# Rodent study finds artificial butter chemical harmful to lungs

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A new study shows that exposure to a chemical called diacetyl, a component of artificial butter flavoring, can be harmful to the nose and airways of mice. Scientists at the National Institute of Environmental Health Sciences (NIEHS), part of the National Institutes of Health, conducted the study because diacetyl has been implicated in causing obliterative bronchiolitis (OB) in humans. OB is a debilitating but rare lung disease, which has been detected recently in workers who inhale significant concentrations of the flavoring in microwave popcorn packaging plants.

When laboratory mice inhaled diacetyl vapors for three months, they developed lymphocytic bronchiolitis - a potential precursor of OB. None of the mice, however, were diagnosed with OB.

“This is one of the first studies to evaluate the respiratory toxicity of diacetyl at levels relevant to human health. Mice were exposed to diacetyl at concentrations and durations comparable to what may be inhaled at some microwave popcorn packaging plants,” said Daniel L. Morgan, Ph.D., head of the Respiratory Toxicology Group at the NIEHS and co-author on the paper that appears online in the journal, *Toxicological Sciences*. The study was done in collaboration with Duke University researchers.

The authors conclude that these findings suggest that workplace exposure to diacetyl contributes to the development of OB in humans, but more research is needed.

Although exposure of laboratory animals by inhalation closely duplicates the way humans are exposed to airborne toxicants, the study points out that some anatomical differences between the mice and humans may account for why the nasal cavity of mice is more susceptible to reactive vapors than that of humans. Another reason may be that mice breathe exclusively through their noses.

The researchers also speculate that the extensive reaction of diacetyl vapors in the nose and upper airways of mice may have prevented toxic concentrations from penetrating deeper in the lung to the bronchioles or tiny airways where obstruction occurs in humans.

When the mice were exposed to high concentrations of diacetyl using a method that bypasses the nose, the researchers found lesions partially obstructing the small airways. More studies are under way to determine if these lesions progress to OB in mice.

The National Toxicology Program, headquartered at the NIEHS, plans to do a larger set of studies to provide inhalation toxicity data on artificial butter flavoring and the two major components, diacetyl and another compound called acetoin. The NTP studies will help pinpoint more definitively the toxic components of artificial butter flavoring and potentially help identify biomarkers for early detection. The NTP data will then be shared with public health and regulatory agencies so they can set safe exposure levels for these compounds and develop guidance to protect the health of workers in occupations where these chemicals are used.

Source: National Institute of Environmental Health Sciences