

# The Effect of EcoCare® feed on Manure Odors and Ammonia

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## Where does the smell come from?

Manure odors are related to the animal's diet. The odor compounds found in swine manure are natural by-products produced by anaerobic decomposition of urine and feces (Table 1). Most of the odor compounds found in swine manure originate from undigested carbohydrates and proteins (nitrogen) that have passed through the gastro-intestinal and urinary tract (<sup>1</sup>Sutton, et. al, 1999). Volatile fatty acids (VFA), which are generally considered to be major contributors to offensive manure odors, are formed during the anaerobic decomposition of undigested carbohydrates in the feces. During manure storage, starch and non-starch polysaccharides are converted to short-chain acids such as acetate, propionate, butyrate and valerate. Branched chain VFAs such as iso-butyrate and iso-valerate can also be formed from the digestion of amino acids, valine and leucine, in carbohydrate-limited environments. Most often, the ratio of iso-butyrate, butyrate, isovalerate and valerate to less offensive VFAs, such as acetate and propionate, determines the intensity of odors generated from stored manure.

Ammonia (NH<sub>3</sub>) results from the decomposition of urea nitrogen in the urine and undigested proteins in the manure. Indole, phenol, phenol-acetate, phenol-propionate, para-cresol and skatole originate from the decomposition of the amino acids tryptophan, phenylalanine, and tyrosine. Sulfide-type odors originate from the decomposition of the sulfur amino acids, methionine and cystine and from other compounds that would contain sulfur. <sup>2</sup>Hobbs et al. (1996) demonstrated a reduction in nitrogen excretion and odor compounds by feeding a 14% crude protein diet compared to a 21% crude protein diet.

**Table 1.** Common end products associated with the decomposition of urea from urine and undigested feed ingredients.

Substrate	End-Product
Urea (Urine)	Ammonia
Protein	Ammonia, Amines
Tryptophan Phenylalanine Tyrosine	Indole, Skatole, Phenol, Paracresol
Valine, Leucine	Iso-butyrate, Iso-valerate
Methionine, Cystine	Mercaptans, Hydrogen Sulfide
Starch, Glucose, Non-starch polysaccharide	Acetate, Propionate, Butyrate, Valerate

## How can odors affect us?

Humans can detect ammonia odor at concentrations as low as 5 to 10 ppm. As ammonia concentration increases, the discomfort associated with it also increases. At over 10 to 25 ppm of ammonia, there is eye and respiratory irritation, while at over 50 ppm there are increased lesions to the eyes and respiratory tract. The National Institute for Occupational Safety and Health (NIOSH) standard for ammonia exposure is 25 ppm over an 8 hour day. As with humans, ammonia is an irritant to animals and can have detrimental effects on health and performance. These include an increased incidence of respiratory infections, reduced rate of gain and poorer feed efficiency. It was estimated that in swine, an ammonia concentration of 25 ppm results in eye and lung irritation and an approximate 6% reduction in average daily gain. Fifty ppm results in an approximate 12% reduction in average daily gain, and 100 ppm results in an approximate 30% reduction in average daily gain and a 9% reduction in feed efficiency.

## How does EcoCare® affect odors?

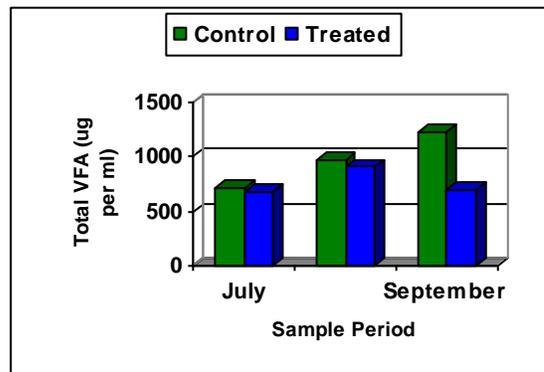
EcoCare® feed is an environmentally-conscious nutritional program that has been developed to reduce manure odor. Through the incorporation of specific bacteria, ammonia-inhibiting compounds and refined crystalline amino acid use, odors originating from nitrogen-containing compounds are reduced.

EcoCare® feed delivers saponin-derived compounds at a constant and optimal level. Scientific research has demonstrated that the premier source used in EcoCare® feed significantly reduces intestinal ammonia. By reducing intestinal ammonia, EcoCare® helps to maintain gut health, improve the efficiency of nutrient utilization, and enhance animal performance. This reduction in intestinal ammonia is attributed to the pronounced affect that saponin-derived compounds have on intestinal microbial populations, including both fauna (protozoa) and flora (bacteria). Protozoa engulf bacteria and cause proteolysis of the bacterial protein,

ultimately increasing intestinal ammonia. The saponin-derived compounds suppress protozoa by attaching to the cholesterol in its cell membrane, which causes breakdown in the membrane and subsequent death of the protozoa. Thus, the suppression of protozoa minimizes intestinal ammonia. Along with this reduction, extensive research has been conducted proving the ability of these saponin-derived compounds to reduce aerial ammonia by an average of 45%.

EcoCare<sup>®</sup> feed also delivers a constant and optimal level of a highly efficient heat-stable microbial feed additive that contains 3 strains of *Bacillus* organisms, selected for their ability to improve the decomposition of stored swine manure. This component of EcoCare<sup>®</sup> feed begins working by providing a source of live micro-organisms in the gastro-intestinal tract. These micro-organisms are distributed in every fraction of manure produced, consuming undigested nutrients and reducing the production of odor-causing compounds. Trials have shown a reduction in ammonia emissions by 40%. Research<sup>3</sup> has also shown that this highly specific bacterial component of EcoCare<sup>®</sup> reduces the generation of odor compounds, such as VFAs, by 43% after 90 days of use (Figure 1). Additionally, this compound has been shown to effectively prevent the build-up of manure solids and thus reduce building clean-up time.

**Figure 1.** The effects of the highly specific bacterial component of EcoCare<sup>®</sup> feed on odor.



By incorporating the latest technologies at constant and optimal levels, EcoCare<sup>®</sup> has a positive impact on intestinal microbial populations and beneficially alters the manure decomposition process. This powerful combination can reduce production of odorous compounds by 40%.

**Through technologies used in the EcoCare<sup>®</sup> feed program,  
odors can be reduced by 40%**

## References

- <sup>1</sup>Sutton, A.L., K.B. Kephart, M.W.A. Verstegen, T.T. Canh and P.J. Hobbs. 1999. Potential for reduction of odorous compounds in swine manure through diet modification. *J. Anim. Sci.* 77:430-439
- <sup>2</sup>Hobbs, P.J., B.F. Pain, R. M. Kay, and P.A. Lee. 1996. Reduction of odorous compounds in fresh pig slurry by dietary control of crude protein. *J. Sci. Food. Agric.* 71:508-514.
- <sup>3</sup>Hammond, E., T. Rehberger, J. O'Neill, T. Parrott and A. Veldkamp. 1998. Effects of feeding *Bacillus* cultures (MicroSource "S") on the odor characteristics of swine manure. *Proceedings of the American Association of Swine Practitioners*. Des Moines, IA. Pp. 113-116

*For further information on EcoCare<sup>®</sup> Feed, please see your local feed sales representative at a Land O'Lakes Feed Co-op or Purina Mills Dealer. Visit us on-line at [www.LOLFeed.com](http://www.LOLFeed.com), [www.PurinaMills.com](http://www.PurinaMills.com),*

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