Swine Feeding Principles

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Topics to be Covered

• Protein and Amino Acids
• Energy Values
• Guidelines for Growing and Breeding Swine
• Interpreting Feed Tag Information
Swine Digestive System

Simple stomach (Monogastric)

Different from cattle and Sheep (Ruminants)
Dietary Protein

UREA

NH₃ → UREA

LIVER

AMINO ACIDS

AMINO ACIDS

65% OF PROTEIN

PEPTIDES

AMINO ACIDS

Wasted Nitrogen

LEVEL TO PROVIDE FOR MAXIMUM MICROBIAL GROWTH

MICROBIAL PROTEIN

PROTEIN → AMINO ACIDS

35% OF PROTEIN

SMALL INTESTINE
Dietary Protein → Amino Acids
Protein

- Protein in the feed is necessary for building muscle and producing milk.

- **Crude protein or total protein is the total amount of protein in a feed, listed as percent.**
Protein

• Measured in a lab by nitrogen \( \times 6.25 \)

• *Not a measure of quality or digestibility*
Percent Protein is a minor consideration in swine rations

Amino acids are required for growth of pigs.

Swine feed should be balanced on amino acids.
Amino Acids are called the “Building Blocks of Protein”
There Are 22 Amino Acids…..

• Ten are known as “Dietary Essential Amino Acids” for pigs.
Amino Acids

- Lysine
- Methionine
- Threonine
- Tryptophan
- Isoleucine

- Arginine
- Histidine
- Phenylalanine
- Valine
- Leucine
Protein (muscle)

lysine-methionine-tryptophan

lysine-valine-isoleucine-leucine
Protein Quality is Important

If one or more amino acids are deficient in the diet, protein synthesis in the animal (muscle growth) proceeds at a slower rate or stops.
Protein (muscle)

lysine-methionine-tryptophan

Protein Synthesis Stops
AA in Protein Sources

- Soybean Meal - *high*
- Canola Meal – *high*
- Peas – *low-moderate*
- Fish Meal - *high*
- Alfalfa Meal – *low-moderate*
- Dried Milk Products - *moderate*
Energy

- The energy (carbohydrate) in a feed provides what is necessary for growth, lactation and reproduction.

- *Energy is estimated, not usually tested.*
Energy

• The energy content is often listed as TDN but is an old system (Total Digestible Nutrients)

• Digestible Energy or Metabolizable Energy as KCAL or Mcal.
Carbohydrate in a Ration

- *Grains and Fats* provide the bulk of energy needed for growth and lactation.
Grain Energy

• Corn
Grain Energy

- Corn
- Wheat
- Barley
Grain Energy

- Corn
- Wheat
- Barley
- Oats

Protein

Higher

Higher
## Energy of Grains

<table>
<thead>
<tr>
<th>FEED</th>
<th>% TDN</th>
<th>KCAL/LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>90</td>
<td>1550</td>
</tr>
<tr>
<td>Wheat</td>
<td>85</td>
<td>1450</td>
</tr>
<tr>
<td>Barley</td>
<td>82</td>
<td>1380</td>
</tr>
<tr>
<td>Oats</td>
<td>78</td>
<td>1240</td>
</tr>
</tbody>
</table>
Fats and Oils

• These contain 2.25 times the energy of corn. Used in small amounts to raise calorie density or content.

• Soybean oil, “white grease,” are examples.
Examples of Nutrient Requirements
National Research Council

- Publishes Nutrient Requirements for Swine.

- The following charts are based on this information.
## Growing/Finishing Pig

<table>
<thead>
<tr>
<th>Stage</th>
<th>Kcal/Day</th>
<th>% Lysine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaner</td>
<td>1,680</td>
<td>1.35 (22% CP)</td>
</tr>
<tr>
<td>Feeder</td>
<td>3,400</td>
<td>1.25 (20% CP)</td>
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<tr>
<td>Grower I</td>
<td>6,305</td>
<td>1.00 (18% CP)</td>
</tr>
<tr>
<td>Grower II</td>
<td>8,760</td>
<td>0.85 (15% CP)</td>
</tr>
<tr>
<td>Finisher</td>
<td>10,450</td>
<td>0.75 (14% CP)</td>
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</table>
# Early Gestating Sows

<table>
<thead>
<tr>
<th></th>
<th>DE KCAL</th>
<th>Lysine</th>
<th>Crude Protein</th>
<th>Ca/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>385 pound sow</td>
<td>6200 per day</td>
<td>0.57%</td>
<td>13.5 %</td>
<td>.9/.8</td>
</tr>
</tbody>
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# Lactating Sows

<table>
<thead>
<tr>
<th></th>
<th>DE KCAL</th>
<th>Lysine</th>
<th>Crude Protein</th>
<th>Pig gain/day</th>
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<tbody>
<tr>
<td>385 lb sow</td>
<td>19,000 + per day</td>
<td>0.95 %</td>
<td>17.5 %</td>
<td>.4 - .5</td>
</tr>
<tr>
<td>Based on 12 lbs per day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
So…..we know what the pig needs……

The “break” in the nutrition link is that we know nutrient needs but many times lack feed nutrient content……
Sample Feed Tag

Pig Grower
Medicated
for pigs between 30 and 75 pounds
Net Weight 50 pounds
Pig Grower
Medicated
for pigs between 30 and 75 pounds

Active Drug Ingredients
Chlortetracycline
100g/Ton
Sulfathiazole 0.011%
(100g/Ton)
Penicillin 50g/Ton
Guaranteed Analysis
Crude Protein min 18.00%
Lysine min 1.10%
Crude Fat min 6.50%
Crude Fiber max 4.00%
Calcium min 0.60%
Calcium max 1.10%
Phosphorus min 0.40%
Salt min 0.40%
Salt max 0.90%
Selenium min 0.30 PPM
Zinc min 0.30 PPM
## Growing/Finishing Pig

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INGREDIENTS: Grain Products, Plant Protein Products, Processed Grain By-Products, Fat, Calcium Phosphate, Lignin, Sulfonate, Ground Limestone, Salt, L-Lysine Monohydrochloride, Methinone Supplement, Zinc Oxide, Zinc Sulfate, Ferrous Sulfate, Manganous Oxide, Copper Sulfate, Calcium Iodate, Sodium Selenite,
## GUARANTEED ANALYSIS

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<th>Component</th>
<th>Min</th>
<th>Max</th>
<th>Value</th>
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<tbody>
<tr>
<td>Crude Protein</td>
<td></td>
<td></td>
<td>16.0 %</td>
</tr>
<tr>
<td>Lysine</td>
<td>Min</td>
<td></td>
<td>0.5 %</td>
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<tr>
<td>Crude Fat</td>
<td>Min</td>
<td></td>
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<tr>
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<td>Calcium</td>
<td>Min</td>
<td></td>
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<tr>
<td>Phosphorus</td>
<td>Min</td>
<td></td>
<td>0.65 %</td>
</tr>
<tr>
<td>Salt</td>
<td>Min</td>
<td></td>
<td>0.4 %</td>
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<tr>
<td>Salt</td>
<td>Max</td>
<td></td>
<td>0.9 %</td>
</tr>
<tr>
<td>Selenium</td>
<td>Min</td>
<td></td>
<td>0.3 ppm</td>
</tr>
<tr>
<td>Zinc</td>
<td>Min</td>
<td></td>
<td>180 ppm</td>
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Pig Grower 16

INGREDIENTS

Processed Grain By-Products, Grain Products, Plant Protein Products, Molasses Products, Calcium Carbonate, Hydrolized Vegetable Oil and Animal Fat, Salt, Monocalcium and Dicalcium Phosphate, Choline Chloride, Vitamin A Acetate, Vitamin D3 Supplement,
Pig Grower 16

Vitamin E Supplement, Manganous Oxide, Zinc Sulfate, Ferrous Sulfate, Copper Sulfate, Sodium Selenite, Ethylenediamine Dihydriodide, Cobalt Sulfate, Niacin Supplement, Calcium Pantothenate, Biotin, Riboflavin Supplement, Vitamin B12 Supplement, Menadione Dimethylpyrimidinol Bisulfite (Vitamin K), Pyridoxine, Hydrochloride, Thiamine Mononitrate, Folic Acid, Zinc Oxide, Calcium Iodate, DL-Methionine Hydroxy Analogue.
Present Day Swine Rations

• Are based on desired performance.

• Can be related to body condition score, backfat, level of lean gain or total weaned litter weight.
National Swine Nutrition Guide

U. S. Pork Center of Excellence
National Swine Nutrition Guide

• Digestibility of nutrients is the key such as DAA and Dig. P

Alternative Feed Publication:

http://www.pork.org/filelibrary/resources/04836.pdf