

Aerosolized Dust Particulates and Bioaerosols of a Dairy on the Southern High Plains of New Mexico

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INTRODUCTION

Aerosolized particulates and bioaerosols emanating from dairy concentrated animal feeding operations (CAFO's), have come under increasing regulatory scrutiny. The concentration and size of dust particles, and the type and concentration of bioaerosols (including endotoxins) need to be determined in dairies consisting of several thousand head.

MATERIALS AND METHODS

To conduct this study we divided the dairy (D3) into four unique areas, three outside and one inside. They were the open air accessory barn (feed processing area), processed manure windrows or replacement heifer pens depending on the dairy, and boundary fences which included the open air loafing pens. Outside sites were analyzed upwind and downwind as close to the site that was practical and safe. The milk barn air was analyzed inside, collection sites were down the central alley at both the front and back opposite cows being milked, and a few meters outside the barn for control intake air. Aerosol equipment consisted of sequential Reference Ambient Air Samplers (RAAS 300) PM_{2.5} and PM₁₀ particulate monitors, DustTrak 8520 laser monitors, and biological cascade impactors. Both six-stage and two-stage impactors were used to determine the concentration of bioaerosols, and specialized media was used to differentiate the type of bacteria and fungi.

RESULTS

Only the RAAS Federal Reference Method data are reported in this abstract. There was no significant difference (PROC GLM) between RAAS upwind, 0.0444 mg/m³ (0.009 SEM) and downwind, 0.0617 mg/m³ (0.011 SEM) mean concentration of dust. A significant ($P \leq 0.001$) difference was observed between RAAS PM₁₀, 0.0907 mg/m³ (0.012 SEM) and PM_{2.5}, 0.0162 mg/m³ (0.003 SEM) mean dust concentration. Mean dust concentration was significantly ($P \leq 0.008$) greater 0.0676 mg/m³ (0.012 SEM) at the accessory barn compared to that collected at the boundary fences (0.0424 mg/m³ (0.008 SEM)). The main facility was significantly ($P \leq 0.001$) less dusty 0.0301 mg/m³ (0.003 SEM) than the heifer replacement lot 0.0741 mg/m³ (0.013 SEM).

The milk barn's intake air contained 0.0245 mg/m³ (0.003 SEM), inside front had 0.0366 mg/m³ (0.006 SEM), and inside back had 0.0406 mg/m³ (0.007 SEM), and these three values were significant at the $p \leq 0.06$ level.

CONCLUSIONS

This dairy was in full compliance for not exceeding maximum (150 µg/24 hr for PM₁₀, 50 µg/24 hr for PM_{2.5}) particulate dust limits during the month that it was analyzed.

Keywords: Dairy particulate aerosols, Dust particulate size, Milk barn aerosols

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