

TECHNOLOGY SUMMARY

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Diet Modification to Reduce Odors, Gas Emissions and Nutrient Excretions from Swine Operations

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Species: Swine

Use Area: Feed Management

Technology Category: Emission Reduction

Air Mitigated Pollutants: Ammonia, Hydrogen
Sulfide, Volatile Fatty Acids, Volatile Organic Acids,
Odor

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System Summary:

Odor and gas emissions from pork operations primarily come from the anaerobic degradation of manure. Since the pig is the initial point source of nutrients excreted and resultant gas and odor emissions, diet modification has the potential to reduce nutrients excreted and thereby reduce gas and odor emissions. A wean-finish pig study was conducted to determine the effect of feeding a low nutrient excretion (LNE) diet on nutrient excretion, gas and odor emissions. Overall, pigs fed the LNE diet grew faster while consuming less feed and a better overall feed efficiency compared to control (CTL)-fed pigs. Carcass weights were heavier for LNE-fed pigs compared to CTL-fed pigs. Daily excretion of dry matter, nitrogen (N), ammonium N, phosphorus (P), potassium (K), ash, and volatile fatty acids were greater for CTL-fed pigs compared to LNE-fed pigs and linearly increased over time. Pigs fed LNE diets consistently excreted 26-28% less ammonium N, 40% less P and 17-18% less K for LNE-fed pigs compared to CTL-fed pigs. Pigs fed LNE diets reduced aerial NH₃ emissions over the wean-finish period by 13.6% compared to pigs fed CTL diets. Aerial H₂S and SO₂ emissions and odors were not different among dietary treatments. Aerial NH₃, H₂S, and CH₄ concentrations were increased by 43.4, 68.3, and 29.0%, respectively, from wk 4 to wk 16. Conversely, the concentration of CO₂ was reduced by 13.6% during wk 20 compared to wk 4.

Applicability and Mitigating Mechanism:

- Increasing available nutrients and reducing excess nutrients in pig diets have the potential to reduce nutrient excretion and gas and odor emissions
- When economics allow, pork operations producing a majority of pigs implement the diet modification techniques described

Limitations:

- Greatest limitation is the cost of the technology on feed and net economic returns
- The availability of feed ingredients to implement consistent diets is imperative
- Selection of feed ingredients impacts available nutrients for the pig, nutrient excretion and gas and odor emissions

Cost:

An economic analysis was conducted with this study and the cost per kg of feed was computed using average corn, soybean meal, and hog prices for the last two years and current prices for other ingredients. Carcass value was based on the Indiana Packers Carcass Buying Program (<http://www.inpac.com/proc/carcass.html>) as of March 2008. The cost of feed per kg was essentially constant for all formulations and phases. The higher gain to feed ratio for the LNE-fed pigs regardless of sex favors the use of LNE diets from a net return over feed cost standpoint. The estimated economic benefits range from \$8.92 per head for barrows to \$10.82 per head for gilts. A model used to include the decisions about cropping patterns, manure management, and crop fertilization in conjunction with their choice of feed rations for livestock further reinforces the potential economic benefits of the LNE diets. The economic benefits for the LNE diets range from \$7.21 per pig space for gilts to \$8.79 per pig space for barrows.