testing for swine. In 2013 we tested 154 samples for pseudorabies and Brucella antibodies.

Toxicology

Cynthia L. Gaskill

The primary mission of the toxicology section at the UKVDL is to provide toxicological diagnostic testing capabilities and consultations to Kentucky veterinarians, UKVDL pathologists and residents, county Extension agents, livestock producers, pet owners, state officials, and others. A large variety of toxicological tests are available through the toxicology section, including assays for metals and minerals; organic compounds including a multitude of pesticides, drugs and other chemicals; biological toxins such as plant, insect, bacterial, and fungal toxins; and numerous other toxicants. Tests are performed on tissues, gastrointestinal contents, biological fluids, baits, feed, forages, water, soil, and many other substances.

Consultation services include assistance with therapeutic advice, differential diagnoses, residue considerations, toxicological risk assessments, determination of appropriate tests, appropriate sample collection and submission recommendations; interpretation of analytical results, and other general toxicological information. Dr. Gaskill also provides the state veterinarian's office with alerts, updates, and toxicological information regarding cases of poisoning or contaminated animal feeds diagnosed at the UKVDL. In 2013, Dr. Gaskill provided over 1,500 toxicological consultations.

The toxicology section personnel consist of Dr. Cynthia Gaskill, DVM Ph.D., clinical veterinary toxicologist and section head; Dr. Lori Smith, Ph.D., senior analytical chemist; Michelle Helm, B.Sc., chemist/technician; and several student interns.

Highlights

- The toxicology section handled a number of herd food animal poisoning cases involving unusual chemical toxicants. We worked in cooperation with the Kentucky state veterinarian's office, the USDA FSIS, the EPA, and the FDA on these cases. We provided analyses of blood, tissues, and feeds to evaluate herd animals for evidence of exposure, source, and tissue residues to assist the state veterinarian with quarantine/withholding time decisions, and we provided toxicological information related to toxicokinetics, environmental considerations, treatments, and other considerations. For a number of these cases, the chemist developed specialized testing procedures, and the toxicologist worked closely with authorities at USDA FSIS to establish acceptable analytical parameters and interpretations. Because the state of Kentucky does not have a meat safety testing laboratory, analyses for chemical contaminants in food-producing animals often falls to the UKVDL to help ensure a safe human food supply. Our work helped prevent several herds from being unnecessarily destroyed.
- The toxicology section was awarded a large nationally competitive FDA Vet-LIRN program grant totaling $500,000 over five years. This funding provides support for instrumentation, personnel, and supplies to develop analytical methods and complete inter-laboratory validation studies for the FDA for analytical testing of contaminated feeds. New LC-MS/MS instrumentation leased using funds from this grant will be used for diagnostic purposes in addition to method development and validations for the FDA, and hence will enable the toxicology section to provide new and updated diagnostic methods.
- Successful renewal of a smaller FDA Vet-LRN grant shared with microbiology that helps fund support for the diagnostic operations of the laboratory, including instrumentation maintenance costs, student labor, and supplies associated with increased analyses in large-scale events of contaminated animal feeds. The grant totals $82,500 over five years.
- We were awarded USDA ARS SCA funding totalling $69,000 over three years to investigate tall fescue associated intoxication in livestock.
- We hosted four student interns for the Forensic Science internship program at Eastern Kentucky University, three M.Sc. graduate students from UK and EKU, and several student observers from programs such as Kentucky Equine Management and Morehead Vet Tech internship programs.
- We continued to provide forage ergovaline analyses for the University of Kentucky Horse Pasture Evaluation program, veterinarians, Extension agents, and producers.
- The toxicology section continued participation in several proficiency testing programs to ensure quality results.

The UKVDL toxicology section participated in several research projects directly applicable to improvements in diagnostic offerings. Funding for some of these projects helps support instrumentation and labor used also for diagnostic purposes. A few of the 2013 projects include:

- Evaluation of Kentucky barn owls for evidence of chemical contaminations
- Investigations into the effects of harvest, transport, storage, and processing conditions on ergovaline analyses of tall fescue
- Serum cobalt concentrations in Thoroughbred and Standardbred race horses
- Method development for toxic metal analyses in eggs (lead, arsenic, mercury, others)
- Development of LC-MS/MS methodology for quantitation of anticoagulant rodenticides in feeds and tissues

- Optimization of cadmium reductor methodology for nitrate quantitation in forages
- New methods for rapid field analysis for cyanide in forages

Research findings, methods, continuing education programs, seminars, and other scientific information were presented at numerous meetings and conferences, including:

- American Academy for Veterinary and Comparative Toxicology annual meeting and retreat, San Diego and Davis, California
- American Association of Veterinary Laboratory Diagnosticians annual meeting, San Diego, California
- American Chemical Society National meeting, Indianapolis, Indiana
- American Forage and Grassland Council Annual Conference, Covington, Kentucky
- International Grassland Congress, Sydney, Australia
- Kentucky Breeder's Short Course, Lexington, Kentucky
- Eastern Kentucky University Department of Chemistry Seminar Series, Richmond, Kentucky
- Bourbon County Farm Field day, Bourbon County, Kentucky
- Bourbon County Horticulture Poisonous Plants Seminar, Paris, Kentucky
- University of Kentucky Agricultural Biotechnology Program Seminar Series, UK, Lexington, Kentucky

In 2013, the toxicology section provided approximately 1,500 diagnostic toxicological analyses, with many cases involving multiple samples such as forage and feed samples, tissues, body fluids, baits, and other samples, and often involving multiple animals and multiple tests per case. The most common tests requested in 2013 were GC/MS analyses of blood, tissues, GI contents, and other samples for specific organochlorine pesticide compounds; ergovaline analyses of fescue forages; metal and mineral quantifications in samples such as liver, kidney, and serum; nitrate analyses in ocular fluid from aborted fetuses; screening of rumen and stomach contents for organic compounds; and serum cobalt analyses.

Epidemiology

Jacqueline L. Smith

The UKVDL epidemiology section plans and conducts veterinary epidemiological research experiments that lead to the earliest detection of animal disease outbreaks, with our primary mission being to provide animal disease surveillance and to assist veterinarians in the investigation of serious and unusual disease problems. Daily monitoring of finalized necropsy and lab testing data streams provide near real-time disease cluster analysis.

The section also conducts data acquisition and statistical analysis in support of the office of the state veterinarian and the USDA and provides animal health situational awareness for industry stakeholders. Many of these studies lead to publication in peer-reviewed journals and lay publications. Disease reporting to the state veterinarian (reportable infectious diseases, diseases of interest, emergency disease notification) is performed weekly for the typical endemic diseases; unusual or emergency disease situations are reported immediately. In-depth field investigations to better characterize disease outbreaks for identifying causative etiology through the collection of diagnostic specimens and recommending diagnostic testing are provided free of charge to any farm/producer in the state of Kentucky at the request of a local client with the approval of the UKVDL administration.

Highlights

- Conducted 418 telephone consultations to clients requesting suggestions, recommendations, and information related to animal health issues
- Responded to 213 statistical requests from UKVDL faculty, state and federal officials, local veterinarians, and other UK faculty (1–10 hrs each)
- Responded to 171 graphics requests (2–10 hrs each)
- Sent 52 weekly reportable disease reports (approximately 1 hour per week)

Educational Updates

- Epidemiology's graduate student from the University of Kentucky School of Public Health, Azia Routson, has been accepted as part of the inaugural class at the Lincoln Memorial University School of Veterinary and Comparative Medicine.
- Former epidemiology section analyst Randy Stepusin has completed his DVM at Auburn University and is now practicing in Pennsylvania.

Research Projects in Progress

- Continuous health monitoring of cattle, Dr. Craig Carter, Dr. Jackie Smith
- Animal disease cluster detection, Dr. Craig Carter, Dr. Jackie Smith
- U.S. Leptospirosis sero-epidemiological survey, Dr. Craig Carter, Dr. Noah Cohen, Dr. Jackie Smith, Ms. Meg Steinman, Dr. Erdal Erol

Kentucky Agricultural Experiment Station Projects

Hatch, McIntire-Stennis, and Animal Health projects for calendar year 2013, as reported in the USDA Current Research Information System (CRIS) database, follow.

Agricultural Economics

A Comprehensive Study of Kentucky's Equine Industry—*Stowe, C.; Rossano, M.; Coleman, R.; Davis, A.*
Agricultural and Rural Finance Markets in Transition (NC1014, NC221, NCT-194)—*Katchova, A.*
Assessing the Consumer Behavior, Market Coordination, and Performance of the Consumer-oriented Fruit and Vegetable Sector—*Woods, T.A.*
Economic Impacts of International Trade and Domestic Policies on Southern Agriculture—*Reed, M.*
Environmental Impacts of Equine Operations—*Stowe, C.*
Family Firms and Policy in Times of Disruption (NC1030)—*Robbins, L.W.*
Food Safety Incidents and the Food Supply Chain: The Impacts on Consumers and Producers and the Strategic Response of Supply Chain Managers and Food Industry Leaders—*Saghaian, S.H.*
Nanotechnology and Biosensors—*Hu, W.*
The Economics of Precision Agricultural Machinery Management—*Dillon, C.*
Whole Farm Dairy and Beef Systems: Gaseous Emissions, P Management, Organic Production, and Pasture Based Production—*Kusunose, Y.*

Animal and Food Sciences

Characterization of Carbon-centered Free Radicals in Food Proteins—*Boatright, W.*
Diet and Vascular Endothelial Cell Function—*Hennig, B.*
Enteric Diseases of Food Animals: Enhanced Prevention, Control, and Food Safety—*Newman, M.*
Factors Affecting Phosphorus Concentrations and Phosphorus Digestibility in Pasture Herbage Consumed by Grazing Animals—*Lawrence, L.*
Factors Affecting Small Intestinal Carbohydrate Assimilation in Beef Cattle—*Harmon, D.L.; McLeod, K.R.*
Factors Regulating Muscle Protein Synthesis and Accretion in Horses—*Urschel, K.L.*
Fate of Antioxidant Peptides and Proteins in Food Processing—*Xiong, Y.L.*
Genetic Selection and Crossbreeding to Enhance Reproduction and Survival of Dairy Cattle—*McAllister, A.J.*
Improving the Sustainability of Livestock and Poultry Production in the United States—*Cromwell, G.L.; Grove, J.*
Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production Systems—*Matthews, J.C.*
Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises (Rev. NC-1119)—*Bewley, J.M.*
Mastitis Resistance to Enhance Dairy Food Safety—*Bewley, J.M.*
Metabolic Relationships in Supply of Nutrients for Lactating Cows—*McLeod, K.R.*
Methods to Increase Reproductive Efficiency in Cattle—*Silvia, W.J.*
National Animal Nutrition Program—*Cromwell, G.L.*
Nutritional Systems for Swine to Increase Reproductive Efficiency—*Lindemann, M.*
Ovarian Influences on Embryonic Survival in Ruminants—*Bridges, P.J.*
Rapid Assay Probe Technologies and Media for Monitoring Flora in Foodstuffs—*Hicks, C.L.*
Species-specificity in Carboxymyoglobin Redox Stability—*Suman, S.P.*
Use of a Carbohydrate-based Toxin Adsorbent Supplement Provided through a Mineral Carrier to Alleviate Endophyte Toxicosis in Beef Cows and Calves Grazing Tall Fescue—*Ely, D.*

Biosystems and Agricultural Engineering

Agricultural Safety and Health Research and Extension—*Purschwitz, M.A.*
Development of an Algae-based System for CO_2 Mitigation—*Crofcheck, C.L.; Montross, M.D.*
Development of Stream Assessment Tools and Riparian Corridor Techniques for Enhancing Water Quality in Karst Watersheds in Central Kentucky—*Agouridis, C.T.; Warner, R.C.*
Engineering for Food Safety and Quality—*Payne, F.A.*
Integrated Systems Research and Development in Automation and Sensors for Sustainability of Specialty Crops—*Dvorak, J.*
Marketing and Delivery of Quality Grains and BioProcess Coproducts—*Montross, M.D.; McNeill, S.G.*
Modeling for TMDL Development and Watershed Based Planning, Management, and Assessment—*Edwards, D.R.*
Standardized Testing for Global Navigation Satellite System Technology—*Stombaugh, T.*
Stream/Aquifer Interface: Understanding the Riparian Corridor—*Workman, S.R.*
The Science and Engineering for a Biobased Industry and Economy—*Nokes, S.E.; Lee, C.; Crofcheck, C.; Montross, M.*

Community and Leadership Development

A Framework for Secondary Schools Agriscience Education Programs that Emphasizes the STEM Content in Agriculture—*Hains, B.*
Agricultural Education Research—*Hains, B.*
Interactions of Individual, Family, Community, and Policy Contexts on the Mental and Physical Health of Diverse Rural Low-Income Families—*Dyk, P.*
Renewing an Agriculture of the Middle: Value Chain Design, Policy Approaches, Environmental, and Social Impacts—*Tanaka, K.*

Entomology

Bed Bug Biology and Behavior—*Haynes, K.*
Biological Control in Pest Management Systems of Plants—*Harwood, J.D.*
Biological Control of Arthropod Pests and Weeds—*Yeargan, K.V.*
Biological Improvement of Chestnut through Technologies that Address Management of the Species, Its Pathogens and Pests—*Rieske-Kinney, L.K.*
Biology and Management of Insects Attacking Turf and Woody Landscape Plants—*Potter, D.A.; Redmond, C.T.*
Biology, Ecology, and Management of Emerging Disease Vectors—*Dobson, S.L.*
Biology, Impact, and Management of Soybean Insect Pests in Soybean Production Systems—*Yeargan, K.*
Defining and Utilizing Selected Molecular Features of Insect Viruses—*Webb, B.A.*
Delineation of Structural Complexity in Above and Belowground Forest Food Webs—*Harwood, J.D.*
Ecology and Management of European Corn Borer and Other Lepidopteran Pests of Corn—*White, J.A.*
Effects of Prey Biodiversity on Pest Regulation by Generalist Predators—*Harwood, J.D.*
Exotic Organisms Interact to Influence Persistence of a Native Species: Potential Interplay between the Asian Chestnut Gall Wasp and Its Chestnut Hosts—*Rieske-Kinney, L.K.*
Genomic and Metagenomic Analyses of a Wood-feeding Cockroach, ***Cryptocerus punctulatus***—*Zhou, X.*
Genomic Approaches to Analyses of Immune-suppressive Genes of the ***Campoletis sonorensis*** Polydnavirus—*Webb, B.A.*
Improving Management of Insects of Public Health Significance in Kentucky—*Brown, G.C.*
Inbreeding Depression in Mating Biology Following Population Bottlenecks in a Storage Pest—*Fox, C.W.*
Interactions of Emerging Threats and Bark Beetle–Microbial Dynamics in Forest Ecosystems (from W1187)—*Rieske-Kinney, L.*
Invasive Species and Biological Control: The Role of Facultative Inherited Bacterial Symbionts—*White, J.A.*
Molecular Analysis of Juvenile Hormone Action in the Red Flour Beetle, ***Tribolium cataneum***—*Palli, S.S.*
Phylogeny and Biodiversity of Hymenopteran Biological Control Agents—*Sharkey, M.*
Quantifying the Effect of Habitat Structure on Biological Control—*Harwood, J.D.*
Systematics, Taxonomy, Biodiversity, and Food Web Interactions of Ichneumonidae (Insecta: Hymenoptera)—*Sharkey, M.; Chapman, E.*

Forestry

Distribution and Ecology of the North American River Otter (***Lontra canadensis***) in Kentucky—*Lacki, M.J.*
Evaluating the Use of Light Detection and Ranging (LIDAR) Information to Improve Forest Management Decisions—*Contreras, M.*
Forest Management and Foraging Habitat of Bats Vulnerable to White-nose Syndrome—*Lacki, M.J.*

Multiscale Approaches to Investigate the Effects of Various Anthropogenic Disturbances on Stream-inhabiting Amphibians and Reptiles—*Price, S.*
Participation of Kentucky Woodland Owners in the Woody Biomass Market—*Stainback, G.A.*
Silvicultural Approaches to Enhance the Resiliency of Oak-dominated Forests to Disturbance—*Lhotka, J.*
Use of Underplanting to Enhance the Health and Sustainability of Oak Dominated Ecosystems in Kentucky and the Central Hardwood Region—*Lhotka, J.; Stringer, J.*
Using Remotely-sensed Data to Evaluate Post-fire Vegetation and Fuel Dynamics in Central and Appalachian Hardwood Forests—*Arthur, M.A.*

Horticulture

Arthropod Resistance of *Lycopersicon hirsutum* LA2329, a Wild Relative of Tomato—*Snyder, J.C.*
Chemical Genetic Dissection of Plant Cellulose Synthesis—*DeBolt, S.*
Chloroplast-localized Co- and Post-translational Processing Enzymes: Essential Determinants of Protein Maturation—*Houtz, R.L.*
Defining the Role(s) of Plant Sorbitol Dyhydrogenase—*Archbold, D.*
Developing Optimized Organic Production Systems for Cucurbits and Apples—*Williams, M.*
Environmental and Genetic Determinants of Seed Quality and Performance (from W1168)—*Downie, A.B.; Geneve, R.L.; Perry, S.; Baskin, C.*
Identification and Predicting LEA Protein Interacting Proteins—*Downie, A.B.*
Identifying the Biophysical, Biochemical, Environmental, and Genetic Factors Associated with Seed Development, Dormancy, Germination, and Establishment of Eastern Gamagrass—*Geneve, R.L.*
Improving Economic and Environmental Sustainability in Tree-fruit Production through Changes in Rootstock Use—*Archbold, D.*
Multi-state Evaluation of Wine Grape Cultivars and Clones—*Archbold, D.*
Quantifying the Linkages among Soil Health, Organic Farming, and Food—*Jacobsen, K.*
Regulation of Expression and Activity of Sorbitol Dehydrogenase in Apple—*Archbold, D.*
Sustainable Practices, Economic Contributions, Consumer Behavior, and Labor Management in the U.S. Environmental Horticulture Industry—*Ingram, D.L.*
Water Management and Quality for Ornamental Crop Production and Health—*Dunwell, W.*

Human Environmental Sciences

EFNEP Related Research, Program Evaluation, and Outreach—*Forsythe, H.E.*
The Influence of Social Media on Attendee Behavior—*Lu, Y.*

Plant and Soil Sciences

A Comparison of Soil Seed Bank Dynamics of Herbicide Resistant and Nonresistant Amaranthus Species—*Baskin, C.*
Breeding and Genetics of Forage Crops to Improve Productivity, Quality, and Industrial Uses—*Phillips, T.D.*
Characterizing Mass and Energy Transport at Different Vadose Zone Scales (from W1188)—*Wendroth, O.*
Complementary Approaches to Developing Scab Resistant Wheat Varieties—*Van Sanford, D.A.*
Cooperative Variety Testing Programs—*Van Sanford, D.A.*
Design, Assessment, and Management of Onsite Wastewater Treatment Systems: Addressing the Challenges of Climate Change—*Karathanasis, A.D.*
Development of External Regulation of Transgenic Traits in Crop Plants—*Davies, H.*
Ecophysiological Aspects of Forage Management—*McCulley, R.L.*
Effect of Urease Inhibitors on Volatile N Loss from Soil and Other N Transformations—*Coyne, M.S.*
Environmental and Genetic Determinants of Seed Quality and Performance—*Perry, S.*
Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems (from W1082)—*D'Angelo, E.M.*
Functional Metagenomic Analysis of Soil-dwelling and Plant-associated Microbial Communities—*Moe, L.A.*
Genetic Control of Pod Shattering in Soybeans—*Zhu, H.*
Hydropedology: Genesis, Properties, and Distribution of Hydromorphic Soils—*Karathanasis, A.D.*
Improving the Sustainability of Livestock and Poultry Production in the United States—*Grove, J.*
Influence of Tall Fescue Cultivar and Endophyte Genotype Combinations on Root System Architecture, Exudate Composition, and Soil Biogeochemical Processes—*McNear, D.*
Messenger RNA 3 Prime End Formation in Plants—*Hunt, A.G.*
Molecular Genetic Analysis of a Novel Feedback Inhibition Mechanism in the Cytokinin Response Pathway—*Smalle, J.S.*
Nitrate-dependent Iron (II) Oxidation in Soils—*Matocha, C.*
Nitrogen Cycling, Loading, and Use Efficiency in Forage-based Livestock Production Systems (formerly NCT-196 and NC-189)—*Goff, B.*
Performance of Small Grain Varieties in Kentucky—*Van Sanford, D.A.; Bruening, W.P.*
Plant Genetic Resources Conservation and Utilization—*Phillips, T.D.*
Positional Cloning and Characterization of RCT1, an Anthracnose Resistance Gene in Medicago—*Zhu, H.*
Precision Conservation with Geospatial Technologies—*Mueller, T.G.; Shearer, S.A.*
Reduction of Tobacco-specific N-nitrosamines (TSNA) in Dark Tobaccos—*Bailey, W.A.*
Regulation of Gene Expression during Plant Embryogenesis—*Perry, S.E.*
Soil Survey Characterizations and Interpretations for Kentucky Soils—*Karathanasis, A.D.*
Triacylglycerol Biosynthesis in Soybeans—*Hildebrand, D.*
Turfgrass and the Environment—*Barrett, M.*
Turfgrass Management Practices in Kentucky—*Williams, D.W.; Powell, A.J.*
Unraveling the Catalytic Specificity of Terpene Hydroxylases and Engineering Sesquiterpene Hydroxylation in Plants—*Chappell, J.*

Plant Pathology

Cellular and Molecular Biology of Plant Rhabdoviruses—*Goodin, M.M.*
Characterization of Resistance Gene-mediated Signaling and Role of Oleic Acid and Glycerol 3-Phosphate in Plant Defense—*Kachroo, P.*
Dissecting Defense Signaling Pathways in Soybean and Arabidopsis—*Kachroo, A.*
Elucidating and Manipulating Alkaloid Biosynthesis Pathways in the Plant-symbiotic Epichloe and Neotyphodium Species of Fungi—*Schardl, C.*
Genes Controlling Invasive Growth in the Rice Blast Fungus *Magnaporthe oryzae*—*Farman, M.L.*
Molecular Biology of the Interaction between Corn and Corn Stalk Rot Fungi—*Vaillancourt, L.J.*
Mycotoxins: Biosecurity, Food Safety, and Biofuels Byproducts (NC129, NC1025)—*Vaillancourt, L.J.*
New Strategies to Induce Resistance against Tombusviruses Based on Host Factors—*Nagy, P.*
Population Dynamics and Fitness Roles of Host Specificity Genes in the Fungus *Magnaporthe oryzae*—*Farman, M.L.*

Veterinary Science

A Novel Dimorphic Fungus as an Emerging Cause of Reproductive Losses in Mares and Other Livestock—*Swerczek, T.W.*
Computational Methods for mRNA Transcriptome from RNA-Seq Data—*MacLeod, J.N.*
Control of Equine Gastrointestinal Parasites: Immunology, Host Genetics, and Drug Resistance—*Nielsen, M.*
Control, Transmission, and Prevalence of Natural Infections of Internal Parasites of Equids and Ruminants—*Lyons, E.T.*
Equine Infectious Anemia Virtue Detection and Control in Equid Populations—*Issel, C.J.; Cook, R.E.; Cook, S.J.*
Genetic Basis of Attenuation of the T953 Strain of EHV-1 and Development of a Genetically Defined Live Attenuated Equine Herpesvirus-1 Vaccine—*Balasuriya, U.*
Identification of Surface Proteins of *Streptococcus equi* with Potential in Vaccine Development—*Timoney, J.*
Interactions of Equine Viral Pathogens with the Equine Innate Immune System—*Chambers, T.M.; Horohov, D.W.*
Interferon Gamma Regulation in the Foal—*Horohov, D.W.*
Investigation of *Sarcocystis neurona* Genes Involved in Parasite Survival and Pathogenesis—*Howe, D.K.*
National Animal Genome Research Program—*Bailey, E.*
Reference Standards, Internal Standards, and Critical Reagents/Regulatory Analytes for Analytical/Toxicological Approaches to Problems in Equine Medicine—*Tobin, T.*
Studies on Regulation of Reproduction in the Horse—*Ball, B.*
The Immunological Basis for *Rhodococcus equi* Susceptibility in the Foal—*Horohov, D.W.*
Vasomodulatory Effects of Endophyte Infected Tall Fescue in Horses—*McDowell, K.; Lawrence, L.; Bush, L.*

Collegewide Extramural Funding

This information, generated from the Office of Sponsored Projects Administration database, includes any award with a start date within the reporting period (January 1, 2013–December 31, 2013) and any budgetary addition or reduction to existing projects processed within the reporting period. The grant is listed under the department of the principal investigator.

4-H Central Operations

Total—$86,625

Engaging Youth, Serving Communities 11, National Four H Council, $25,000—*Mains, M.*
National Guard Youth Camp, Kentucky Army National Guard, $61,625—*Fox, D.*

Agricultural Economics

Total—$617,629

CEDIK Scholarship Program for Appalachian Health Care Career Students, New York Community Trust, $138,000—*Davis, A.*
Economic Analysis of Commercial Aquaponic Production Systems, University of Georgia, $9,975—*Woods, T.; Heidemann, K.*
Evaluating the Economic Impact of MarketReady, University of Arkansas, $10,042—*Woods, T.*
Farm Business Management and Benchmarking: Kansas, Illinois, and Kentucky Collaboration, Kansas State University, $72,388—*Katchova, A.*
Fellowship for Karen Rignall: Assessing Poverty Dynamics in an Arid Agrarian Context, National Science Foundation, $208,569—*Kusunose, Y.*
Implement Plan of Work for So. SARE PDP Program, University of Georgia, $31,345—*Meyer, A.*
ReadyCommunity Stage Two, National Institute of Food and Agriculture, $104,460—*Davis, A.; Garkovich, L.*
So. SARE–PDP program, Program Assistant, University of Georgia, $22,000—*Meyer, A.*
So. SARE Model State Program—Training Funds, University of Georgia, $10,000—***Meyer, A.***
UK CEDIK Health Economic Analysis, Kentucky Department for Public Health, $2,500—*Davis, A.*
USDA SARE Fellows Spring 2013 Tour to Kentucky, University of Wyoming, $8,350—*Meyer, A.*

Agricultural Programs

Total—$323,840

EDEN Strengthening Community Agrosecurity Preparedness (S-CAP) Workshop Update, Purdue University, $41,323—*Higdon, A.; Dwyer, R.; Newman, M.*
Improving Whole Community Animal and Agriculture Preparedness, National Institute of Food and Agriculture, $76,016—*Higdon, A.; Dwyer, R.; Newman, M.; Pickens, C.*
Kentucky AgrAbility, National Institute of Food and Agriculture, $162,000—*Hancock, J.; Purschwitz, M.*
Multi-jurisdictional Coordination Functional Exercise, Animal and Plant Health Inspection Service, $44,501—*Higdon, A.; Dwyer, R.; Newman, M.; Pickens, C.*

Animal and Food Sciences

Total—$2,210,226

An Integrated Evaluation of the Nutrient Uplift Provided by Xylanase in Finishing Diets, National Pork Board, $93,000—*Lindemann, M.; Jang, Y.*
Analysis of Plasma Samples for Changes in Glucose and Amino Acid Concentrations in Response to Algae Supplementation, Alltech Biotechnology Inc, $1,400—*Urschel, K.*
Assessment of Heat Stress in Kentucky Dairy Cows, Kentucky Academy of Science Foundation, $3,000—*Bewley, J.; Smith, S.*
Clinical Mastitis Incidence in Compost Bedded Pack Barns as Compared to Freestall Barns, University of Georgia, $13,750—*Bewley, J.; Arnold, L.; Eckelkamp, E.; Taraba, J.*
Compost Bedded Pack Dairy Barn Management, Kentucky Governor's Office of Agricultural Policy, $53,875—*Bewley, J.; Taraba, J.*
Dietary Mitigation of Antibiotic-induced Changes in Equine Hindgut Bacteria, Kentucky Horse Racing Commission, $86,471—*Lawrence, L.*
Editor of the Journal of Nutritional Sciences, Elsevier Science Inc, $76,730—*Hennig, B.*
Farming for Cash: An Apprenticeship Program for Kentucky's Beginning Limited-resource and Small-scale Farmers, Kentucky State University, $100,000—*Pescatore, A.*
Fighting with Food: Battling Chemical Toxicity with Good Nutrition, Miami University, $29,431—*Hennig, B.; Gaetke, L.*
Genomic Selection for Improved Fertility of Dairy Cows with Emphasis on Cyclicity and Pregnancy, Texas A&M University, $15,492—*Amaral-Phillips, D.*
Impact of Algae Supplemented Diets Combined with Antioxidants on the Nutrition Profile, Quality Attributes, and Storage Stability of Chicken Broiler Meat, Alltech Biotechnology Inc, $40,708—*Xiong, Y.*
Improving Fertility of Dairy Cattle Using Translational Genomics, Washington State University, $9,641—*Amaral-Phillips, D.*
Kentucky Beef Network, Kentucky Beef Network, $485,247—*Lehmkuhler, J.; Amaral-Phillips, D.; Anderson, L.; Bullock, K.; Burdine, K.; Burris, W.; Halich, G.; Smith, S.*
Nutrigenomics Applied to Meat Science: Understanding the Impact of Alltech Antioxidant Nutrients on the Quality and Storage Stability of Chicken Meat, Alltech Biotechnology Inc, $15,420—*Xiong, Y.*
Nutrition and Superfund Chemical Toxicity, National Institute of Environmental Health Sciences, $150,000—*Hennig, B.; Gaetke, L.*
Oats: Preventing Equine Disease: Role of Starch Source in Large Intestinal Microbial Disturbances, Prairie Oat Growers Association, $122,601—*Lawrence, L.*
Regulation of EAAC1 Controllers to Enable Efficient Nutrient Metabolism, National Institute of Food and Agriculture, $373,798—*Matthews, J.; Burris, W.; Lindemann, M.*
Southeast Quality Milk Initiative: Implementing Science-based Recommendations to Control Mastitis and Improve Milk Quality in the Southeast, University of Tennessee, $126,011—*Bewley, J.; Arnold, L.; Garkovich, L.*
Student Sponsorship Good, Alltech Biotechnology Inc, $15,750—*Pescatore, A.*
Student Sponsorship Fisher, Alltech Biotechnology Inc, $15,750—*Pescatore, A.*
Student Sponsorship van Benschoten, Alltech Biotechnology Inc, $34,650—*Pescatore, A.*
The Alltech–UK Animal Nutrigenomics Alliance, Alltech Biotechnology Inc, $224,000—*Matthews, J.*
Use of In Vitro Fermentation as a Comparative Measure of Ionophore Function, Zoetis LLC, $40,120—*Harmon, D.*
Use of Natural Remedies to Alleviate Enteric Pathogens in Organic Poultry, Agricultural Research Service, $83,381—*Pescatore, A.; Jacob, J.*

Associate Directors

Total—$744,348

2012-13 Acquisition of Goods and Services for USDA Offices in Ag North—Field Work, Agricultural Research Service, $8,062—***Cox, N.***
2012-13 Acquisition of Goods and Services for USDA Offices in Ag North—O&M Account, Agricultural Research Service, $566—***Cox, N.***
FAPRU SCA, Agricultural Research Service, $735,720—*Cox, N.; Workman, S.*

Biosystems and Agricultural Engineering

Total—$2,185,366

A Cooperative Extension Program for Kentucky's Energy Efficiency Education Needs 2013-2014, Kentucky Energy and Environment Cabinet, $100,000—*Fehr, R.*
Control and Monitoring of Sprayer Output, Case New Holland America LLC, $85,000—*Stombaugh, T.; Dvorak, J.*
Energy Audits for Grain and Poultry Producers in Kentucky, Rural Development, $14,950—*McNeill, S.; Montross, M.; Overhults, D.; Shearer, S.*
Low Cost Biomass Saccharification Process for Producing Biofuels, Eastern Kentucky University, $28,454—*Crofcheck, C.*
Managing Mud, Manure, and Runoff: Kentucky Livestock BMP Demonstration and Training Project, Kentucky Energy and Environment Cabinet, $500,000—*Higgins, S.; Gumbert, A.*
Nigeria: Commodity Storage—Technical Assistance, Foreign Agricultural Service, $20,721—***McNeill, S.***
On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System, National Institute of Food and Agriculture, $1,146,261—*Nokes, S.; Crofcheck, C.; DeBolt, S.; Halich, G.; Lee, C.; Montross, M.; Mueller, T.; Smith, S.; Stombaugh, T.*

Phase 2: Control and Monitoring of Sprayer Output, Case New Holland America LLC, $200,000—*Stombaugh, T.; Dvorak, J.*
Safety in Agriculture for Youth (SAY), Pennsylvania State University, $25,000—*Purschwitz, M.*
Screening and Evaluation of Oilfield Sewage–proof Microalgae, Sinopec Petroleum Engineering Corporation, $50,000—*Crofcheck, C.*
Support of the French Tobacco Sector in Mechanization of Burley Tobacco, Association Nationale Interprofessionnelle et Technique Du Tabac, $14,980—*Wells, L.*

Community and Leadership Development

Total—$14,102

Greenhouse Management for the Agricultural Educator, Kentucky Department of Education, $7,213—*Epps, R.*
Mapping Sustainable Farm Systems: An Integrated Focus on Upper South New Producers as Catalysts of "Good Stewardship." University of Georgia, $3,889—*Tanaka, K.; Jacobsen, K.*
Perkins Leadership Project, Kentucky Education and Workforce Development Cabinet, $1,500—*Epps, R.; Vincent, S.*
Perkins Leadership Project, Kentucky Education and Workforce Development Cabinet, $1,500—*Vincent, S.*

Dietetics and Human Nutrition

Total—$870,184

Adolescent and Parent Food Activity Patterns as Drivers of Food Choices and Behaviors, National Institute of Food and Agriculture, $149,074—*Gustafson, A.; Adams, I.*
CYFAR Capacity Building Supplement, National Institute of Food and Agriculture, $98,738—*Kurzynske, J.; Stivers, W.*
Development of Strategies and Culturally Appropriate Models for Addressing Disparities in Obesity Prevention for Asian Americans, Robert Wood Johnson Foundation, $100,000—*Adams, I.*
Enhancing Internet Behavioral Weight Loss Programs with Portion Controlled Foods, National Heart Lung and Blood Institute, $348,475—*Webber, K.*
Specialty Crop: Plate It Up Kentucky Proud Recipe Development for Consumers and Producers, with Family Meals Research Component, Kentucky Department of Agriculture, $51,353—*Stephenson, T., Stephenson, L.*
Specialty Crop: Plate It Up Kentucky Proud Recipe Development for Consumers with Nutrition Research Component, Kentucky Department of Agriculture, $42,544—*Stephenson, T., Mullins, J., Stephenson, L.*
Strong Dads, Resilient Families, National Institute of Food and Agriculture, $80,000—*Kurzynske, J.; Ashurst, K.; Jones, K.*

Entomology

Total—$1,930,694

2010 University Protocol for Evaluating Field Efficacy of Herculex I, YieldGard Corn Borer, and Bt11xMIR162 Deployed against Corn Earworm, Fall Armyworm, and Other Southern U.S. Lepidoptera Larvae, Pioneer Hi Bred International Inc, $30,580—*Bessin, R.*
2013-14 UK Private Pesticide Applicator, Kentucky Department of Agriculture, $27,500—*Townsend, L.*
Advancing IPM in Kentucky through Extension: 2013-2016, National Institute of Food and Agriculture, $86,500—*Bessin, R.; Dunwell, W.; Gauthier, N.; Knott, C.; Lee, C.; Lucas, P.; Seebold, K.*
Asian Longhorned Beetle (ALB) Outreach, Animal and Plant Health Inspection Service, $27,481—*Lensing, J.*
Benefits of Golf Course Naturalized Areas for Biological Control and Pollinator Conservation, United States Golf Association, $40,000—*Potter, D.; Dobbs, E.*
Biodiversity and the Development of Natural Pest Control, Washington State University, $45,000—*Harwood, J.*
Biological Control of the Hemlock Woolly Adelgid, Animal and Plant Health Inspection Service, $15,000—*Lensing, J.; Harper, C.*
Center for Arthropod Management Technologies, National Science Foundation, $308,000—*Palli, S.*
Cooperative Agricultural Pest Surveys, Infrastructure—Animal and Plant Health Inspection Service, $101,460—*Lensing, J.*
Ecdysteroid Signaling in Filarial Parasites, University of South Florida, $16,263—*Palli, S.; Xu, J.*
Efficacy of Management Tools for Rose Slug Sawfly, University of Florida, $7,500—*Potter, D.*
Emerald Ash Borer Survey in Kentucky, Animal and Plant Health Inspection Service, $94,320—*Lensing, J.; Collins, J.; Harper, C.*
FY 13-14 UK Mosquito Surveillance, Kentucky Department for Public Health, $6,804—*Brown, G.*
Grape Survey, Animal and Plant Health Inspection Service, $12,613—*Lensing, J.; Harper, C.*
Gypsy Moth Survey, Animal and Plant Health Inspection Service, $76,745—*Lensing, J.; Harper, C.*
Mass Production of *Aedes albopictus* Males for Experimental Use, MosquitoMate Incorporated, $11,458—*Dobson, S.*
Molecular Analysis of Juvenile Hormone Action, National Institute of General Medical Sciences, $199,191—*Palli, S.*
Monitor Gypsy Moth Populations for Slow the Spread Program, Slow the Spread Foundation, $41,000—*Harper, C.*
Orchard Survey, Animal and Plant Health Inspection Service, $15,035—*Lensing, J.; Harper, C.*
P450 Inhibition Assays, Agricultural Research Service, $80,918—*Palli, S.*
Phytophthora ramorum Farm Bill National Nursery Survey, Animal and Plant Health Inspection Service, $25,000—*Lensing, J.*
Pine Shoot Beetle Survey, Animal and Plant Health Inspection Service, $11,290—*Harper, C.*
SBIR: Biological Methods for Enhancing Wound Healing Properties, ParaTechs Corp, $52,239—*Webb, B.*
Talk to the Dead: Chemical Communications in Corpse Management in Termites, Kentucky Science and Technology Co Inc, $30,000—*Zhou, X.; Haynes, K.*
Thousand Cankers Disease (TCD) Survey, Animal and Plant Health Inspection Service, $14,740—*Lensing, J.*
Toxic Aphids: How Bacterial Symbionts Influence Coccinellid Defense and Biological Control of *Aphis craccivora*, National Institute of Food and Agriculture, $454,573—*White, J.*
Trial of IV Formulae, Intellectual Ventures Management LLC, $69,500—*Dobson, S.*
Understanding the Mechanisms for Aphid-derived Toxicity Toward Ladybeetles, Kentucky Science and Technology Co Inc, $29,984—*White, J.*

eXtension

Total—$869,703

Building Cooperative Extension's 21st Century Network, University of Nebraska, $411,236—*Wood, C.*
ECOP/CSREES E-extension Supplement Amendment 18 to contract #26-6365-001-301, University of Nebraska, $458,467—*Wood, C.*

Family and Consumer Sciences

Total—$404,028

Children, Youth, and Families at Risk Liaison, National Institute of Food and Agriculture, $48,709—*Torres, N.*
Kentucky Military-Extension Adventure Camp Initiative, Purdue University, $203,890—*Ashurst, K.*
KY Operation Military Kids 2013, Army, $42,500—*Ashurst, K.*
KY Operation Military Kids 2014, Army, $85,000—*Ashurst, K.*
Specialty Crop: Plate It Up Kentucky Proud Recipe Development for Consumers and Producers, with Family Meals Research Component, Kentucky Department of Agriculture, $997—*Stephenson, L., Stephenson, T.*
UK Supplemental Nutrition Assistance Program Education (SNAP Ed), Kentucky Cabinet for Health and Family Services, $22,932—*Vail, A., Stephenson, L.*

Forestry

Total—$948,090

Cow Elk Survival, Cause-specific Mortality, Natality, and Neonate Recruitment, Rocky Mountain Elk Foundation, $54,000—*Cox, J.*
Evaluation of Acidic Atmospheric Deposition and Its Influence on Soil Solution Composition in the Daniel Boone National Forest, Forest Service, $33,490—*Barton, C.; Karathanasis, A.*
Fire Management and Habitat Quality for Endangered Bats in Mammoth Cave National Park, JFSP, Forest Service, $20,000—*Lacki, M.; Rieske-Kinney, L.*
Forest and Wood Product Certification Educational Outreach, Kentucky Energy and Environment Cabinet, $22,500—*Stringer, J.*
Green Forests Work for Appalachia: Continued Deployment and Marketing, Appalachian Regional Commission, $300,000—*Barton, C.*
Heritage Land Conservation Fund Book, Kentucky Heritage Land Conservation Fund, $30,000—*Barnes, T.*
Kentucky Woodlands Magazine—Not All Green is Good, Kentucky Energy and Environment Cabinet, $32,000—*Stringer, J.; Thomas, W.*

Monitoring Hydrologic Response to Thinning in a Headwater Wetland at the Frances Palk State Nature Preserve, Kentucky Energy and Environment Cabinet, $3,000—*Barton, C.*
Mower Tract Ecological Restoration, American Rivers, $150,000—*Barton, C.*
Population Growth and Expansion of the Black Bear in Eastern Kentucky, Kentucky Department of Fish and Wildlife, $93,000—*Cox, J.*
Resource Selection, Movement Patterns, Survival, and Cause-specific Mortality of Adult Bull Elk in Kentucky, Kentucky Department of Fish and Wildlife, $65,500—*Cox, J.*
Survival, Cause-specific Mortality, and Natality of White-tailed Deer in Southeast Kentucky, Kentucky Department of Fish and Wildlife, $134,600—*Cox, J.*
UK Forest Stewardship Public Awareness, Publicity, and Training, Kentucky Energy and Environment Cabinet, $10,000—*Stringer, J.*

Horticulture

Total—$2,087,878

Building Technical Support Capacity for Kentucky's High Tunnel Specialty Crop Producers, Kentucky Department of Agriculture, $50,791—*Jacobsen, K.; Coolong, T.*
Center for Crop Diversification, Kentucky Governor's Office of Agricultural Policy, $113,347—*Houtz, R.; Rowell, A.; Woods, T.*
Defining Determinants and Dynamics and Cellulose Microfibril Biosynthesis, Assembly, and Degradation, Cornell University, $326,042—*DeBolt, S.*
Greenhouse Gas Emissions (carbon footprint) and Associated Costs of Field-grown, Deciduous Shrub Production System Components and the Subsequent Impact in the Landscape, Horticultural Research Institute, $15,000—*Ingram, D.*
Impact and Social Acceptance of Selected Sustainable Practices in Ornamental Crop Production Systems, Brigham Young University, $185,799—*Geneve, R.; Jacobsen, K.*
Impacts of Citrulline and Lycopene on Cardiovascular Health, National Watermelon Promotion Board, $28,000—*Saha, S.*
KHC VI—Lexington, Kentucky Horticulture Council, $560,000—***Ingram, D.; Woods, T.***
Soil and Water Conservation in Seasonal High Tunnels: Evaluating Approved Practices and New Innovations for Resource Conservation, Natural Resources Conservation Service, $73,222—*Jacobsen, K.; Rowell, A.*
Sustainable Nutrient Cycling on Diversified Farms Serving Community Food Systems, National Institute of Food and Agriculture, $495,000—*Jacobsen, K.; Wendroth, O.*
The Impact of Sterol Biogenesis on Cellulose Synthesis in Higher Plants, Kansas State University, $63,863—*DeBolt, S.*
UK Ginseng 2013 Monitoring, Kentucky Department of Agriculture, $11,000—*Wright, S.*
Untapping the Potential of Small Effector Molecules Produced by Endophytic Microbes for Cellulose Modification Strategies, National Science Foundation, $165,814—*DeBolt, S.*

International Programs

Total—$69,450

Extension Services in Serbia and Montenegro, Foreign Agricultural Service, $69,450—*Reed, M.*

Kentucky Small Business Development Center

Total—$415,944

Kentucky Small Business Development Center, Small Business Administration, $402,444—*Naugle, L.*
Kentucky Small Business Development Center Lease, Commerce Lexington Inc, $13,500—*Naugle, L.*

Kentucky Tobacco Research Development Center

Total—$711,491

A Topping-induced Tobacco Sucker Control System Delivered by Intragenic Transformation, Council for Burley Tobacco, $20,739—*Yuan, L.; Singh, S.*
Folium—Evaluation of Tobacco BioFuels Production, University of California Berkeley, $153,437—***Yuan, L.; Chambers, O.; Mundell, R.***
Precision and Accuracy of Individual Alkaloid Measurements, Council for Burley Tobacco, $12,000—*Ji, H.*
Production and Purification of Nicotine from Green Tobacco for Emerging Tobacco Products, Council for Burley Tobacco, $15,000—*Yuan, L.; Jack, A.; Ji, H.; Mundell, R.*
Production of Chemicals in Tobacco Leaves, British American Tobacco, $455,315—*Yuan, L.; Moe, L.*
Use of Cis-abienol or T-phylloplanin to Prevent Black Shank Disease in Tobacco, Council for Burley Tobacco, $25,000—*Mihaylova-Kroumova, A.*
Utilization of the Arabidopsis FT Gene to Facilitate Rapid Tobacco Variety Development, Council for Burley Tobacco, $30,000—*Zaitlin, D.; Miller, R.*

Landscape Architecture

Total—$8,369

West Muhammad Ali Boulevard Corridor Study, Louisville Central Community Center, $8,369—*Hargrove, R.*

Merchandising, Apparel and Textiles

Total—$96,920

Cotton Incorporated Laundry Study 2013, Cotton Incorporated, $30,000—*Easter, E.*
Quality Control Lab for NAILM, Association for Linen Management, $56,920—*Easter, E.*
The Heartland of the United States as Destinations for the Inbound Market from China, Purdue University, $10,000—*Lu, Y.*

Plant and Soil Sciences

Total—$3,570,122

A Knockdown-towards-Mutation Approach for Manipulating the Chemistry of Tobacco, British American Tobacco, $932,458—*Wagner, G.; Mihaylova-Kroumova, A.; Yuan, L.*
Accelerating the Development of FHB-resistant Soft Red Winter Wheat Varieties, Agricultural Research Service, $58,632—*Van Sanford, D.*
Agronomic Maximization of Soybean Yield and Quality, University of Minnesota, $70,000—*Lee, C.*
Alternative Polyadenylation and Non-stop mRNAs in Arabidopsis, National Science Foundation, $518,302—*Hunt, A.*
An Integrated Approach to Understanding the Dynamics of Poultry Litter Use in Corn-Soybean Production Systems, Kentucky Soybean Promotion Board, $35,000—*Ritchey, E.; Hershman, D.; Martin, J.*
Bayer Soybean, Bayer CropScience GmbH, $10,000—*Lawson, S.; Slack, C.*
Burley Tobacco Breeding and Genetics, Philip Morris International Management SA, $325,000—*Miller, R.*
Collaborative Proposal: CPSF30 at the Convergence of RNA Processing, Cellular Signaling, and Development in Plants, National Science Foundation, $16,661—*Hunt, A.*
Commercialization of Early Flowering Chia, Kentucky Specialty Grains LLC, $4,000—*Hildebrand, D.*
Conservation Tillage Management Systems for Tobacco, Altria Corporate Services Inc, $48,640—*Bailey, W.; Pearce, R.*
Controls on the Plant-Soil Stoichiometry of Dryland Agroecosystems: A Sabbatical Strengthening Grant, National Institute of Food and Agriculture, $112,015—*McCulley, R.*
Developing Control Strategies for Glyphosate-Resistant Weeds in Kentucky, Kentucky Soybean Promotion Board, $15,770—*Martin, J.; Green, J.*
Development of Chia in Kentucky, Kentucky Specialty Grains LLC, $4,620—*Phillips, T.*
Development of Chia, ***Salvia hispanica*** L., as a Sustainable Oil Source for Renewable Chemical Applications, Consortium for Plant Biotechnology Research Inc, $24,694—*Hildebrand, D.*
Development of Effective Educational Programs to Manage and Mitigate Herbicide Resistant Weeds, Purdue University, $30,000—*Martin, J.; Green, J.*
Establishing ***Salvia hispanica*** as a Sustainable Crop for Kentucky Farmers, Kentucky Small Grain Growers Association, $19,842—*Hildebrand, D.*
Fragipan Remediation, Kentucky Soybean Promotion Board, $35,000—*Murdock, L.; Karathanasis, A.*
Genotype x Environment x Management Interactions in Wheat: Year 2, Kentucky Small Grain Growers Association, $6,800—*Lee, C.; Russell, K.; Van Sanford, D.*
Host Genetic Control of Strain-specific Nitrogen Fixation in the Legume-Rhizobial Symbiosis, National Institute of Food and Agriculture, $500,000—*Zhu, H.*
Improving Barley and Wheat Germplasm for Changing Environments, University of California Davis, $65,676—*Van Sanford, D.*
MON 09-08, Monsanto Co, $6,000—*Slack, C.; Lawson, S.*
Monsanto 24-14, Monsanto Co, $6,000—*Lawson, S.; Slack, C.*

Morphological, Physico-chemical, and Mineralogical Characterization of Kentucky Soils, Natural Resources Conservation Service, $10,000—*Karathanasis, A.*
Performance of Small Grain Varieties in Kentucky, Kentucky Small Grain Growers Association, $9,000—*Bruening, W.*
Project 1—Effect of Excess Heat on TSNA, Altria Corporate Services Inc, $91,000—*Bailey, W.*
Prospects for Using Nanoparticles to Replace Quadris for Control of Frogeye Leaf Spot and Blue Mold in Tobacco Cultivation., Council for Burley Tobacco, $25,000—*Wagner, G.*
Raising Soybean Yield Potential in Dry Seasons: Increased Rooting Depth and Greater Soil Water Extraction with Deeper Depth to the Fragipan, Kentucky Soybean Promotion Board, $35,000—*Grove, J.; Ritchey, E.*
Regional Biomass Feedstock Partnership, South Dakota State University, $28,000—*Williams, D.*
Renewal Center for the Environmental Implications of Nanotechnology, Duke University, $150,000—*Unrine, J.; Tsyusko-Unrine, O.*
RR2X Soybean Systems Recommendations: Midwest (Conventional Tillage), Monsanto Co, $9,600—*Martin, J.*
Small Grain Fragipan Remediation, Kentucky Small Grain Growers Association, $35,000—*Murdock, L.; Karathanasis, A.*
Soft Red Winter Wheat Breeding and Variety Development for Kentucky, Kentucky Small Grain Growers Association, $36,000—*Van Sanford, D.*
Soil Atlas of Kentucky, Natural Resources Conservation Service, $20,000—*Karathanasis, A.*
Strategies to Confirm and Manage ALS-resistant Common Chickweed in Wheat in Kentucky (2013-2014), Kentucky Small Grain Growers Association, $8,420—*Martin, J.*
Stressing Soybeans to Increase Yield, Kentucky Soybean Promotion Board, $51,932—*Lee, C.*
Synchrotron X-ray Microprobe and Microspectroscopy Research at Low Temperature Geochemistry, University of Chicago, $49,571—*Unrine, J.*
Syngenta Soybean, Syngenta Crop Protection, $14,000—*Lawson, S.; Slack, C.*
The Effect of Temperature and Relative Humidity on TSNA Accumulation During Curing of Burley Tobacco, Council for Burley Tobacco, $14,000—*Fisher, C.*
The Effects of Plant Population on Agronomic Characteristics of Burley Tobacco, Council for Burley Tobacco, $25,000—*Miller, R.*
U.S. Wheat and Barley Scab Initiative's Networking and Facilitation Office and Website, Agricultural Research Service, $93,329—*Van Sanford, D.*
Warrant Post Soybean, Monsanto Co, $6,720—*Slack, C.; Lawson, S.*
Warrant PRE in Soybeans, Monsanto Co, $13,440—*Martin, J.*

Plant Sciences-Agronomy—Research Challenge Trust Fund

Total—$86,355

Methodology for Designing Vegetative Buffers Using GIS and Terrain Analysis, Forest Service, $25,000—*Mueller, T.*
Remediation of coal slurry impoundment liquids using a multi-stage constructed treatment wetland system, Kentucky Energy and Environment Cabinet, $61,355—*D'Angelo, E.; Agouridis, C.; McNear, D.; Unrine, J.; Warner, R.*

Plant Pathology

Total—$372,171

A Host Protein Interaction and Localization Map for a Plant, National Science Foundation, $69,668—*Goodin, M.*
Broadening Host Specificity in Soybean-Rhizobium Symbiosis, Kentucky Soybean Promotion Board, $42,810—*Kachroo, A.*
Elucidating the Spread and Transmissibility of Blueberry Mosaic Virus, a New Disease of Blueberry in the Southeastern U.S., University of Georgia, $15,000—*Gauthier, N.*
Evaluation of Soybean Vein Necrosis–Associated Virus Infected Soybean for Seed Transmission, Kentucky Soybean Promotion Board, $30,500—*Hershman, D.*
Glycerol Metabolism and Its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System, National Science Foundation, $6,000—*Kachroo, P.; Kachroo, A.; Vaillancourt, L.*
Identifying Factors that Regulate Broad-spectrum Resistance to Phytophthora, Kentucky Science and Technology Co Inc, $29,970—*Seebold, K.; Kachroo, A.*
Molecular, Genetic, and Biochemical Characterization of Oleate-regulated Defense Gene Expression in Plants, National Science Foundation, $6,000—*Kachroo, P.; Kachroo, A.*
Novel Strategies for Managing Blast Diseases on Rice and Wheat, Kansas State University, $99,084—*Farman, M.*
Reducing Losses to Potato and Tomato Late Blight by Enhanced Monitoring of Pathogen Populations and Improved Resistant Plants, Education and Extension, Regents of the University of California Riverside, $10,742—*Seebold, K.*
Solving Urban Tree Mysteries by Training Better Detectives, Kentucky Division of Forestry, $10,427—*Gauthier, N.*
Southern Plant Diagnostic Network, Kentucky Component, University of Florida, $22,000, Vincelli, P.
Understanding the Interrelationships between the Various Chemical Inducers of Plant Systemic Immunity, Kentucky Science and Technology Co Inc, $29,970—*Kachroo, P.*

Plant Pathology—Research Challenge Trust Fund

Total—$200,897

Key Role of the Multifunctional Translation Elongation Factor in Virus Replication, National Science Foundation, $200,897—*Nagy, P.*

Regulatory Services

Total—$46,836

BSE Rule and Medicated Feed Inspections, Food and Drug Administration, $44,986—*Harrison, G.; Green, K.*
Medicated Feed Mill and BSE Rule Inspections, Food and Drug Administration, $1,850—*Green, K.; Mason, D.*

School of HES Administration

Total—$3,123,852

Different Faces of Substance Abuse Conference, Foundation for a Healthy Kentucky, $600—*Vail, A.*
UK Supplemental Nutrition Assistance Program Education (SNAP Ed), Kentucky Cabinet for Health and Family Services, $3,123,252—*Vail, A.; Stephenson, L.*

UK Veterinary Diagostic Laboratory

Total—$186,771

Bovine Spongiform Encephalopathy 5/1/13-3/31/14, Kentucky Department of Agriculture, $17,400—*Carter, C.*
Bovine Spongiform Encephalopathy Testing and Related Services, Kentucky Department of Agriculture, $3,000—*Carter, C.*
Diagnostic Laboratory Support of NAHLN, Animal and Plant Health Inspection Service, $50,875—*Carter, C.*
FDA Vet-LRN Veterinary Diagnostic Laboratory Cooperative Agreement Program Funding to Increase Sample Analysis in the Event of Animal Food or Drug-related Illness, Food and Drug Administration, $16,500—*Gaskill, C.*
Validation of LC-MS/MS Analyses of Animal Tissue and Feed Matrices for Toxicants, Food and Drug Administration, $98,996—*Gaskill, C.; Smith, L.*

Veterinary Science

Total—$2,290,715

Characterizing the Role of *Strongylus vulgaris* Infection in Referred Colic Cases, Virbac Animal Health, $35,200—*Nielsen, M.*
Do Horses with Pituitary Pars Intermedia Dysfunction (PPID) Respond as Well to Vaccination (Vetera# Gold) when Compared to Non-PPID, Aged-matched Horses? Boehringer Ingelheim, $108,921—*Adams, A.*
Effect of an Immunostimulant Containing *Propionibacterium acnes* (EqStim™) on Cell-mediated Immunity and Nasal Shedding of Respiratory Pathogens Using a Model of Weaning Stress in Foals, Neogen Inc, $63,246—*Adams, A.*
EIAV Envelope Variation and Vaccine Efficacy, University of Pittsburgh, $306,495—*Issel, C.; Cook, R.; Horohov, D.*
Evaluating Seasonal Influences on Hormone Responses to a Diagnostic Test Advocated for Early Diagnosis of eEquine Cushing's Disease, Morris Animal Foundation, $95,167—*Adams, A.; Horohov, D.; Urschel, K.*
Geriatric Horses (>20 yrs): Do They Respond Immunologically Different to Anthelmintic Treatment when Compared to Younger Adult Horses (5-15 yrs)? Zoetis LLC, $24,569—*Adams, A.; Nielsen, M.*
Identification of Genetic Factors Responsible for Establishment of Equine Arteritis Virus Carrier State in Stallions, National Institute of Food and Agriculture, $654,810—*Balasuriya, U.; Artiushin, S.; Bailey, E.; Cook, R.; Horohov, D.; MacLeod, J.; Squires, E.; Timoney, P.; Troedsson, M.*
Influenza, Secondary Bacterial Infection, and Interleukin-23, Kentucky Horse Racing Commission, $49,234—*Chambers, T.; Horohov, D.*
Is There a Relationship between the Status of Circulating Vitamin and Fatty Acid Levels to Systemic Inflammation and Muscle Mass in Aged Horses? Waltham Centre for Pet Nutrition, $34,272—*Adams, A.*

MAF Fellowship Training Grant—Use of Recombinant Proteins to Identify Antibody Responses Associated with Equine Proliferative Enteropathy, Morris Animal Foundation, $99,670—*Horohov, D.*

Molecular Diagnostic Assays for the Detection and Control of Contagious Equine Metritis, American Quarter Horse Foundation, $37,679—*Artiushin, S.; Balasuriya, U.*

Morris Animal Foundation (MAF) Pfizer Animal Health (PAH) Veterinary Fellowship, Morris Animal Foundation, $40,000—*Troedsson, M.*

Objective Evaluation of Deworming Regimens in Horses—Growth Rates, Disease Incidence and Financial Aspects, Zoetis LLC, $112,861—*Nielsen, M.; Stowe, C.*

Parasite Material Agreement, Zoetis LLC, $21,364—*Nielsen, M.*

Suppression of the Equine Type-1 Interferon Response by Equine Herpesvirus-1, American Quarter Horse Foundation, $44,847—*Chambers, T.; Horohov, D.*

The Effect of Exercise on Pro-inflammatory Cytokine Expression in the Young Racehorse and Its Impact on Training-related Injuries, Kentucky Horse Racing Commission, $189,297—*Horohov, D.*

The Influence of Genetic Deficits in Aggrecan Structure (Cartilage) on Race Track Breakdown, Kentucky Horse Racing Commission, $15,218—*Bailey, E.; Lear, T.*

The Interaction between Anthelmintic Treatment and Vaccination, Grayson Jockey Club Research Foundation Inc, $60,466—*Nielsen, M.; Chambers, T.; Horohov, D.*

The Use of Excede Metaphylatically to Prevent Post-influenzal Respiratory Infections, Zoetis LLC, $143,021—*Horohov, D.; Chambers, T.*

Unique Patterns of Gene Expression in Articular Chondrocytes: Important Insight for Joint Surface Lesion Repair and Cell-based Therapies, Morris Animal Foundation, $100,000—*MacLeod, J.*

Use of Recombinant Proteins to Identify Antibody Responses Associated with Equine Proliferative Enteropathy, Morris Animal Foundation, $54,378—*Horohov, D.*

Multidisciplinary Grants Led by Other Colleges*

Appalachia Community Cancer Network II—U54, National Cancer Institute, $1,088,516—*Webber, K.*

Appalachians Together Restoring the Eating Environment (APPAL-TREE), National Institute on Minority Health and Health Disparities, $357,126—*Davis, A.; Gustafson, A.; Mullins, J.*

Central Appalachian Regional Education Research Center, National Institute of Occupational Safety and Health, $575,875—*Purschwitz, M.*

Construction and Assessment of Prototype Devices to Remove Aluminum from Solutions, Alkymos Inc, $15,000—*Unrine, J.*

Demonstration of an Algae-based System for CO_2 Mitigation from Coal-fired Power Plants, Kentucky Energy and Environment Cabinet, $155,146—*Crofcheck, C.*

Endocrine Disruptor Mediated Activation of PXR Causes Dyslipidemia, National Institute of Environmental Health Sciences, $332,520—*Hennig, B.*

FEEDER: Foundations for Engineering Education for Distributed Energy Resources, University of Central Florida, $80,959—*Colliver, D.*

Fellowship for Petriello: Novel Methodologies to Quantify Anti-inflammatory Nitro-fatty Acids, American Heart Association Great Rivers Affiliate, $26,000—*Hennig, B.*

Hippocampal Neurotoxicity Induced by Ethanol Withdrawal, National Institute on Alcohol Abuse and Alcoholism, $312,120—*Littleton, J.*

Indonesia Higher Education Leadership and Management Project, Chemonics International Inc, $103,576—*Reed, M.; Tanaka, K.*

Kentucky Girls STEM Collaborative Project, Puget Sound Center For Teaching Learning and Technology, $7,500—*Burks, J.*

Kentucky Industrial Assessment Center (KIAC): Developing the Next Generation Energy Assessment Engineering Workforce, Department of Energy, $208,000—*Colliver, D.*

KSEF RDE: Leveraging Novel Genetic and Genomic Technologies to Understand and Conserve a Kentucky State Endangered Giant Salamander, Kentucky Science and Technology Co Inc, $30,000—*Price, S.*

NSF/EPSCoR: Transforming Kentucky's New Economy with EPSCoR, National Science Foundation, $1,265,500—*Schardl, C.; Webb, B.*

Southeast Center for Agricultural Health and Injury Prevention, National Institute of Occupational Safety and Health, $1,266,342—*Hains, B.; Isaacs, S.; Purschwitz, M.; Vincent, S.*

Southern Tier Housing Corporation TVA Mitigation Project, Southern Tier Housing Corporation, $336,671—*Colliver, D.*

Synthetic Crop for Direct Biofuel Production through Re-routing the Photorespiration Intermediates and Engineering Terpenoid Pathways, Texas AgriLife Research, $403,100—*Goklany, S.*

Unlocking Transcript Diversity via Differential Analyses of Splice Graphs, University of North Carolina, $151,519—*MacLeod, J.*

**Only College of Agriculture co-investigators are listed.*

Intellectual Property

GenBank Register

Entomology

Sharkey, Michael. *Agathacrista depressifera.* Accession KC556782.

Sharkey, Michael. *Agathacrista krataei.* Accension KC556781.

Sharkey, Michael. *Agathacrista sailomi.* Accession KC556780.

Sharkey, Michael. *Agathacrista winloni.* Accession ATRMK218-11 (Barcode of Life Database accession number).

Sharkey, Michael. *Disophrys erythrocephala.* Accession KC899814.

White, Jen. *Aphis craccivora* and symbionts. Accession JX629765–JX629768, KF362016–KF362043; SRP017772.

White, Jen. *Aphis glycines* symbionts. Accession KC701197–KC701199.

M. Sharkey had nine additional accessions.

Kentucky Tobacco Research and Development Center

Maiti, I.B., and D.K. Sahoo. Binary plant gene expression vector pSiM24, complete sequence. Accession KF032933.

Maiti, I.B., and J. Banerjee. *Nicotiana tabacum* calmodulin-lysin N-methyltransferase like mRNA. Accession KF114021.

Sahoo, D.K., and I.B. Maiti. Binary plant gene expression vector pKDH, complete sequence. Accession KF041008.

Plant and Soil Sciences

Wang, F., and S.E. Perry. Genome wide binding sites of the Arabidopsis B3 domain protein FUSCA3. Accession GSE43291.

Plant Pathology

Kachroo, A.P. *Glycine max* heat shock protein 90-1 (HSP90-1), mRNA. Accession NM_001249683.1 GI:351726362.

Kachroo, A.P. *Glycine max* heat shock protein 90-2 (LOC100194422), mRNA. Accession NM_001249670.1 GI:351725975.

Kachroo, A.P. *Glycine max* microsomal omega-3 fatty acid desaturase (LOC547470), mRNA. Accession NM_001250014.1 GI:351721123.

Kachroo, A.P. *Glycine max* non-race specific disease resistance 1b (NDR1b), mRNA. Accession NM_001248138.1 GI:351726081.

Kachroo, A.P. *Glycine max* RAR1 protein (RAR1-1), mRNA. Accession NM_001249629.1 GI:351724798.

Schardl, C.L. *Epichloë amarillans* lysergyl peptide synthetase subunit 1 (lpsA), chanoclavine-I dehydrogenase (easD), chanoclavine synthase catalase protein (easC), and elymoclavine monooxygenase (cloA) genes, complete cds. Accession KC989563.1 GI:528206576.

Schardl, C.L. *Epichloë festucae* isolate E2368 RNA polymerase III beta subunit (rpcB) gene, complete cds. Accession KF148614.1 GI:543175197.

Schardl, C.L. *Neotyphodium aotearoae* strain e899 clone e899_IDT indole-diterpene biosynthetic gene cluster, partial sequence. Accession KC970577.1 GI:511342255.

Schardl, C.L. *Neotyphodium coenophialum* dimethylallyltryptophan N-methyltransferase (easF), agroclavine dehydrogenase (easG), chanoclavine aldehyde oxidoreductase/isomerase (easA), putative oxygenase (easH), and dimethylallyltryptophan synthase (dmaW) genes, complete cds. Accession KC989607.1 GI:528206715.

Schardl, C.L. *Neotyphodium coenophialum* isolate E4163 LolC (lolC), LolD (lolD), LolO (lolO), LolA (lolA), LolU (lolU), LolP (lolP), LolT (lolT), and LolE (lolE) genes, complete cds. Accession KC990457.1 GI:511773503.

A.P. Kachroo had five additional accessions.

C.L. Schardl had 214 additional accessions.

Veterinary Science

Howe, D.K. *Sarcocystis falcatula* hypoxanthine-xanthine-guanine phosphoribosyl transferase (HXGPRT) mRNA, complete cds. Accession KF406341.

Howe, D.K. *Sarcocystis falcatula* hypoxanthine-xanthine-guanine phosphoribosyl transferase (HXGPRT) mRNA, complete cds. Accession KF406342.

Howe, D.K. *Sarcocystis falcatula* hypoxanthine-xanthine-guanine phosphoribosyl transferase (HXGPRT) mRNA, complete cds. Accession KF406343.

Li, Y., F. Cook, S. Pronost, P.J. Henney, B.M. Crossley, S.F. Sells, L.S. Goehring, K.L. Smith, D.P. Lunn, W. Laegried, P.J. Timoney, and U.B.R. Balasuriya. Equid herpesvirus 1 DNA polymerase catalytic subunit. Accession KC924759.

Li, Y., F. Cook, S. Pronost, P.J. Henney, B.M. Crossley, S.F. Sells, L.S. Goehring, K.L. Smith, D.P. Lunn, W. Laegried, P.J. Timoney, and U.B.R. Balasuriya. Equid herpesvirus 1 DNA polymerase catalytic subunit. Accession KC924760.

Li, Y., F. Cook, S. Pronost, P.J. Henney, B.M. Crossley, S.F. Sells, L.S. Goehring, K.L. Smith, D.P. Lunn, W. Laegried, P.J. Timoney, and U.B.R. Balasuriya. Equid herpesvirus 1 DNA polymerase catalytic subunit. Accession KC924761.

Li, Y., F. Cook, S. Pronost, P.J. Henney, B.M. Crossley, S.F. Sells, L.S. Goehring, K.L. Smith, D.P. Lunn, W. Laegried, P.J. Timoney, and U.B.R. Balasuriya. Equid herpesvirus 1 DNA polymerase catalytic subunit. Accession KC924762.

Li, Y., F. Cook, S. Pronost, P.J. Henney, B.M. Crossley, S.F. Sells, L.S. Goehring, K.L. Smith, D.P. Lunn, W. Laegried, P.J. Timoney, and U.B.R. Balasuriya. Equid herpesvirus 1 DNA polymerase catalytic subunit. Accession KC924763.

Velineni, S., and J.F. Timoney. M-like protein of *S. canis* 80 334. Accession KF662371.

Velineni, S., and J.F. Timoney. M-like protein of *S. canis* 81 186V. Accession 662372.

Velineni, S., and J.F. Timoney. M-like protein of *S. canis* 81 969. Accession 662373.

Velineni, S., and J.F. Timoney. M-like protein of *S. canis* 85-8. Accession 662374.

Velineni, S., and J.F. Timoney. M-like protein of *S. canis* 85 041. Accession 662375.

U.B.R. Balasuriya had 58 additional accessions.

J.F. Timoney had 115 additional accessions.

P.J. Timoney had 58 additional accessions.

Gene Expression Omnibus

Animal and Food Sciences

Matthews, J.C., W.R. Burris, J.A. Boling, Z. Zhang, and J.D. Patterson. Released June 1. Hepatic transcriptome profiles differ among maturing beef heifers supplemented with different forms of dietary selenium. GSE44680.

Patents Issued

Horticulture

DeBolt, S., D. Harris, and J. Stork. Plants and plant products useful for biofuel manufacture and feedstock, and methods of producing same. Patent 8,383,888. Issued Feb. 26.

Rodgers, D., R.L. Houtz, L.M.A. Dirk, and M.A. Williams. Crystallization and structure of a plant peptide deformylase. Patent 8,417,498. Issued Apr. 9.

Plant and Soil Sciences

Chappell, J., and K. Back. Chimeric isoprenoid synthases and uses thereof. Patent 8,354,504. Issued May 21.

Chappell, J., and L.F. Ralston. Cytochrome P450s and uses thereof. Patent 8,445,231. Issued May 21.

Hildebrand, D., R. Li, and T. Hatanaka. Diacylglycerol acyltransferas sequences and related methods. Patent 8,431,772. Issued Apr. 30.

Hildebrand, D., W. Jamboonsri, and T. Phillipps. Early flowering mutant chia and uses thereof. Patent 8,586,831. Issued Nov. 19.

2013 Plant Variety Releases

Plant and Soil Sciences

Pfeiffer, T. KY08-0238 Sweet sorghum.

Pfeiffer, T. KY08-1810-2 Sweet sorghum.

Van Sanford, D. KY03C-1237-32 Soft red winter wheat.

Publications

All publication dates are 2013 unless otherwise noted.

Annual Report

One Hundred and Twenty-Fifth Annual Report of the Kentucky Agricultural Experiment Station for 2012. College of Agriculture, University of Kentucky, Nancy M. Cox, Director. June.

Books and Book Chapters

Agricultural Economics

Katchova, A.L. Agricultural contracting and competition. Chapter 9, pp. 177–192. IN: H.S. James, ed. *Ethics and Economics of Agrifood Competition*. Springer, New York, NY.

Katchova, A.L., and T.A. Woods. Local foods and food cooperatives: Ethics, economics, and competition issues. Chapter 12, pp. 227–242. IN: H.S. James, ed. *Ethics and Economics of Agrifood Competition*. Springer, New York, NY.

Animal and Food Sciences

Jacob, J., and A. Pescatore. 2012. Gut health and organic acids, antimicrobial peptides, and botanicals as natural feed additives. pp. 351–378. IN: S.C. Ricke, E.J. Van Loo, M.G. Johnson, and C.A. O'Bryan, eds. *Organic Meat Production and Processing.* Wiley-Blackwell, Ames, IA.

Jacob, J., and A. Pescatore. 2012. Prebiotics. pp. 379–406. IN: S.C. Ricke, E.J. Van Loo, M.G. Johnson, and C.A. O'Bryan, eds. *Organic Meat Production and Processing.* Wiley-Blackwell, Ames, IA.

Lawrence, L. Feeding stallions and broodmares. pp. 231-242. IN: R.J. Geor, P.A. Harris, and M. Coenen, eds. *Clinical and Applied Nutrition.* Saunders Elsevier, St. Louis, MO.

Urschel, K.L., and L.M. Lawrence. Amino acids and protein. Chapter A-6, pp. 112-135. IN: *Equine Applied and Clinical Nutrition.* Saunders Elsevier, St. Louis MO.

Biosystems and Agricultural Engineering

Agouridis, C.T. Bankfull frequency in rivers. Chapter 35. IN: S. Eslamian, ed. *Handbook of Engineering Hydrology,* vol. 2*: Modeling, Climate Changes and Variability.* Taylor & Francis, CRC Group, New York, NY.

Agouridis, C.T. Hydrologic assessment of the Guy Cove Stream Restoration Project. pp. 444–445. IN: J.R. Craynon, ed. *Environmental Considerations in Energy.* Society for Mining, Metallurgy, Englewood, CO.

Huffman, R.L., D.D. Fangmeier, W.J. Elliot, and S.R. Workman. *Soil and Water Conservation Engineering.* 7th ed. American Society of Agricultural and Biological Engineers, St. Joseph, MI. 523 pp.

Community and Leadership Development

Hustedde, R.J., and J. Ganowicz. The basics: What's essential about theory for community development practice. pp. 163–179. IN: M.A. Brennan, J.C. Bridger, and T.R. Alter, eds. *Theory, Practice, and Community Development.* Routledge Press, New York, NY.

Entomology

Fox, C.W., and F.J. Messina. Life histories. IN: D. Gibson, ed. *Oxford Bibliographies.* Oxford University Press, NY. Published online: doi:10.1093/OBO/9780199830060-0016.

Li, X.R., and X. Zhou. Lignocellulolytic wood-feeding cockroach—A forgotten treasure. pp. 223–236. IN: J.Z. Sun, S.Y. Ding, and J. Doran-Peterson, eds. *Biological Conversion of Biomass for Fuel and Chemicals: Exploration from Natural Utilization Systems.* Energy and Environment Series. Royal Society of Chemistry, London.

Peterson, J.A., J.J. Obrycki, and J.D. Harwood. *Bacillus thuringiensis*: Transgenic crops. pp. 307–320. IN: S.E. Jorgensen, ed. *Encyclopedia of Environmental Management,* vol. 1. Taylor & Francis, New York, NY. Published online: http://dx.doi.org/10.1081/E-EEM-120046904.

Sun, J.Z., and X. Zhou. Lignocellulolytic systems of insects and their potential for viable biofuels. pp. 195–222. IN: J.Z. Sun, S.Y. Ding, and J. Doran-Peterson, eds. *Biological Conversion of Biomass for Fuel and Chemicals: Exploration from Natural Utilization Systems.* Energy and Environment Series. Royal Society of Chemistry, London.

White, J.A., M. Giorgini, M. Strand, and F. Pennacchio. Arthropod endosymbiosis and evolution. pp. 441–477. IN: A. Minelli, G. Boxshall, and G. Fusco, eds. *Arthropod Biology and Evolution: Molecules, Development, Morphology.* Published online: doi:10.1007/978-3-642-36160-9_17.

Family Sciences

Vazsonyi, A.T., and J. Mikuska. Immigration nation? Swiss Fremdenkinder yesterday and today. pp. 471–483. IN: A. Kuhn, C. Schwarzenegger, P. Margot, A. Donatsch, M.F. Aebi, and D. Jositsch, eds. *Criminology, Criminal Policy, and Criminal Law in an International Perspective: Essays in Honour of Martin Killias on the Occasion of His 65th Birthday.* Stämpfli, Bern, Switzerland.

Horticulture

Antonious, G.F. Pesticides: Measurement and mitigation. pp. 2013–2027. IN: S.E. Jorgensen, eds. *Encyclopedia of Environmental Management.* Taylor & Francis, New York, NY. Published online: http://dx.doi.org/10.1081/E-EEM-120046251.

Landscape Architecture

Lee, B.D., C.L. Wilson, and A. Schörgendorfer. Subwatershed clusters for land use assessment and planning. IN: R. Dodge and R. Congalton, eds. *Meeting Environmental Challenges with Remote Sensing Imagery.* Environmental Awareness Book Series. American Geosciences Institute, Alexandria, VA. Published in partnership with AmericaView, USGS Land Remote Sensing Program, American Society for Photogrammetry and Remote Sensing.

Plant and Soil Sciences

Bailey, W.A. Herbicides used in tobacco. pp. 175–199. IN: A. Price, ed. *Herbicides—Current Research and Case Studies in Use.* InTech Publishing, New York, NY.

D'Angelo, E.M. Methods for determining toxic organic compounds in wetlands. Chapter 42. IN: R.D. DeLaune, K.R. Reddy, C.J. Richardson, and J.P. Megonigal, eds. *Methods in Biogeochemistry of Wetlands.* Soil Science Society of America, Madison, WI. 1,024 pp.

Pattanaik, S., J.R. Werkman, and L. Yuan. Biomolecular fluorescence complementation as a tool to study interactions of regulatory proteins in plant protoplasts. pp. 185–193. IN: L. Yuan, and S. Perry, eds. *Plant Transcription Factors: Methods and Protocols,* vol. 754. Methods in Molecular Biology. Humana Press, New York, NY.

Unrine, J., B. Collin, and R. Warner. Selenium concentrations and solid-state chemical speciation in black shale associated with a West Virginia coal seam. pp. 438–442. IN: J. Craynon, ed. *Environmental Considerations in Energy Productions.* Society for Mining, Metallurgy, and Exploration, Englewood, CO.

Wendroth, O. Soil variability. pp. 292–332. IN: N. Lazarovitch and A.W. Warrick, eds. *Exercises in Soil Physics.* Catena Verlag GmbH, Reiskirchen, Germany.

Plant Pathology

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C.J. Stowe contributed to one article in Veterinary Science.
A.L. Meyer contributed to one article in Family Sciences.

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S.E. Nokes contributed to one article in Plant Pathology.
F.A. Payne contributed to one article in Animal and Food Sciences.
J.L. Taraba contributed to three articles in Animal and Food Sciences.
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S. DeBolt contributed to one article in Biosystems and Agricultural Engineering and one in the Kentucky Tobacco Research and Development Center.

A.B. Downie contributed to one article in Plant and Soil Sciences.

R.L. Geneve contributed to two articles in Plant and Soil Sciences.

R.L. Houtz contributed to one article in the Kentucky Tobacco Research and Development Center.

J.C. Snyder contributed to one article in Entomology.

J. Stork contributed to one article in the Kentucky Research and Development Center.

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E.T. Lyons contributed to one article in Animal and Food Sciences.

J.N. MacLeod contributed to one article in Computer Science.

J.F. Timoney contributed to one article in the Veterinary Diagnostic Laboratory.
D.W. Horohov contributed to one article in the Veterinary Diagnostic Laboratory.

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Vincelli, P., E. Dixon, and D. Fourqureen. Evaluation of fungicide application on disease intensity, stalk strength and yield in field corn, trial III, 2011. Plant Disease Management Reports No. 7:FC095.

Vincelli, P., E. Dixon, and D. Williams. Efficacy of fungicides for control of dollar spot in a mixed creeping bentgrass/*Poa annua* soil-based green, 2012. Plant Disease Management Reports No. 7:T004.

Vincelli, P., E. Dixon, and D. Williams. Influence of fungicide spray programs on turf quality in a mixed creeping bentgrass/*Poa annua* soil-based green, 2012. Plant Disease Management Reports No. 7:T005.

Vincelli, P., E. Dixon, R. Smith, and G. Olsen. Evaluation of Headline for control of foliar diseases of alfalfa, 2012. Plant Disease Management Reports No. 7:CF037.

Vincelli, P., D. Hershman, and C. Lee. Use of strobilurin fungicides by top-yielding corn producers in 2012. Mid-America Farmer Grower 33:12, 22 Mar. 2013, p. 7. Published online: http://www.mafg.net/Articles.aspx?ArticleID=MTQ4NjQ%3d-p9JKZiEWXig%3d.

Retailing and Tourism Management

Wei, W., Y. (Tracy) Lu, and L. Cai. Conventions going paperless: The power of social media technology—Anecdotes from convention attendees. Presentation, Asia-Pacific CHRIE Conference, Macao, China, May 21–24.

UK Veterinary Diagnostic Laboratory

Arnold, L.M. Acute or atypical interstitial pneumonia in grazing cattle. Cow Country News, Sep.

Arnold, L.M. Acute or atypical interstitial pneumonia in grazing cattle. Off The Hoof, Aug.

Arnold, L.M. Brassicas: Be aware of animal health risks. Cow Country News, Nov.

Arnold, L.M. Brassicas: Be aware of animal health risks. Grazing News, Winter.

Arnold, L.M. Colostrum management for dairy calves. Kentucky Dairy Notes, June.

Arnold, L.M. Decisions in the face of growing dewormer resistance. Goat Producer's Newsletter, Winter.

Arnold, L.M. Deworming—When is it profitable to deworm? Off The Hoof, Apr.

Arnold, L.M. Did anaplasmosis kill my cow? Kentucky Dairy Notes, Oct.

Arnold, L.M. Did anaplasmosis kill my cow? Off the Hoof, Oct.

Arnold, L.M. Does your pour-on dewormer still work? Cow Country News, June.

Arnold, L.M. Does your pour-on dewormer work? Off the Hoof, May.

Arnold, L.M. Acute or atypical interstitial pneumonia (AIP). Kentucky Veterinary News, Fall.

Arnold, L.M. Fescue toxicosis. Cow Country News, Oct.

Arnold, L.M. Fescue toxicosis. Off the Hoof, Sep.

Arnold, L.M. Forage-related disorders in cattle-hypomagnesemic tetany or "grass tetany." Off the Hoof, Dec.

Arnold, L.M. Judicious use of antibiotics—What does this mean for a beef producer? Cow Country News, July.

Arnold, L.M. Judicious use of antibiotics—What does this mean for a dairy producer? Kentucky Dairy Notes, July.

Arnold, L.M. Judicious use of antibiotics—What does this mean for a beef producer? Off the Hoof, June.

Arnold, L.M. New research in the diagnosis and treatment of neonatal calf diarrhea. Cow Country News, Jan.

Arnold, L.M. Slaframine toxicosis or "slobbers" in cattle. Cow Country News, Aug.

Arnold, L.M. Slaframine toxicosis or "slobbers" in cattle. Off the Hoof, July.

Arnold, L.M. Test your knowledge of parasite management that affect dewormer resistance. Goat Producer's Newsletter, Fall.

Arnold, L.M. UK fundamentals of herd health: Vaccinations for the cow-calf operation. Cow Country News, Apr.

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Arnold, L.M. USDA issues final rule for animal disease traceability. Cow Country News, Feb.

Arnold, L.M. USDA issues final rule for animal disease traceability. Off the Hoof, Jan.

Arnold, L.M. USDA's animal disease traceability begins March 11, 2013. Kentucky Dairy Notes, Mar.

Arnold, L.M. What are you doing to protect refugia? Goat Producer's Newsletter, Summer.

Arnold, L.M. What do you mean my calf has polio? Off the Hoof, Nov.

Arnold, L.M. What is the best antibiotic against *Staphylococcus aureus* mastitis in lactating cows? Kentucky Dairy Notes, Aug.

Arnold, L.M. What to look for in an oral electrolyte product. Cow Country News, Mar.

Arnold, L.M. What to look for in an oral electrolyte product. Kentucky Dairy Notes, Feb.

Arnold, L.M. What to look for in an oral electrolyte product. Off the Hoof, Feb.

Arnold, L.M. When does it pay to deworm in Kentucky? Cow Country News, May.

Arnold, L.M., and C. Gaskill. Winter 2012–2013: Mycotoxins and their effects on cattle. Kentucky Veterinary News, Winter.

Baszler, T., E. Ostlund, B. Crossley, U. Balasuriya, D. Bradway, E. Erol, D. Johnson, D. Rodman, S. Sells. Inter-laboratory comparison of equine herpesvirus type 1 polymerase chain reaction techniques utilized in north american diagnostic facilities. Proceedings, 56th Annual American Association of Veterinary Laboratory Diagnosticians, San Diego, CA, Oct. 19.

Brumfield, D.M., D.L. Smith, L.L. Smith, and C.L. Gaskill. Analytical method development for the extraction and analysis of eight anticoagulant rodenticides by high-performance liquid chromatography with electrospray ionization mass spectrometry. Proceedings, 246th National Meeting and Exposition of the American Chemical Society, Indianapolis, IN, Sept 8–12.

Carter, C.N., J. Cassady, N. Ronald, C. Gaskill, M. Arnold, J. Smith, and W. Northington. Knowledge-based differential diagnostic and accessioning mobile application to improve ruminant laboratory case submissions. Proceedings, XVI International Symposium of the WAVLD, Berlin, Germany, June.

Carter, C.N., J. Smith, and E. Erol. Equine monocytic ehrlichiosis. Kentucky Case Series 2008–2013, Equine Disease Quarterly 22(4):3–4.

Carter, C.N. Editor, Diagnostic Laboratory Rounds. Kentucky Veterinary News, Spring, Summer, Fall, and Winter issues.

Carter, C.N. From the Diagnostic Laboratory. Cattle Country News, Sep.

Cotton, K., L. Smith, C. Gaskill, R. Coleman, and R. Smith. Effect of sample handling and storage on ergovaline concentrations in fresh tall fescue samples. Proceedings, 22nd International Grassland Congress, Sydney, Australia, Sep. 15–19.

Cotton, K., L. Smith, C. Gaskill, R. Coleman, and R. Smith. Effect of sample handling and storage on ergovaline concentrations in tall fescue. Proceedings, American Forage and Grassland Council Conference, Covington, KY, Jan. 6–8.

Erol, E. Diagnostic methods of infectious diseases and on site diagnostic methods in veterinary medicine. Proceedings, 10th National Veterinary Internal Diseases Congress, Urgup, Turkey, June.

Erol, E., A. Loynachan, S. Locke, N. Kelly, and C. Carter. Toxin genotypes and antimicrobial susceptibility patterns of *Clostridium perfringens* isolates recovered from horses. Proceedings, 56th Annual American Association of Veterinary Laboratory Diagnosticians meeting, San Diego, CA, Oct. 19.

Erol, E., L. Cassone, L. Kennedy, U. Bryant, S. Locke, and C.N. Carter. Infectious agents identified from equine neonatal fatalities between 2010 and 2012. Proceedings, XVI International Symposium of the WAVLD, Berlin, Germany, June.

Gaskill, C.L. Cases of poisoning in horses. Proceedings, 4th Annual Kentucky Breeder's Short Course, Lexington, KY, Jan. 19.

Gaskill, C.L. Blue-green algae poisoning. Bluegrass Equine Digest, Oct., p. 1.

Gaskill, C.L. Snakebite in horses. Equine Disease Quarterly 22(3):4–5.

Gaskill, C.L. Snakebite in horses. The Horse online newsmagazine, July 15.

Gaskill, C.L. Toxicological case interpretations: The weak link in quality control? American Academy of Veterinary and Comparative Toxicology Working Retreat, Davis, CA, Oct. 22.

Gaskill, C.L. Toxicology and residue problems as reportable diseases: State regulations. Proceedings, Joint Committee on Environment and Toxicology, 56th Annual American Association of Veterinary Laboratory Diagnosticians meeting, San Diego, CA, Oct. 19.

Gaskill, C.L., and J.D. Green. Plants poisonous to horses and how to control them. Presentation, Bourbon County Horticulture Extension, Paris, KY, June 3.

Gaskill, C.L., and L.L. Smith. Food animal chemical residues—Issues for diagnostic laboratories. Proceedings, 56th Annual Meeting of the American Association of Veterinary Laboratory Diagnosticians, San Diego, CA, Oct. 19.

Gaskill, C.L., and L.L. Smith. The case of the toxic tennis ball. Proceedings, 56th Annual Meeting of the American Association of Veterinary Laboratory Diagnosticians, San Diego, CA, Oct. 19.
Williams, N.M. Equine neurologic disease. Equine Disease Quarterly 22:2.

Veterinary Science

Adams, A. The importance of nutrition in enhancing immunity in the aging horse. Equine Disease Quarterly 22(4):4.
Adams, A.A. Understanding the differences between EMS and PPID. Bluegrass Equine Digest. Published online: http://www2.ca.uky.edu/gluck/images/BED/BED-Jun13.pdf.
Balasuriya, U.B.R., B.M. Crossley, and P.J. Timoney. Laboratory diagnosis of equine herpesvirus-1 infection in horses: Advances and challenges. Proceedings, 116th Annual Meeting of the United States Animal Health Association, Greensboro, NC, Oct. 18–24.
Ball, B.A. Abnormalities of the equine estrous cycle. Proceedings, Zoetis Symposium, Guadalajara, Mexico, June 26–29.
Ball, B.A. Endocrinological evaluation of the prospective and breeding stallion. Proceedings, Zoetis Symposium, Guadalajara, Mexico, June 26–29.
Ball, B.A. New diagnostic methods in endocrinology. Proceedings, Zoetis Symposium, Guadalajara, Mexico, June 26–29.
Ball, B.A. Testicular and epididymal injuries and abnormalities. Proceedings, Zoetis Symposium, Guadalajara, Mexico, June 26–29.
Ball, B.A. Ultrasonographic and endoscopic examination of the stallion. Proceedings, Zoetis Symposium, June 26–29, Guadalajara, Mexico.
Dwyer, R.M. Commentary. Lloyd's Equine Disease Quarterly 22(1):1.
Dwyer, R.M. Commentary. Lloyd's Equine Disease Quarterly 22(2):1.
Dwyer, R.M. Commentary. Lloyd's Equine Disease Quarterly 22(3):1.
Dwyer, R.M. Rabies cases during 2011. Lloyd's Equine Disease Quarterly 22(2):4.
Dwyer, R.M. West Nile Virus and EEE cases in Kentucky. Bluegrass Equine Digest e-Newsletter, October.
Howe, D.K., and S. Reed. EPM diagnostics. Equine Disease Quarterly 22(2):3.
Lyons, E.T. Delusional parasitosis. American Society of Parasitologists Newsletter 35(1):7–11.
Nielsen, M.K., L. Mittel, A. Grice, M. Erskine, E. Graves, W. Vaala, R.C. Tully, D.D. French, R. Bowman, and R.M. Kaplan. AAEP parasite control guidelines. American Association of Equine Practitioners. Published online: http://www.aaep.org/info/parasite-control-guidelines.
Timoney, J.F. *Streptococcus zooepidemicus*: Only an opportunist? Equine Disease Quarterly 22(3):3.
Troedsson, M.H.T. Equine endometritis. Proceedings, Associação Brasileira deMédicos Veterinários de Equideos Annual Meeting, Campinos, Brazil, June 21–23.
Troedsson, M.H.T. Placentitis. Proceedings, Proceedings, Associação Brasileira deMédicos Veterinários de Equideos Annual Meeting, Campinos, Brazil, June 21–23.

Graduate Degrees

Degrees listed are from the 2013 spring semester, 2013 second summer session, and 2013 fall semester.

Ph.D. Dissertations

Agricultural Economics

Arthur, Bruno Rabarison. Financial anomalies: Evidence from agricultural industries.
Cavanaugh, Grant M. Direct climate markets: The prospects for trading teleconnection risk.
Collier, Benjamin Lee. Financial inclusion and natural disasters.
Jette-Nantel, Simon. Implications of off-farm income for farm income stabilization policies.
Vassalos, Michael. Essays on fresh vegetable production and marketing practices.
Zhou, Guzhen. Nanotechnology in the food system: Consumer acceptance and willingness to pay.

Animal and Food Sciences

Anandappa, Marienne A. Evaluating food safety systems development and implementation by quantifying HACCP training durability.
Burk, Steffanie V. Detection of antibodies against *parascaris equorum* excretory-secretory antigens.
Delles, Rebecca. Dietary antioxidant supplementation (economase-bioplex) to alleviate adverse impacts of oxidized oil on broiler meat quality: A chemical, textural, enzymatic, and proteomic study.
Foote, Andrew P. Effect of ergot alkaloids on bovine foregut vasculature, nutrient absorption, and epithelial barrier function.
Hoar, Melanie E. Use of MTB-100™, provided through a mineral mix, to reduce toxicity when lactating beef cows graze endophyte-infected tall fescue.
Koontz, Anne F. Effects of endophyte infected fescue alkaloid ingestion on energy metabolism, nitrogen balance, in situ feed degradation, and ruminal passage rates.
Liu, Jing. Effect of amylase and protein oxidation on the thermal, rheological, structural, and digestive properties of waxy and common rice flours and starches.
Miles, Edwena D. Effect of estradiol supplementation on blood estradiol and metabolite levels, and hepatic protein expression, in growing, mature, and senescent beef cattle.
Monegue, James S. Evaluation of the effects of vitamin K on growth performance and bone health in swine.
Willig, Jennifer A. Analysis of antiviral and chemoprotective effects of strawberry anthocyanins.

Biosystems and Agricultural Engineering

Modenbach, Alicia A. Sodium hydroxide pretreatment of corn stover and subsequent enzymatic hydrolysis: An investigation of yields, kinetic modeling and glucose recovery.
Sama, Michael P. Precise evaluation of GNSS position and latency errors in dynamic agricultural applications.

Entomology

Crain, Philip. Putting theory into practice: Predicting the invasion and stability of *Wolbachia* using simulation models and empirical studies.
Welch, Kelton. Selective utilization of microhabitats by web-building spiders.

Family Sciences

Huff, Nichole L. Positive affect, hemispheric lateralization, and relational problem solving: A mixed-methods exploration of parent-adolescent communication.

Horticulture

Caudle, John R. Control of *Erwinia tracheiphila* in *Cucumis melo.*

Plant and Soil Sciences

Plant Physiology

Werkman, Joshua R. DNA-binding site recognition by bHLH and MADS-domain transcription factors.

Soil Science

Dhakal, Prakash. Abiotic nitrate and nitrite reactivity with iron oxide minerals.
Gumbert, Amanda A. Influence of riparian buffer management strategies on soil properties.
Kreba, Sleem. Land use impact on soil gas and soil water transport properties.
Landrum, Carla. Mapping and decomposing scale-dependent soil moisture variability within an inner bluegrass landscape.
Lucas, Shawn T. Managing soil microbial communities with organic amendments to promote soil aggregate formation and plant health.

Plant Pathology

El-Habbak, Mohamed H. Overexpression/silencing of selected soybean genes alters resistance to pathogens.
Starnes, John H. Characterization and distribution of novel non-LTR retroelements driving high telomere RFLP diversity in clonal lines of *Magnaporthe oryzae.*
Torres, Maria F. Cellular and molecular aspects of the interaction between maize and the anthracnose pathogen *Colletotrichum graminicola.*

Veterinary Science

Liu, Chong. Evidence for the maturation of cellular immune responses in equine infectious anemia virus-infected ponies.
Page, Allen. Determination of farm-specific *Lawsonia intracellularis* seroprevalence in central Kentucky Thoroughbreds and the identification of factors contributing to equine proliferative enteropathy.

M.S. Theses

Agricultural Economics

Brown, Rachael Martha. Economic optimization and precision agriculture: a carbon footprint story.
Dunaway, Tarrah Michelle. Farm financial performance of Kentucky farms.
Osborne, William Anthony. Improving farm management decisions by analyzing production expenditure allocations and farm performance standing.
Penn, Jerrod M. Valuation of recreational beach quality and water quality management strategies in Oahu.
Robert, Marion Angelique. Thoroughbred farm managers' willingness to pay for alternative deworming regimens in horses.
Smith, Chaquenta L. Effect of family structure on educational attainment and health insurance coverage of youth in the Lower Mississippi Delta region.

In addition, two non-thesis master's degrees were awarded in calendar year 2013.

Animal and Food Sciences

Black, Randi Alyson. Compost bedded pack barns: Management practices and economic implications.
Fowler, Ashley. Phosphorus digestibility and phytate degradation in long yearlings and mature horses.
Good, Lindsay. The effects of Actigen® and threonine supplementation on growth parameters, immune function, and intestinal health in monogastrics.
Harlow, Brittany E. Changes to the equine hindgut microflora in response to antibiotic challenge.
Kenney, Nicole. Impact of direct-fed microbials on nutrient utilization in beef cattle.
Liang, Di. Estimating the economic losses from diseases and extended days open with a farm-level stochastic model.
Mastro, Laurel. The effect of pituitary pars intermedia dysfunction on protein metabolism and insulin sensitivity in aged horses.
Slaughter, Leeann L. Antilisterial characteristics of volatile essential oils.
Sterrett, Amanda E. Management and technology solutions for improving milk quality.
van Benschoten, Megan D. Effects of a proprietary premix on productive performance and egg quality of white and brown egg laying hens fed diets high in distillers dried grains with soluble (DDGS).

Biosystems and Agricultural Engineering

Graham, Tabitha L. Investigation of media ingredients and water sources for algae CO_2 capture at different scales to demonstrate the correlations between lab-scale and large-scale growth.
Kellow, Jeffrey M. Weather forecast modeling of solar thermal systems and energy management.
Lyvers, Christina M. Evaluation of handling equipment sound pressure levels as stressors in beef cattle.
Villines, Jonathan A. Using GIS to delineate headwater stream origins in the Appalachian coal-belt region of Kentucky.

Community and Leadership Development

Adams, Randy. Identifying risk and protective factors of preparatory and non-preparatory students in agricultural education programs of a rural Kentucky high school.
Bolin, Rachel. Mobile health technology and health behavior: A look into the workplace setting.
Boone, George E. Emotion, community development and the physical environment: An experimental investigation of measurements.
Farrell, Shannon W. The process of learner centered instruction in adult clientele.
Pratt, Bethany. Empowerment food: A curriculum for growing conscientious eaters.
Schack, Miranda R. Evaluation of motivation and professional development of Curriculum for Agricultural Science Education (CASE) lead and master teachers.
Thomas, Ryan H. Impact of transformational leadership: Exploring the transformational leadership qualities of selected secondary agriculture teachers.
Tucker, Bethany J. "Los Jovenes Lideres del Manana": A leadership development program for Latino youth.
Whittle, Jennifer L. Horse sense: Evaluating the teaching of horse safety principles to teens in an online environment.

In addition, two non-thesis master's degrees were awarded in calendar year 2013.

Dietetics and Human Nutrition

Armes, Ann M. Disordered eating habits and behaviors among elite collegiate athletes.
Camenisch, Amy L. Entrepreneurship on the farm: Kentucky growers' perceptions of benefits and barriers.
Ireland, Amanda N. Overall diet quality of collegiate athletes.
Lewis, Sarah Elizabeth. Low-income adults food management practices and nutrition behaviors and association with diet.
Mayes, Lindsey M. Nutrition knowledge and dietary habits of farmers market patrons.
Murnan, Erin Marie. Fit Camp: A behavioral weight loss program and the effects of self-monitoring, social support, attendance and motivation.
Stauble, Taylor M. Celiac disease and diet quality.

Entomology

Allen, Christine. An assessment of the invasive poison hemlock and its insect associates in Kentucky.
Curry, Meghan. Endosymbiont prevalence and reproductive manipulation of the spider *Mermessus fradeorum*.
Dobbs, Emily. Enhancing arthropod ecosystem services in turf: Mowing height, naturalized roughs, and Operation Pollinator.

In addition, one non-thesis master's degree was awarded in calendar year 2013.

Graduate Enrollment

Graduate enrollment data are from the UK Office of Institutional Research, http://www.uky.edu/IR/student.html.

	2012	2013	net change
Agricultural Economics			
Master's	22	20	-2
Doctorate	32	32	0
Major Total	54	52	-2
Animal and Food Sciences			
Master's	34	39	5
Doctorate	26	18	-8
Major Total	60	57	-3
Biosystems and Agricultural Engineering			
Master's	22	22	0
Doctorate	9	5	-4
Major Total	31	27	-4
Entomology			
Master's	13	14	1
Doctorate	23	20	-3
Major Total	36	34	-2
Family Sciences			
Master's	22	23	1
Doctorate	27	28	1
Major Total	49	51	2
Forestry			
Master's	15	18	3
Doctorate*			0
Major Total	15	18	3
Retailing & Tourism Management			
Master's	10	8	-2
Doctorate*			0
Major Total	10	8	-2
Dietetics and Human Nutrition			
Master's	21	21	0
Doctorate*			0
Major Total	21	21	0
Plant Pathology			
Master's	1	2	1
Doctorate	17	15	-2
Major Total	18	17	-1
Plant and Soil Sciences/Horticulture			
Master's	29	31	2
Doctorate	48	46	-2
Major Total	77	77	0
Rural Sociology/Career, Technology and Leadership Education			
Master's	30	36	6
Doctorate	5	7	2
Major Total	35	43	8
Veterinary Science			
Master's	10	6	-4
Doctorate	17	18	1
Major Total	27	24	-3
Grand Total	**433**	**429**	**-4**

*Degree type not offered.

Family Sciences

Carlson, Matthew W. Maximizing benefits and minimizing impacts: Dual-earner couples' division of household labor.

Hamilton, Kristen Auberry. The effects of marital conflict and marital environment on change in marital status.

Machaty, Agnes. Dispositional optimism and marital adjustment.

Reed, Kayla. How parental divorce during emerging adulthood gives meaning to emerging adults' experiences: A phenomenological approach.

In addition, one non-thesis master's degree was awarded in calendar year 2013.

Forestry

Shrestha, Prativa. Carbon life-cycle and economic analysis of forest carbon sequestration and woody bioenergy production.

Maigret, Thomas. Effects of streamside management zone timber harvest on salamander communities in Robinson Forest.

Horticulture

Anderson, Victoria. Calendula officinalis growth and production of secondary compounds in greenhouse and soil-based herbal organic production systems.

Hessler, Alex. Reduced tillage and living mulches for organic vegetable production.

Plant and Soil Sciences

Integrated Plant and Soil Sciences

Bourguignon, Marie. Ecophysiological responses of tall fescue genotypes to endophyte infection and climate change.

Khaeim, Hussein M. Mass selection with an optical sorter for head scab resistance in soft red winter wheat.

Plant Science

Pyzola, Stephanie. Nitrate reduction coupled to iron(II) and manganese(II) oxidation in an agricultural soil.

Rathnayake, Sewwandi. Transformations, bioavailability and toxicity of ZnO manufactured nanomaterials in wastewater.

In addition, one non-thesis master's degree in Crop Science was awarded in calendar year 2013.

Plant Pathology

Holdcroft, Anna M. Alternative methods of control for *Phytophthora nicotianae* of tobacco.

Retailing and Tourism Management

Han, Michelle. Effects of restaurant tax and price increases: Implications for managers, policy makers, and lobbyists.

Veterinary Science

De Negri, Rafaela. Equine serum antibody responses to *Streptococcus equi* and *Streptococcus zooepidemicus.*

Eberth, John E. Chondrodysplasia-like dwarfism in the miniature horse.

Gaubatz, Breanna. Equine protozoal myeloencephalitis: Investigation of genetic susceptibility and assessment of an equine infection model.

Financial Statement

Statement of Federal Formula Funds

Fiscal Year 2013

Income

Federal Funds	
Hatch	4,642,178
Hatch Multi–State	1,311,247
McIntire–Stennis	579,540
Animal Health	56,303.00
Total Federal Funds	6,589,268
State Funds	
Total State Funds	27,226,866
Total Funds	**33,816,134**

Expenditures

	Federal	**State**	**Total**
Personal Services	5,430,427	21,787,134.19	27,217,561
Travel	146,114	460,467.47	606,582
Other Operating Expenses	850,812	4,546,769.76	5,397,582
Equipment	161,915	432,494.57	594,410
Total Expenditures	**6,589,268**	**27,226,866**	**33,816,134**

Staff

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Departments

Following are departmental faculty and leadership lists for calendar year 2013. (R) denotes Experiment Station appointment.

Agricultural Communications

Skillman, L.M., Director

Agricultural Economics

Maynard, L.J., Professor and Chair (R)
Batte, M.T., Part-time Research Professor
Brown, R., Senior Lecturer
Dasgupta, S., Adjunct Assistant Professor
Davis, A., Associate Extension Professor
Debertin, D.L., Professor (R)
Dillon, C., Professor (R)
Freshwater, D., Professor (R)
Gorton, W.T., Adjunct Assistant Professor
Halich, G., Assistant Extension Professor
Hu, W., Professor (R)
Isaacs, S., Extension Professor
Katchova, A., Associate Professor (R)
Kusunose, Y., Assistant Professor (R)
Meyer, A.L., Extension Professor
Nogueira, L., Assistant Professor (R)
Reed, M.R., Professor (R)
Robbins, L., Professor (R)
Saghaian, S., Associate Professor (R)
Schieffer, J.K., Assistant Professor (R)
Simon, M.E., Adjunct Assistant Professor
Skees, J.R., Professor (R)
Snell, W.M., Extension Professor
Stowe, C.J., Associate Professor (R)
Walters, C.G., Assistant Extension Professor
Williamson, L., Extension Professor
Woods, T.A., Extension Professor

Animal and Food Sciences

Harmon, R.J., Professor and Chair(R)
Aaron, D.K., Professor (R)
Aiken, G.E., Adjunct Associate Professor
Amaral-Phillips, D.M., Extension Professor
Anderson, L.H., Extension Professor
Andries, K.M., Adjunct Assistant Professor
Ao, T, Adjunct Assistant Professor
Bewley, J.M., Associate Extension Professor
Boatright, W.L., Professor (R)
Boling, J.A., Professor (R)
Brennan, K.M., Adjunct Assistant Professor
Bridges, P.J., Assistant Professor (R)
Bullock, K.D., Extension Professor
Burris, R., Extension Professor
Cantor, A.H., Associate Professor (R)
Camargo, F.C., Associate Extension Professor
Coffey, R.D., Extension Professor
Coleman, R.J., Associate Extension Professor
Cox, N.M., Associate Dean for Research
Cromwell, G.L., Professor (R)
Dawson, K.A., Adjunct Professor
Ely, D.G., Professor (R)
Flythe, M.D., Adjunct Assistant Professor
Harmon, D.L., Professor (R)
Heersche, Jr., G., Extension Professor
Hennig, B., Professor (R)
Hicks, C.L., Professor (R)
Klotz, J.L., Adjunct Assistant Professor
LaBonty, E.A., Lecturer
Lawrence, L.M., Professor (R)
Lehmkhuler, J.W., Assistant Extension Professor
Lindemann, M.D., Professor (R)
Matthews, J.C., Professor (R)
McLeod, K.R., Associate Professor (R)
Newman, M.C., Associate Professor (R)
O'Leary, J., Extension Associate Professor
Pescatore, A.J., Extension Professor
Pierce, J.L., Adjunct Assistant Professor
Rentfrow, G.K., Associate Extension Professor
Rossano, M.G., Associate Professor (R)
Silvia, W.J., Professor (R)
Strickland, J.R., Adjunct Associate Professor
Strobel, H.J., Adjunct Associate Professor
Suman, S.P., Associate Professor (R)
Tidwell, J., Adjunct Assistant Professor
Tricarico, J.M., Adjunct Assistant Professor
Urschel, K.L., Assistant Professor (R)
Vanzant, E.S., Associate Professor (R)
Wang, C., Adjunct Assistant Professor
Webster, C.D., Adjunct Assistant Professor
Xiong, Y., Professor (R)

Biosystems and Agricultural Engineering

Nokes, S.E., Professor and Chair (R)
Agouridis, C.T., Assistant Professor (R)
Bolster, C.H., Adjunct Professor
Byers, M.E., Adjunct Assistant Professor
Castillo, M.Z., Adjunct Associate Professor
Colliver, D.G., Professor (R)
Crofcheck, C.L., Associate Professor (R)
Dvorak, J.S., Assistant Professor (R)
Edwards, D.R., Professor (R)
Fehr, R.L., Extension Professor Emeritus
Gates, R.S., Adjunct Professor
Higgins, S.F., Adjunct Assistant Professor
McNeill, S.G., Associate Extension Professor
Montross, M.D., Professor (R)
Murphy, W.E., Professor
Overhults, D.G., Extension Professor
Payne, F.A., Professor Emeritus (R)
Purschwitz, M.A., Extension Professor (R)
Sama, M.P., Assistant Professor
Stombaugh, T.D., Extension Professor (R)
Taraba, J.L., Extension Professor
Walker, S.P., Assistant Professor (R)
Warner, R.C., Extension Professor
Webb, E.G., Adjunct Assistant Professor
Wells, L.G., Professor Emeritus
Wheeler, E.F., Adjunct Associate Professor
Wilhoit, J.H., Associate Extension Professor
Workman, S.R., Professor and Assistant Dean for Research (R)

Community and Leadership Development

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Dyk, P., Associate Professor (R)
Epps, R., Assistant Professor (R)
Garkovich, L., Professor
Hains, B., Assistant Professor (R)
Harris, R., Associate Professor (R)
Hustedde, R., Extension Professor
Jones, K., Associate Extension Professor
Maurer, R., Extension Professor Emeritus
Nah, S., Associate Professor (R)
Namkoong, K., Assistant Professor
Ricketts, K., Associate Extension Professor
Rossi, A., Lecturer
Tanaka, K., Associate Professor (R)
Vincent, S., Assistant Professor (R)
Weckman, R., Associate Professor Emeritus
Zimmerman, J., Extension Professor

Dietetics and Human Nutrition

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Adams, I.K., Assistant Extension Professor
Addo, K., Associate Professor Emeritus
Brewer, D.P., Lecturer
Chow, C.K., Professor
Combs, E.L., Lecturer
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Gaetke, L.M., Professor, Partial Retirement (R)
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Mullins, J.T., Associate Extension Professor
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Webber, K.H., Assistant Professor (R)
Williams, A.W., Lecturer

Entomology

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Brown, G.C., Professor (R)
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Fox, C.W., Professor (R)
Harwood, J.D., Assistant Professor (R)
Haynes, K.F., Professor (R)
Johnson, D.W., Extension Professor
Palli, S.R., Professor (R)
Potter, D.A., Professor (R)
Potter, M.F., Extension Professor
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Sharkey, M.J., Professor (R)
Townsend, L.H., Extension Professor
Webb, B.A., Professor (R)
Webster, T.C., Assistant Adjunct Professor
White, J.A., Assistant Professor (R)
Yeargan, K.V., Professor (R)
Xuguo, Z., Assistant Professor (R)

Family Sciences

Werner-Wilson, R.J., Endowed Professor and Chair (R)
Brock, G.W., Professor Emeritus
Culp, III, K., Adjunct Associate Professor
Flashman, R., Extension Professor
Haleman, D., Lecturer
Hans, J., Associate Professor (R)
Heath, C.J., Professor (R)
Hosier, A., Assistant Extension Professor
Hunter, J.L., Assistant Extension Professor
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Parker, T.S., Assistant Professor (R)

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Kentucky Tobacco Research and Development Center

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Yuan, L., Research Director
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Ji, H., Scientist II
Maiti, I., Scientist III
Mihaylova-Kroumova, A., Scientist II
Mundell, R., Scientist II
Patra, B., Scientist I
Pattanaik, S., Scientist II
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Nieman, T.J., Professor
Sass, C.K., Assistant Professor
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Plant and Soil Sciences

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Plant Pathology

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