

**ADIPIC ACID (AA); A FEED ACIDIFIER WITH THE POTENTIAL TO
LOWER AMMONIA EMISSION AND REDUCE AMINO ACID
REQUIREMENTS?**

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Introduction

Adipic acid is available as an odorless and pleasant tasting crystalline powder approved for feed acidification. Beyond acidification of the feed, adipic acid may have certain other characteristics of interest to animal production. When consumed, a portion is excreted in urine, and this may lower the urine pH, and thus ammonia emission. Adipic acid also shows a great structural similarity to several of the key intermediates in the lysine degradation cascade, and Cerdan (1988) hypothesized that adipic acid may inhibit lysine degradation.

Methods and Results

To test these hypotheses, nursery pigs (approximately 10 kg) were fed diets with and without adipic acid (1%). On Day 5 and 6 of the experiment, urine was collected for pH determination, while on Day 7, plasma samples were obtained for the determination of plasma free amino acids. Results for this assay showed that adipic acid was very effective in lowering urine pH (from 7.7 to 5.5). In vitro ammonia emission from these urine samples (after mixing with a small amount of feces) was significantly inhibited (94% decrease for the first hour of incubation with feces, decreasing to a 39% inhibition after 46 hours incubation, see also Fig. 1). Plasma amino acid concentrations were affected as well, with significant increases in plasma lysine and threonine.

In order to test whether these increases in plasma amino acid concentrations have any effect on amino acid requirement, a diet was formulated with lysine, threonine, and tryptophan (tryptophan was included as it uses enzymes from the lysine degradation pathway) limited to 70% of the NRC requirement, and all other amino acids to 90% of the NRC requirement. This diet was supplemented with either amino acids or with adipic acid such that the effect of adipic acid on efficiency of lysine, threonine, and tryptophan utilization could be determined. These diets were again fed to nursery pigs for a period of 15 days. This experiment showed that adipic acid did not improve the efficiency of lysine, threonine, or tryptophan utilization.

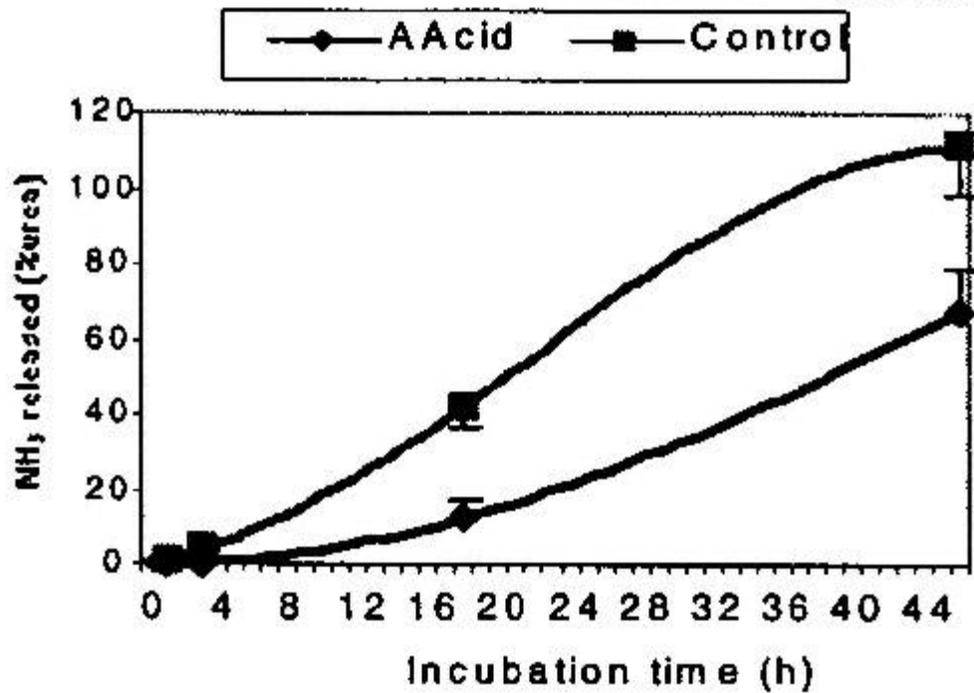


Figure 1. Ammonia release from urine incubated with feces. See text for detail.

Summary

Adipic acid has a strong effect on urine pH, and thus is technically interesting as a feed ingredient for reducing ammonia emission. Feeding it to an animal will also alter plasma amino acid concentrations, but it will not affect their efficiency of utilization.