January 2015

Swine Day 2015 Supplements

R. D. Goodband  
*Kansas State University, Manhattan*, goodband@k-state.edu

M. D. Tokach  
*Kansas State University, Manhattan*, mtokach@k-state.edu

S. S. Dritz  
*Kansas State University, Manhattan*, dritz@k-state.edu

J. M. DeRouchey  
*Kansas State University, Manhattan*, jderouch@k-state.edu

*See next page for additional authors*

Follow this and additional works at: [https://newprairiepress.org/kaesrr](https://newprairiepress.org/kaesrr)  
Part of the [Other Animal Sciences Commons](https://newprairiepress.org/kaesrr)

**Recommended Citation**


This report is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in Kansas Agricultural Experiment Station Research Reports by an authorized administrator of New Prairie Press. Copyright January 2015 Kansas State University Agricultural Experiment Station and Cooperative Extension Service. Contents of this publication may be freely reproduced for educational purposes. All other rights reserved. Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. K-State Research and Extension is an equal opportunity provider and employer.
Swine Day 2015 Supplements

Abstract
It is with great pleasure that we present the 2015 Swine Industry Day Report of Progress. This report contains updates and summaries of applied and basic research conducted at Kansas State University during the past year. We hope that the information will be of benefit as we attempt to meet the needs of the Kansas swine industry.

Keywords
swine

Creative Commons License
This work is licensed under a Creative Commons Attribution 4.0 License.

Authors
Foreword

It is with great pleasure that we present the 2015 Swine Industry Day Report of Progress. This report contains updates and summaries of applied and basic research conducted at Kansas State University during the past year. We hope that the information will be of benefit as we attempt to meet the needs of the Kansas swine industry.

2015 Swine Day Report of Progress Editors
Bob Goodband, Mike Tokach, Steve Dritz, Joel DeRouchey, and Jason Woodworth
## Standard Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADG</td>
<td>average daily gain</td>
<td>Mcal</td>
<td>megacalorie(s)</td>
</tr>
<tr>
<td>ADF</td>
<td>acid detergent fiber</td>
<td>ME</td>
<td>metabolizable energy</td>
</tr>
<tr>
<td>ADFI</td>
<td>average daily feed intake</td>
<td>mEq</td>
<td>milliequivalent(s)</td>
</tr>
<tr>
<td>AI</td>
<td>artificial insemination</td>
<td>min</td>
<td>minute(s)</td>
</tr>
<tr>
<td>avg</td>
<td>average</td>
<td>mg</td>
<td>milligram(s)</td>
</tr>
<tr>
<td>bu</td>
<td>bushel</td>
<td>mL</td>
<td>cc (cubic centimeters)</td>
</tr>
<tr>
<td>BW</td>
<td>body weight</td>
<td>mm</td>
<td>millimeter(s)</td>
</tr>
<tr>
<td>cm</td>
<td>centimeter(s)</td>
<td>mo</td>
<td>month(s)</td>
</tr>
<tr>
<td>CP</td>
<td>crude protein</td>
<td>MUFA</td>
<td>monounsaturated fatty acid</td>
</tr>
<tr>
<td>CV</td>
<td>coefficient of variation</td>
<td>N</td>
<td>nitrogen</td>
</tr>
<tr>
<td>cwt</td>
<td>100 lb</td>
<td>NE</td>
<td>net energy</td>
</tr>
<tr>
<td>d</td>
<td>day(s)</td>
<td>NDF</td>
<td>neutral detergent fiber</td>
</tr>
<tr>
<td>DE</td>
<td>digestible energy</td>
<td>NFE</td>
<td>nitrogen-free extract</td>
</tr>
<tr>
<td>DM</td>
<td>dry matter</td>
<td>ng</td>
<td>nanogram(s), .001 Fg</td>
</tr>
<tr>
<td>DMI</td>
<td>dry matter intake</td>
<td>no.</td>
<td>number</td>
</tr>
<tr>
<td>F/G</td>
<td>feed efficiency</td>
<td>NRC</td>
<td>National Research Council</td>
</tr>
<tr>
<td>ft</td>
<td>foot(feet)</td>
<td>ppb</td>
<td>parts per billion</td>
</tr>
<tr>
<td>ft²</td>
<td>square foot(feet)</td>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>g</td>
<td>gram(s)</td>
<td>psi</td>
<td>pounds per square inch</td>
</tr>
<tr>
<td>µg</td>
<td>microgram(s), .001 mg</td>
<td>PUFA</td>
<td>polyunsaturated fatty acid</td>
</tr>
<tr>
<td>gal</td>
<td>gallon(s)</td>
<td>SD</td>
<td>standard deviation</td>
</tr>
<tr>
<td>GE</td>
<td>gross energy</td>
<td>sec</td>
<td>second(s)</td>
</tr>
<tr>
<td>h</td>
<td>hour(s)</td>
<td>SE</td>
<td>standard error</td>
</tr>
<tr>
<td>HCW</td>
<td>hot carcass weight</td>
<td>SEM</td>
<td>standard error of the mean</td>
</tr>
<tr>
<td>in</td>
<td>inch(es)</td>
<td>SEW</td>
<td>segregated early weaning</td>
</tr>
<tr>
<td>IU</td>
<td>international unit(s)</td>
<td>SFA</td>
<td>saturated fatty acid</td>
</tr>
<tr>
<td>kg</td>
<td>kilogram(s)</td>
<td>UFA</td>
<td>unsaturated fatty acid</td>
</tr>
<tr>
<td>kcal</td>
<td>kilocalorie(s)</td>
<td>wk</td>
<td>week(s)</td>
</tr>
<tr>
<td>kWh</td>
<td>kilowatt hour(s)</td>
<td>wt</td>
<td>weight(s)</td>
</tr>
<tr>
<td>lb</td>
<td>pound(s)</td>
<td>yr</td>
<td>year(s)</td>
</tr>
</tbody>
</table>
K-State Vitamin and Trace Mineral Premixes

Diets listed in this report contain the following vitamin and trace mineral premixes unless otherwise specified.

- Trace mineral premix: Each pound of premix contains 12 g Mn, 50 g Fe, 50 g Zn, 5 g Cu, 90 mg I, and 90 mg Se.

- Vitamin premix: Each pound of premix contains 2,000,000 IU vitamin A, 300,000 IU vitamin D₃, 8,000 IU vitamin E, 800 mg menadione, 1,500 mg riboflavin, 5,000 mg pantothenic acid, 9,000 mg niacin, and 7 mg vitamin B₁₂.

- Sow add pack: Each pound of premix contains 100,000 mg choline, 40 mg biotin, 300 mg folic acid, and 900 mg pyridoxine.

Note
Some of the research reported here was carried out under special FDA clearances that apply only to investigational uses at approved research institutions. Materials that require FDA clearances may be used in the field only at the levels and for the use specified in that clearance.
Biological Variability and Chances of Error

Variability among individual animals in an experiment leads to problems in interpreting the results. Animals on treatment X may have higher average daily gains than those on treatment Y, but variability within treatments may indicate that the differences in production between X and Y were not the result of the treatment alone. Statistical analysis allows us to calculate the probability that such differences are from treatment rather than from chance.

In some of the articles herein, you will see the notation “$P < 0.05$.” That means the probability of the differences resulting from chance is less than 5%. If two averages are said to be “significantly different,” the probability is less than 5% that the difference is from chance, or the probability exceeds 95% that the difference resulted from the treatments applied.

Some papers report correlations or measures of the relationship between traits. The relationship may be positive (both traits tend to get larger or smaller together) or negative (as one trait gets larger, the other gets smaller). A perfect correlation is one (+1 or -1). If there is no relationship, the correlation is zero.

In other papers, you may see an average given as 2.5 ± 0.1. The 2.5 is the average; 0.1 is the “standard error.” The standard error is calculated to be 68% certain that the real average (with unlimited number of animals) would fall within one standard error from the average, in this case between 2.4 and 2.6.

Using many animals per treatment, replicating treatments several times, and using uniform animals increase the probability of finding real differences when they exist. Statistical analysis allows more valid interpretation of the results, regardless of the number of animals. In all the research reported herein, statistical analyses are included to increase the confidence you can place in the results.
Index of Key Words

adsorbents  floor space  phytase stability
amino acid  formaldehyde  pig
amino acid ratio  gene expression  pork
analysis  gilt  prediction equation
antibiotics  grain  protein quality
bacon  grinding cost  Ractopamine
bioassay  growth  roller mill
birth weight  growth performance  sequencing
boar exposure  intermittent suckling  sodium metabisulfite
by-product  iodine value  sorghum
carcass fat quality  lactational estrus  sow
chemical treatment  litter separation  sow nutrition
copper  lysine  space allowance
copper sulfate  lysine requirement  split-weaning
corn  mash  spray-dried bovine plasma
creep feeding  meal  stocking density
crystalline AA  method  survey
decontamination  methodology  swabs
deoxynivalenol  minimum infectious dose  swine
dried milk  mycotoxins  swine industry
energy  nursery pig  thermal mitigation
extrude  oregano  topping
feed  particle size  trace minerals
top  particle size analysis  trisbasic copper chloride
feed line  PCR  tryptophan
feed matrix  PDI  ulcer
feed mill  PEDV  valine
feed preference  pellet  vitamins
feed safety  pelleting  vitamin D
feed truck  pellet size  zinc
fines  performance  25(OH)D3
finishing pig  phosphorus
fish meal  phytase  3-sieve
Acknowledgments

Appreciation is expressed to these organizations for assisting with swine research at Kansas State University.

Abilene Animal Hospital, Abilene, KS
Advanced Ag Products, Hudson, SD
Ajinomoto Heartland LLC, Chicago, IL
Anitox Corporation, Lawrenceville, GA
Dave and Lois Baier, Abilene, KS
Biomin USA, San Antonio, TX
DFS Inc., Newell, IA
DNA Genetics, Columbus, NE
DSM Nutritional Products, Parsippany, NJ
Elanco Animal Health, Indianapolis, IN
Farmland Foods LLC, Crete, NE
Feedlogic Corporation, Willmar, MN
Gourley Bros., Webster City, IA
Holden Farms, Northfield, MN
Hord Livestock Company, Bucyrus, OH
Hubbard Feeds, Mankato, MN
ILC Resources, Urbandale, IA
International Ingredient Corporation, St. Louis, MO
JYGA Technologies, St. Nicolas, Quebec, Canada
Kalmbach Feeds, Upper Sandusky, OH
Kansas Pork Association, Manhattan, KS
Kansas Swine Alliance, Abilene, KS
Kemin Industries, Inc., Des Moines, IA
Livestock and Meat Industry Council, Manhattan, KS
Micronutrients, Indianapolis, IN
Midori USA, Cambridge, MA
Midwest Livestock Systems, Inc., Beatrice, NE
National Pork Board, Des Moines, IA
Natural Foods Holdings, Sioux City, IA
New Fashion Pork, Jackson, MN
New Horizon Farms, Pipestone, MN
Novus International, St. Charles, MO
Nutraferma, Dakota Dunes, SD
PIC USA, Hendersonville, TN
Purco, Edgerton, MN
Tech-Mix, Stewart, MN
Triumph Foods, St. Joseph, MO
United Sorghum Checkoff Program, Lubbock, TX
USDA National Institute of Food and Agriculture, Washington, D.C.
Zinpro Corp., Eden Prairie, MN
Zoltenko Farms Inc., Hardy, NE
We especially appreciate the assistance and dedication of Kansas State University employees Duane Baughman, Frank Jennings, Mark Nelson, Terry Gugle, Joel McAtee, Chance Fiehler, and Theresa Rathbun.

Appreciation is also expressed to: Allan Morris, Richard Brobjorg, Heath Houselog, Marty Heintz, Craig Steck, and Bob Taubert, New Horizon Farms, Pipestone, MN, for their dedicated support.

Appreciation is expressed to Triumph Foods LLC, St. Joseph, MO, for collecting jowl fat and conducting the iodine value analysis and to Jerry Lehenbauer, David Donovan, Ann Smith, Brad Knadler, and Brittany Kimler for technical assistance.

Swine Industry Day Committee
Duane Davis  Bob Goodband  Mike Tokach
Joel DeRouchey  Joe Hancock  Jason Woodworth
Steve Dritz  Jim Nelssen
The Livestock and Meat Industry Council, Inc.

The Livestock and Meat Industry Council, Inc. (LMIC) is a nonprofit charitable organization supporting animal agriculture research, teaching, and education. This is accomplished through the support of individuals and businesses that make LMIC a part of their charitable giving.

Tax-deductible contributions can be made through gifts of cash, appreciated securities, real estate, life insurance, charitable remainder trusts, and bequests as well as many other forms of planned giving. LMIC can also receive gifts of livestock, machinery, or equipment. These types of gifts, known as gifts-in-kind, allow the donor to be eligible for a tax benefit based on the appraised value of the gift.

Since its inception in 1970, LMIC has provided student scholarships, research assistance, capital improvements, land, buildings, and equipment to support students, faculty, and the industry of animal agriculture. If you would like to be a part of this mission or would like additional information, please contact the Livestock and Meat Industry Council/Animal Sciences and Industry, Weber Hall, Manhattan, Kansas 66506 or call 785-532-1227.

LMIC Board Members
Kyle Bauer           Greg Henderson           Jan Lyons
David Clawson       Roy Henry             Bill Miller
Joe Downey          Patsy Houghton         Stanton O’Neil
Galen Fink          Virgil Huseman       Tom Perrier
Mark Gardiner       Justin Janssen       Rich Porter
Craig Good          Larry Jones            Ken Stielow
Lyle Gray           Mark Knight           Warren Weibert
Ken Grecian         Pat Koons             
Frank Harper        Kelly Lechtenberg

Royal Board Members
Dell Allen          Bernie Hansen          Phil Phar
Jerry Bohn          Steven Hunt           Harland Priddle
Richard Chase       Steve Irsk             Lee Reeve
Calvin Drake        Larry Jones            Don Smith
Stan Fansher        Kenny Knight           Mikel Stout
Randy Fisher        Gina Miller            Kathleen Strunk
Sam Hands           Andrew Murphy          Duane Walker