2019 Swine Day Foreword, etc.

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Abstract
It is with great pleasure that we present the 2019 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

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Cover Page Footnote
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Foreword

It is with great pleasure that we present the 2019 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.

2019 Swine Day Report of Progress Editors

Bob Goodband
Mike Tokach

Steve Dritz
Joel DeRouchey

Jason Woodworth
Standard Abbreviations

ADG = average daily gain
ADFI = average daily feed intake
AI = artificial insemination
avg = average
bu = bushel
BW = body weight
cm = centimeter(s)
CP = crude protein
CV = coefficient of variation
cwt = 100 lb
d = day(s)
DE = digestible energy
DM = dry matter
DMI = dry matter intake
F/G = feed efficiency
ft = foot (feet)
ft² = square foot(feet)
g = gram(s)
μg = microgram(s), .001 mg
gal = gallon(s)
GE = gross energy
h = hour(s)
HCW = hot carcass weight
in = inch(es)
IU = international unit(s)
kg = kilogram(s)
Kcal = kilocalorie(s)
kWh = kilowatt hour(s)
lb = pound(s)
Mcal = megacalorie(s)
ME = metabolizable energy
mEq = milliequivalent(s)
min = minute(s)
mg = milligram(s)
μL = cc (cubic centimeters)
mm = millimeter(s)
mo = month(s)
MUFA = monounsaturated fatty acid
N = nitrogen
NE = net energy
NDF = neutral detergent fiber
NFE = nitrogen-free extract
ng = nanogram(s), .001 μg
no. = number
NRC = National Research Council
ppb = parts per billion
ppm = parts per million
psi = pounds per square inch
PUFA = polyunsaturated fatty acid
SD = standard deviation
sec = second(s)
SE = standard error
SEM = standard error of the mean
SEW = segregated early weaning
SFA = saturated fatty acid
UFA = unsaturated fatty acid
wk = week(s)
wt = weight(s)
yr = year(s)
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 10 g Mn, 33 g Fe, 33 g Zn, 5 g Cu, 90 mg I, and 90 mg Se.

- **Vitamin premix**: Each pound of premix contains 750,000 IU vitamin A, 300,000 IU vitamin D3, 8,000 mg vitamin E (dl-alpha-tocopherol acetate or 4,000 mg d-alpha-tocopherol acetate), 600 mg menadione, 1,500 mg riboflavin, 5,000 mg pantothenic acid, 9,000 mg niacin, and 6 mg vitamin B12.

- **Sow add pack**: Each pound of premix contains 750,000 IU vitamin A, 100,000 mg choline, 40 mg biotin, 400 mg folic acid, 180 mg pyridoxine, 4,000 mg vitamin E (dl-alpha-tocopherol acetate or 2,000 mg d-alpha-tocopherol acetate), 9,000 mg L-carnitine, and 36 mg Cr.

**Note**

Some of the research reported here was carried out under special U.S. Food and Drug Administration (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 $2.5 \pm 0.1$. 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

algoclay complex
amyrase
amylose
antibiotic
antibiotic alternatives
available lysine
biomass
bone ash
caloric efficiency
carbadox
colostrum
conditioning temperature
corn
die thickness
digestible phosphorus
economic tool
energy
farrowing duration
feed
feed form
feeding regimen
fermentation product
finishing pig
flowability
fumonisin (FUM)
grind
growing pig
growing-finishing pigs
growth
growth performance
heat processing
high amylase corn
high protein distillers dried grains
Holmen NHP100
knife distance
lactation
lipid sources
lysine
manganese
medium chain fatty acids
microbiome
modeling
moisture
near-infrared spectroscopy (NIR)
nursery
nursery diets
nursery pigs
particle size
pellet durability index
pellet hardness
pellet length
pellet quality
pelleting
phase-feeding
phosphorus
phytase
phytase stability
pigs
porcine epidemic diarrhea virus (PEDV)
prediction
production rate
productive energy
profit
protein
release value
seaweed
short chain fatty acids
sow
soybean meal
soybeans
steam pressure
storage time
super-dosing
swine
temperature
transition sow
tryptophan
Viligen™
weaning age
withdrawal
Xylanase
yellow dent corn
zinc oxide
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CJ America, Downers Grove, IL
Collaborative Sorghum Investment Program, Kansas State University
DNA Genetics, Columbus, NE
DSM Nutritional Products, Parsippany, NJ
Feedlogic Corporation, Willmar, MN
Feed One Co., Ltd., Yokohama, Japan
Hamlet Proteins, Findlay, OH
Haverkamp Brothers, Bern, KS
Roy and Linda Henry, Longford, KS
Holden Farms, Northfield, MN
Hord Family Farms, Bucyrus, OH
Hubbard Feeds, Mankato, MN
ICM, Inc., Colwich, KS
ILC Resources, Urbandale, IA
International Ingredient Corporation, St. Louis, MO
Iowa Select Farms, Inc., Iowa Falls, IA
Jefo Nutrition, Saint Hyacinthe, Quebec, Canada
JBS Live Pork, Greely, CO
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
Lincolnway Energy, Nevada, MO
Livestock and Meat Industry Council, Manhattan, KS
Micronutrients, Indianapolis, IN
Minnesota Pork Board, Mankato, MN
National Pork Board, Des Moines, IA
Natural Foods Holdings, Sioux City, IA
Gene Nemechek Family, Wilson, NC
New Fashion Pork, Jackson, MN
New Horizon Farms, Pipestone, MN
NutriQuest, Mason City, IA
Ocean Harvest Technology Limited, Galway, Ireland
Olimix, Brehan, France
Origination, Inc., Maplewood, MN
PIC USA, Hendersonville, TN
Pipestone Applied Research, Pipestone, MN
Pipestone Grow-Finish, Pipestone, MN
Purco, Edgerton, MN
Purina Animal Nutrition, Shoreview, MN
Syngenta Seeds, Inc., Minnetonka, MN
SVC Research, LLC, St. Peter, MN
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Swine Industry Day Committee

Joel DeRouchey  Bob Goodband  Jason Woodworth
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