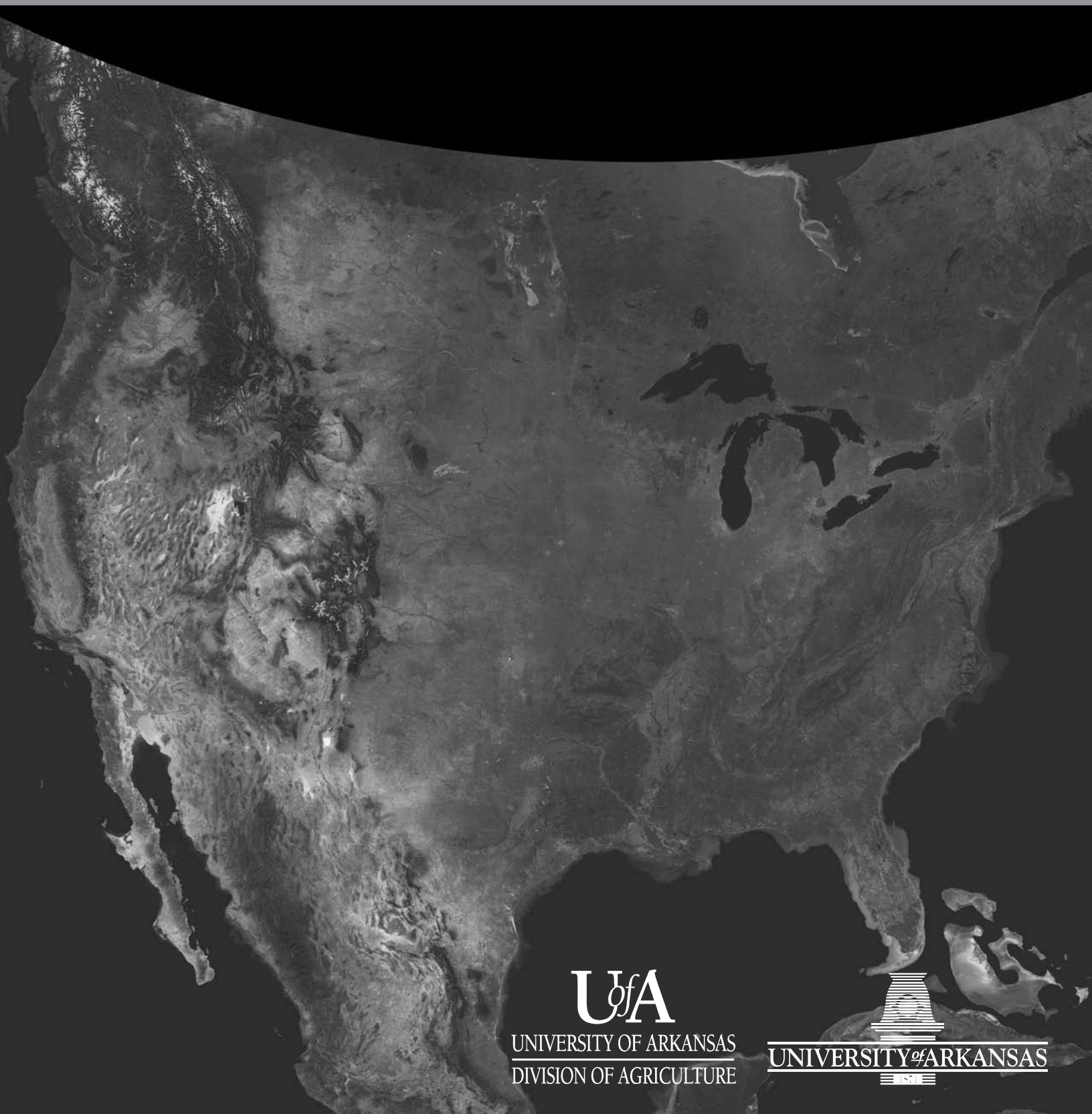
DISCOVERY

The Student Journal of the Dale Bumpers College of Agricultural, Food and Life Sciences
Vol. 5, Fall 2004



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Cover: This image of North America combines cloud-free data from over 500 Multi-angle Imaging SpectroRadiometer (MISR) orbits conducted by NASA and published on NASA's Earth Observatory Web site (visit http://earthobservatory.nasa.gov/ and click on The Image of the Day archive). This impressive satellite imagery captures geological features, ecological systems, and human landscapes throughout North America. Zoom in.

Letter from the Dean

Gregory J. Weidemann

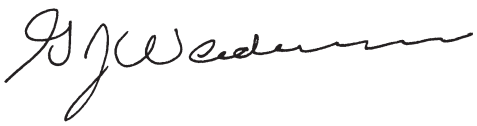
Undergraduate students in the Bumpers College of Agricultural, Food and Life Sciences are being educated to seek solutions to today's societal and food production challenges by applying proper scientific method and research protocols. Public support of higher education enables students to pursue research projects—both quantitative and qualitative—with their faculty mentors. Sixty faculty members presently serve as mentors to students to assist them with their research agendas. Most, but not all, such projects are designed to meet the requirements of an honors thesis in the Bumpers College Honors Program. Whether in the Honors Program or not, students who take advantage of research opportunities gain scientific and professional skills that can strengthen their contributions to society. Conducting a research project and authoring the results add value to their university education.

The Bumpers College encourages student research by awarding undergraduate research grants, including the Carroll Walls Undergraduate Research Fellowship, which provides a grant of $1,000. We awarded 9 Undergraduate Research Grants in the fall of 2003.

DISCOVERY provides a reporting outlet for our student scientists that empowers them to bring the research process to fruition. Being published in *DISCOVERY* does not supersede publication elsewhere; this journal provides a forum for students and faculty to share their results and findings in a citable publication.

The 17 articles in this fifth annual volume of *DISCOVERY* cover a wide range of topics. They explore production issues in rice, soybean, swine, poultry, silage, green beans, and blackberries. Topics also include research on wetlands, soils, cognitive processes, and academic performance. We are proud to present these articles as examples of the research accomplishments of our undergraduate students.

I heartily congratulate the student authors on their accomplishments and extend thanks to their faculty mentors and to the editors who reviewed their manuscripts. Thanks also to the Honors Committee for providing a structured program that encourages our students to step up to today's challenges.



Gregory J. Weidemann, Dean
and Associate Vice President for Agriculture

Effect of pig weaning age and commingling after the nursery phase on humoral and behavioral indicators of well-being and on growth performance

Sarah C. Arthur, Mari E. Davis†, Jason K. Apple§, and Charles V. Maxwell‡*

ABSTRACT

Two hundred and sixteen pigs were weaned at 14 or 21 d of age to determine the effect of weaning age and commingling after the nursery phase on growth and behavior of pigs in a wean-to-finish facility. Pigs were divided into older and younger age groups and allotted 12 pigs/pen with nine replications of each group. At the end of the nursery phase (d 34 after weaning), one-half of the pigs in each group were removed and commingled for the grower/finisher phase and the other half remained in their original pens. Beginning at weaning (d 0), pigs were monitored via camera surveillance following weaning, commingling, and on d 65 after weaning. While in the nursery phase, older pigs had greater gain and feed intake than younger pigs, however, younger pigs were more efficient throughout the nursery phase than older pigs. Toward the end of the grower/finisher period, younger pigs had greater gain, feed intake, and gain:feed than older pigs and reached a common weight 4 d sooner. Younger pigs spent more time standing or moving during the nursery phase than older pigs. Immediately following commingling, the younger, unmixed pigs spent more time feeding. However on d 65 after weaning, the older, commingled pigs and younger, unmixed pigs spent more time feeding than older, unmixed pigs and younger, commingled pigs. In conclusion, younger pigs grew slower than older pigs during the nursery phase; however, younger pigs gained more during the finishing period. Additionally, weaning age and commingling influenced feeding behavior during the grower/finisher period.

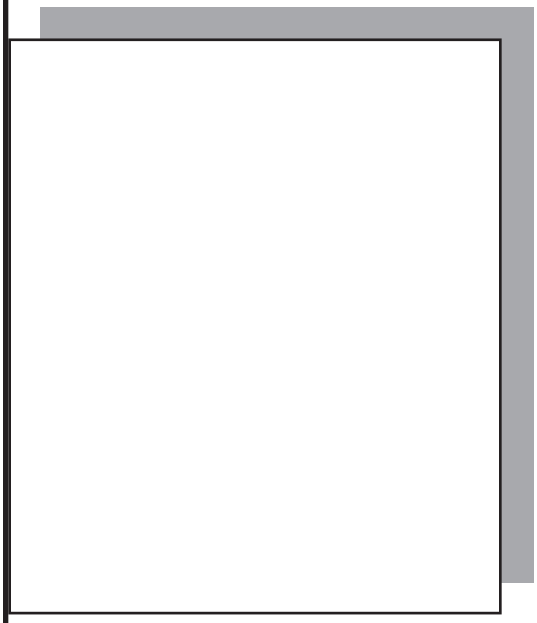
* Sarah C. Arthur is a junior majoring in agricultural education.

† Mari E. Davis is a post-doctoral associate in the Department of Animal Science.

§ Jason K. Apple, faculty sponsor, is an associate professor in the Department of Animal Science.

‡ Charles V. Maxwell, faculty co-sponsor, is a professor in the Department of Animal Science.

MEET THE STUDENT-AUTHOR



Sarah C. Arthur

I am a 2001 graduate of Springdale High School where I was active in National Future Farmers of America. I raised and showed all types of livestock, including sheep, chickens, horses, and rabbits, for local and state-level competitions. With my experience in livestock production, I began my undergraduate career at the University of Arkansas in fall 2001 and began to pursue my degree in the Department of Agricultural and Extension Education, studying agricultural education and communication. At that time, I began working at the Swine Research Facility in Savoy and in the Swine Nutrition Laboratory for Dr. Charles Maxwell in the Department of Animal Science. While working in the Department of Animal Science, I have worked on several swine nutrition and immunology research trials and gained valuable skills such as cell culture techniques and immunological assay procedures. In 2002, I applied for a Dale Bumpers Undergraduate Research Grant and later that year I began working on this project. With the help of Dr. Maxwell and Dr. Jason Apple I have developed an interest in this field of study and plan on pursing a career in the swine industry upon graduating in fall 2005.

INTRODUCTION

Pigs produced in conventional intensively managed swine production systems are routinely weaned as early as 21 d of age and as early as 10 to 14 d of age in off-site segregated early weaning systems. The industry average weaning age is about 17 d. Although there are no restrictions on weaning age in the U. S., the practice of weaning at an age earlier than 21 d is discouraged in some countries and prohibited in others. Recent studies have shown that early-weaning and removal of pigs to an isolated site for rearing can reduce the potential for disease transfer from the dam. Pigs reared in isolation after weaning have been reported to have reduced immunological stress (Johnson, 1997), resulting in a substantial improvement in growth and efficiency of feed utilization compared with those reared in conventional farrow-to-finish systems (Williams et al., 1997). Similarly, commingling pigs following the nursery phase is a common management practice in the swine industry, and imposes an additional social stress upon the young pig. The advent of wean-to-finish facilities has potentially alleviated commingling after the nursery phase. However, the wasted space of placing weanling pigs in pens with space allowances for market hogs has led to the practice of double-stocking pens at weaning and later moving half of the pigs to another pen (DeDecker et al., 2002), again introducing a commingling stress.

Many food-service companies have come under scrutiny from animal-rights and animal-welfare organizations over the humane care and use of the meat animals from which their products are derived. However, it is inherently difficult to measure an animal's well-being in a manner consistent with quantitative science. Stress is typically measured by evaluating changing levels of serum cortisol as an indicator of activation of the hypothalamic-pituitary-adrenal axis in response to a defined stressor (Dantzer and Mormede, 1983). Although cortisol levels have consistently been reported to elevate in response to stress, the very act of obtaining the blood sample intrinsically alters cortisol response (McGlone et al., 1993). It has been suggested that immunological evaluations such as the neutrophil:lymphocyte ratio in the blood may be a more reliable measure of stress than is cortisol concentration (Gross and Siegel, 1983; Stull et al., 1999).

It is imperative that industry decisions in this country are based on studies determining the well-being and