



Foreword

It is with great pleasure that we present the 2020 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.

2020 Swine Day Report of Progress Editors

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Standard Abbreviations

ADG = average daily gain	Mcal = megacalorie(s)
ADF = acid detergent fiber	ME = metabolizable energy
ADFI = average daily feed intake	mEq = milliequivalent(s)
AI = artificial insemination	min = minute(s)
avg = average	mg = milligram(s)
bu = bushel	mL = cc (cubic centimeters)
BW = body weight	mm = millimeter(s)
cm = centimeter(s)	mo = month(s)
CP = crude protein	MUFA = monounsaturated fatty acid
CV = coefficient of variation	N = nitrogen
cwt = 100 lb	NE = net energy
d = day(s)	NDF = neutral detergent fiber
DE = digestible energy	NFE = nitrogen-free extract
DM = dry matter	ng = nanogram(s), .001 Fg
DMI = dry matter intake	no. = number
F/G = feed efficiency	NRC = National Research Council
ft = foot (feet)	ppb = parts per billion
ft ² = square foot(feet)	ppm = parts per million
g = gram(s)	psi = pounds per square inch
µg = microgram(s), .001 mg	PUFA = polyunsaturated fatty acid
gal = gallon(s)	SD = standard deviation
GE = gross energy	s = second(s)
h = hour(s)	SE = standard error
HCW = hot carcass weight	SEM = standard error of the mean
in = inch(es)	SEW = segregated early weaning
IU = international unit(s)	SFA = saturated fatty acid
kg = kilogram(s)	UFA = unsaturated fatty acid
kcal = kilocalorie(s)	wk = week(s)
kWh = kilowatt hour(s)	wt = weight(s)
lb = pound(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 ± 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

acidification	growth performance	piglet performance
administration	growth rate	pigs
African swine fever virus	hemoglobin	Porcine Epidemic Diarrhea Virus
amino acid	high amylase	Porcine Reproductive and Respiratory Syndrome Virus
amino acid digestibility	high amylase corn	
animal welfare	high protein distillers dried grains	power calculation
antibiotics	insoluble fiber	premix stability
AviPlus	iron	protein source
branch chain amino acids	isoleucine	PRRS
castration	KNB-E2	real-time PCR
cellulose	lactation	reducing sugars
classical swine fever	late finishing	refinement
CO ₂ surgical laser	lignosulfonate	release value
compensatory growth	lysine	sample preparation
conditioning temperature	maillard reaction	sample size
copper	manganese	sample storage
corn	manganese hydroxychloride	slow-down program
corn protein	meal	steam conditioning
crude protein	moisture content	stomach ulcers
crystalline amino acids	mortality	subunit vaccine
CSF	nursery pigs	survival
culture approach	pain	swine
distillers dried grains with solubles	particle size	timing
E. coli serogroups	pellet	transition sow
environmental contamination	pellet die thickness	tryptophan
farrowing duration	pellet quality	valine
fecal dry matter	pelleting	vitamin stability
feed mill	pellets	vitamin storage
feed safety	phosphorus	wheat bran
fiber	phytase	yellow dent corn
finisher pigs	phytase activity	zinc
formic acid	phytase stability	zinc acidification
gleptoferron	pig	zinc oxide
growth	piglet	

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Holden Farms, Northfield, MN
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Iowa Select Farms, Inc., Iowa Falls, IA
J. Rettenmaier USA, Schoolcraft, MI
JBS Live Pork, Greely, CO
JYGA Technologies, St. Nicolas, Quebec, Canada
Kansas Pork Association, Manhattan, KS
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Purco, Edgerton, MN
SVC Research, LLC, St. Peter, MN
Swine Health Information Center, Ames, IA
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Tech Mix, LLC, Stewart, MN

Swine Day 2020

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Vetagro, Chicago, IL

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Swine Industry Day Committee

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The Livestock and Meat Industry Council, Inc.

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