Diacetyl and 2,3-Pentanedione Exposures Associated with Cigarette Smoking: 
Implications for Risk Assessment of Food and Flavoring Workers

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Poster Session 403 - Tuesday, June 3, 2014, 9:00 AM - 3:00 PM, Communication and Training, 
Emerging Issues, Hazardous Chemicals, Healthcare, Industrial Hygiene General Practice, 
Occupational and Environmental Epidemiology, Risk Assessment and Management, 
Toxicology.  SR-403-03

The American Industrial Hygiene Conference & Exposition (AIHce) May 31 – June 5, 2014
San Antonio, TX, at the Henry B. Gonzalez Convention Center (HBGCC)

Introduction
Diacetyl and 2,3-pentanedione inhalation have been suggested as causes of severe respiratory 
disease, including bronchiolitis obliterans, in food/flavoring manufacturing workers. Both 
compounds are present in many food items, tobacco, and other consumer products, but 
estimates of exposures associated with the use of these goods are scant.

Methods
A study was conducted to characterize exposures to diacetyl and 2,3-pentanedione associated 
with cigarette smoking. The yields (µg/cigarette) of diacetyl and 2,3-pentanedione in 
mainstream (MS) cigarette smoke were evaluated for six tobacco products (e.g., both full-flavor 
and light cigarettes of three different brands) under three smoking regimens (ISO, 
Massachusetts Department of Public Health, and Health Canada Intense) using a standard 
smoking machine.

Results
The mean diacetyl concentrations in MS smoke ranged from 250-361 ppm for all tobacco 
products and smoking regimens, and the mean cumulative exposures associated with 1 pack-
year ranged from 1.1-1.9 ppm-years. For 2,3-pentanedione, the mean concentrations in MS 
smoke ranged from 32.2-50.1 ppm, and the mean cumulative exposures associated with 1 
pack-year ranged from 0.14-0.26 ppm-years.

Conclusions
We found that diacetyl and 2,3-pentanedione exposures from cigarette smoking far exceed 
occupational diacetyl exposures for most food/ flavoring workers who smoke. This suggests 
that previous claims of a significant exposure-response relationship between diacetyl inhalation 
and respiratory disease in food/flavoring workers were confounded, because none of the 
investigations accounted for non-occupational diacetyl exposure, yet all of the cohorts evaluated 
had considerable smoking histories. Further, because smoking has not been shown to be a risk 
factor for bronchiolitis obliterans, our findings suggest that diacetyl and/or 2,3-pentanedione 
exposure is not a risk factor for this disease.