Air Resources Board
San Joaquin Valley Air Pollution Control District
Status Report on Dairy Research
Related to SB 700 Implementation

May 15, 2006

New research studies carried out under the direction of California air quality regulators have confirmed that dairies are complex sources of air emissions. This research demonstrates significant, landmark progress in both understanding the basic nature of dairy emissions and in controlling those emissions.

The studies also provide new information useful for designing effective control strategies to reduce dairy emissions. Current regulatory efforts are consistent with the current science and will ensure reduced emissions and cleaner air, while minimizing unnecessary economic impact to state, regional and local economies.

The California Air Resources Board, the San Joaquin Valley Air Pollution Control District and the dairy industry's environmental coalition, CARES, collaborated on three projects that have improved the understanding of the nature of dairy emissions:

- A study at UC Davis, led by Dr. Frank Mitloehner, which focused on emissions from cows housed in environmental chambers to evaluate emissions directly from cows and their fresh manure.
- A study at two operating dairies in the San Joaquin Valley, led by Dr. Chuck Schmidt, in which measurements were made at many locations on and around the dairy facilities including the corrals and turnouts, bedding areas, lagoons, feed storage areas, flush lanes, and bunker feed.
- A study by Dr. Schmidt to validate the effectiveness and capture efficiency of using flux chambers to quantify volatile fatty acid (VFA) emissions.

The testing portions of these studies are now complete and detailed final reports are being prepared. When available, reports will be posted at: www.arb.ca.gov/ag/caf/caf.htm.

The studies build upon the existing body of research. The new studies put California solidly at the forefront of dairy emissions research. They have produced significant findings that underscore the importance of science-based regulations and addressing the complexity of dairy emissions. Perhaps the most important finding of all is that dairy emissions are extraordinarily complex, varying not only season to season, but from dairy to dairy, and from place to place within a dairy. Emissions can vary substantially depending on weather, types of feed,

and management styles and many other factors. ARB sponsored research is underway with the goal of modeling emission at individual dairies based on site-specific characteristics. Other key findings include:

- Cattle feed stored on California dairies is a significant source of volatile organic compound (VOC) emissions ;
- Emissions of ethanol and methanol from feed, cows, and their fresh manure appear to be the dominant variety of VOCs emitted, and are more significant than previously thought;
- Manure in drylot corrals appears to be an important source of VOC and ammonia emissions on some dairies;
- Manure storage ponds, also known as lagoons, once suspected as a major source of dairy VOC emissions, appear to emit a comparatively small share of overall dairy VOC emissions;
- Emissions of a class of VOC compounds known as volatile fatty acids (VFAs) are not as significant as previously thought;
- Emissions can vary considerably from dairy-to-dairy and seasonally.

California regulators and the dairy industry have already taken significant steps to reduce overall dairy emissions:

- In the San Joaquin Valley, where more than 80 percent of the state's dairy industry is located, all new or expanding dairy operations have been required since 2004 to adopt stringent emissions reductions measures (known as Best Available Control Technology or BACT) before receiving a construction permit.
- Existing large dairies in the San Joaquin Valley dairies are required to adopt measures known as Best Available Retrofit Control Technology (BARCT); these will be covered under new regulations collectively known as Rule 4570.

Both actions are required under Senate Bill 700 (Florez), a state law that mandates air pollution permits for large farms and livestock facilities. For existing dairies in the San Joaquin Valley, proposed Rule 4570 would require dairy operators to adopt at least 19 separate management practices aimed at reducing emissions – and is expected to reduce dairy VOC emissions in the San Joaquin Valley by about 25 percent. Information regarding this rulemaking is available here: www.valleyair.org/Workshops/public_workshops_past.htm#Rule%204570.

While the studies by Dr. Schmidt and Dr. Mitloehner have provided valuable new information, they do not fully address air emissions from dairies. Additional work is needed to further evaluate the emissions from feed components and corrals, and to better understand the benefits of commonly used emission reductions practices. For example, a preliminary study conducted by Dr. Mitloehner indicates that the practice of flushing concrete floored freestall barns appears to

reduce VOC emissions in the barn. This additional research is also needed to allow a comprehensive update to the interim emission factors currently being used for dairies. To this end, longer-term research is being undertaken. At the January hearing of the Air Resources Board, the Board approved a project with UC Davis to begin development of a process-based dairy emissions model, which is designed to model emissions at individual dairies and to further improve understanding of biological processes that result in dairy emissions. Additional research focusing on appropriate methods for storing and managing feed, best management practices for corrals, and other innovative control methods is also already under way at California State University, Fresno. Future studies may also be necessary, such as investigations of emissions from land application of manure, solid manure handling and other areas of dairies.

Later in 2006, there are tentative plans to hold a research symposium to discuss recent dairy research, ongoing efforts, and future plans.