Trinity Consultants SafeBridge

# MEMORANDUM

**To:** Village of Mount Prospect
**CC:** Isaiah A. Fishman, Meltzer, Purtill & Stelle LLC
**From:** Matthew J. Linman, PhD, SafeBridge Consultants, Inc.; Anne Chappelle, PhD, DABT, SafeBridge Consultants, Inc.
**Date:** 13 June 2025
**RE:** Village of Mount Prospect – Butyric Acid Toxicological Summary FAQ

This document was developed by Trinity Consultants and its Regulatory & Life Sciences specialists, SafeBridge, as a response to community health concerns regarding odors from Prestige Feed Products, LLC (Prestige) animal feed production facility. Relevant references are appended to this document.

**What does Prestige Feed Products make?**
Prestige uses equipment and machinery to dehydrate raw soy and cheese-based materials into animal feed ingredients. It is specifically permitted for the production of these products.

**What is the odor I am smelling?**
The odors that residents of Mount Prospect have noted are most likely due to butyric acid emissions that result from the process of fermenting hydrolyzed soy and cheese waste. Butyric acid odors have been described as pungent, foul, and sour odor often likened to vomit, spoiled butter, or sweaty feet.

**What is butyric acid and where is it produced?**
Butyric acid (also known as butanoic acid) is a short-chain fatty acid naturally found in fermented foods like parmesan cheese, sauerkraut, animal fats, and particularly in spoiled butter (where it was first identified). In the human body, butyric acid is produced in the colon by gut bacteria during the fermentation of dietary fibers, playing a beneficial role in colon health and anti-inflammatory processes.

**Does butyric acid have other uses?**
Butyric acid and its derivatives are used in the manufacture of flavorings and perfumes, pharmaceuticals, and animal feed additives. Additionally, it serves as a precursor in the production of biofuels and plastics.

**Why is the odor so strong for butyric acid?**
Butyric acid is considered to be a strong odor, meaning that it binds very strongly to olfactory receptors in the nose, triggering nerve impulses that transmit information about that odor to the brain. For these reasons, the butyric acid odor is highly noticeable even at very low concentrations. In addition, because it is very easy to volatilize butyric acid from a liquid into a gas/vapor due to its chemical structure, it may be more prevalent in the air compared to other chemicals.

Because butyric acid can be a byproduct of food spoilage, humans have evolved an acute sensitivity to its smell, with odor detection thresholds measurable in the parts-per-billion by volume (ppbv) range. A way to visualize one part per billion (ppb) is to imagine a single drop of ink in an Olympic-sized swimming pool. In fact, among similar short-chain fatty acids, butyric acid is among the most potent with an experimentally determined odor detection threshold of 0.26 ppbv. Tests for odor detection thresholds are objective scientific tests that try to approximate the lowest concentration in air where the average person would be able to detect the odor.

**What are the levels of butyric acid measured in the neighborhood?**
The V3 Odor Assessment Report (January 17, 2024) results showed that the butyric acid air concentration in the neighborhood around the Prestige animal feed production facility ranged between 32.14 ppbv to 40.96 ppbv. This is significantly higher than the experimentally reported odor detection threshold 0.26 ppbv.

**Does perception of an odor automatically result in a cause for health concerns?**
The safety of a substance is not based upon your ability to smell it. This is because olfactory ability is affected by many factors, including genetics, gender, age, environment, and health, and can vary by orders of magnitude for specific odors or for overall olfactory acuity. Further, it is important to recognize that physiological and psychological reactions to odors often overlap, making it difficult to clearly separate the two.

Humans are capable of distinguishing a multitude of different odors. While the concentration needed to detect a smell can be very low, the strongest intensity a person can perceive typically occurs at just 10 to 50 times above that detection threshold. In some cases, repeated exposure to high levels of unpleasant-smelling chemicals can lead to a range of indirect health effects, such as headaches, nausea, loss of appetite, vomiting, dizziness, difficulty breathing, and certain forms of psychological stress. However, odor sensitivity varies widely among individuals—by more than a factor of 1,000—and can be influenced by conditions like allergies or nasal infections. Further, people become accustomed to odors over time, reducing their sensitivity. As a result, our sense of smell is more effective at identifying whether an odor is present or absent, rather than measuring its concentration. With few exceptions, health authorities do not base community health exposure limits solely on the presence of odors, as 1) odor detection thresholds can vary widely among individuals within a population, and 2) the presence of an odor does not directly correlate with a quantifiable adverse health effect.

**What do the experts say about the toxicity of butyric acid and risk to public health?**
Authoritative bodies from the US, Canada and Australia have conducted safety assessments of butyric acid under different uses and concentrations including cosmetics and in food. These agencies concluded that while there may be a distinctive butyric acid smell, there was a low risk to the public/consumer to develop an adverse health effect.

The US EPA concluded that the risk to the general population from environmental releases/sources was low:

> *Available data indicate the potential acute toxicity of the butyric acid/anhydride category members is low via the oral, dermal and inhalation routes. The category members also show low toxicity in repeated-dose studies, developmental and reproductive toxicity studies, and mutagenicity studies…The low overall human health hazard profile and the environmental fate characteristics suggest a low concern for potential risk to the general population from environmental releases.*

Health Canada conducted a risk assessment for commercial uses of butyric acid and concluded the risk to human health was low:

> *On the basis of the available information on precursors of n-butyric acid (n-butanol and n-butyl acetate), n-butyric acid is not predicted to have carcinogenic or genotoxic potential and is not expected to cause reproductive and developmental effects… n-butyric acid is considered to be of low hazard potential.*

In Australia, the Inventory Multi-tiered Assessment and Prioritisation (IMAP) assessed the risks posed by butyric acid to human health and the environment and concluded the risk to the public was low and no regulatory controls in consideration of public health were recommended :

> *Currently there are no restrictions in Australia for using this chemical in cosmetics or domestic products. The chemical (with a foul suffocating odour) is not expected to be used at concentrations that may cause corrosive/irritation effects in cosmetics and domestic products. Therefore, further risk management is not required through scheduling.*

**Should I be concerned about health effects from inhalation of butyric acid?**
Like other acids, the primary adverse effect as a result of exposure to butyric acid is related to the concentration of the substance in combination with the amount of time exposed. Concentrated liquid butyric acid is corrosive, which may result in skin, eye and respiratory irritation.

Although there are no high-quality human toxicology studies, data is available in animals repeatedly exposed to butyric acid via inhalation at doses that are magnitudes above measured community air exposures. As expected, irritation/inflammation in these rats was localized to the nose, trachea and lungs (e.g., respiratory tract) which increased in severity with concentration and over time. Any additional adverse effects observed were a consequence of respiratory tract damage (e.g., overall fatigue, loss of appetite, lethargy).

The highest concentration of butyric acid measured in the neighborhood around the Prestige animal feed production facility ranged from 32.14 ppbv to 40.96 ppbv (0.1158 $mg/m^3$ to 0.1476 $mg/m^3$). By comparison, rats exposed to less than 500,000 ppbv (1802 $mg/m^3$) for 6 hours/day, 5 days/week for 13 weeks did not exhibit any adverse effects. Thus, the predicted margin of safety between the animal exposure and the potential community exposure is over 12,000 times greater than the highest concentration of butyric acid vapor measured in the neighborhood around Prestige animal feed production facility.

Considering the available toxicity data and the measured community exposure levels, the likelihood of significant health effects from butyric acid odors emitted by the Prestige facility is highly unlikely.

## References

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