

New studies further show risk of chemicals to coffee roasters

August 24 2015, by Raquel Rutledge, Milwaukee Journal Sentinel



Workers who roast and grind coffee in factories and cafes across the United States have more reason for concern about exposure to lung destroying chemicals.

A study published by the online journal *Toxicology Reports*, released last week, found high levels of diacetyl and the related chemical 2,3-pentanedione in the air at a small coffee roasting plant.

A second study by some of the same authors, simulating a cafe setting, found the potential for risk to customers who stay in [coffee shops](#) for hours socializing or lingering on their laptops.

Of particular note, the research focused on coffee facilities that did not use added flavors.

Added flavors containing diacetyl and 2,3-pentanedione are known respiratory hazards for those working in the food industry. By avoiding added flavors, the research shows what is not commonly known: that the chemicals are also formed naturally and released from roasting coffee, and to a greater extent from grinding large volumes of beans.

An investigation by the Milwaukee Journal Sentinel published in June found levels of naturally occurring diacetyl and 2,3-pentanedione in the breathing zones of workers at two Wisconsin coffee roasters that exceeded safety levels recommended by the U.S. Centers for Disease Control and Prevention. In some cases, the levels were nearly four times the recommended limit.

Diacetyl has been linked to hundreds of injuries and some deaths involving microwave popcorn workers over the last 15 years. More than 1,000 lawsuits have been filed with awards and settlements totaling hundreds of millions of dollars.

The food industry has gradually moved away from synthetic diacetyl, substituting its molecular cousin, 2,3-pentanedione. Recent studies have found it to be equally as harmful.

An earlier Journal Sentinel report focused on five workers at a Tyler, Texas, coffee factory who contracted debilitating lung diseases thought to be tied to added diacetyl used in hazelnut flavored coffee. One was placed on the waiting list for a lung transplant. They settled a lawsuit against a flavor manufacturer in October for undisclosed sums.

Little attention was paid at the time of the Texas cases to the notion that some coffee workers may be getting a double dose of diacetyl.

The research was conducted by employees of Cardno ChemRisk, a global consulting firm that was hired by diacetyl suppliers and others involved in diacetyl lawsuits. The study in the coffee plant was funded in part by a flavor manufacturer and an insurance carrier, both involved in diacetyl litigation. Authors say the companies did not participate in any phase of the study or review the manuscript before publication.

The studies take aim at the government's efforts to regulate occupational exposure to diacetyl, arguing that proposed levels are too stringent and that harm only comes with higher exposures.

Authors of the studies could not be reached for comment.

Diacetyl occurs naturally in low concentrations in butter, beer, yogurt and other foods and drinks as a byproduct of fermentation. It's also made synthetically and added to chips, snacks and beverages - including coffee - to impart a buttery flavor.

While the U.S. Food and Drug Administration has deemed diacetyl safe to eat in trace amounts, more than a dozen studies - on animals and food workers - have found the chemical toxic to inhale.

The U.S. Occupational Safety and Health Administration, which oversees workplace safety, does not regulate exposure to diacetyl.

The other federal agency with an interest in the issue, the National Institute for Occupational Safety and Health - the research arm of the CDC - recommends in a draft proposal that workers not be exposed to more than 5 parts per billion of diacetyl during an 8-hour workday, or 25 parts per billion during a 15-minute span. The recommendation has stalled.

One Cardno ChemRisk study aimed at looking at occupational exposure

was done at an undisclosed "commercial coffee roasting facility" with one 30-pound roaster and a roasting volume of 1,250 pounds per week.

That study found workers who ground coffee were exposed to as much as 390 parts per billion of diacetyl in a short-term sample, though their samples were taken from a stationary area monitor, not the breathing zones of workers. Experts caution that using area samples to characterize worker exposures is not as accurate as monitoring air around head space.

The Journal Sentinel's testing found concentrations of 60 parts per billion of diacetyl in an employee's breathing zone, in a short-term sample. Long-term samples discovered levels of more than 19 parts per billion.

Cardno ChemRisk's second study was a simulation done in a 126-square-foot residential kitchen. Six people acted as baristas and customers, grinding, brewing and sipping coffee. Researchers collected long and short-term samples, ranging from 3 minutes to 3 hours to mimic the behavior of those who frequent coffee shops.

Results showed diacetyl present in all long-term customer samples at levels ranging from 10 to 14 parts per billion.

National Institute for Occupational Safety and Health scientists warn against applying [occupational exposure](#) limits to other categories of people, however. Workplace recommendations take into consideration air intake volumes consistent with workers moving around, for example. Customers would likely be sedentary.

It's impossible to say what the results mean for cafes, as chemical concentrations in the air depend on the volume of coffee roasted and ground, ventilation, engineering controls and other factors.

The Cardno ChemRisk studies went on to suggest that concentrations at the coffee plant and in the simulation were not high enough to hurt workers. The reports cite two previous animal studies that found that rats and mice suffered serious injury and death only when exposed to diacetyl at far higher levels than found in the [coffee](#) plant.

The author of one of those previous animal studies, Dan Morgan of the National Institutes of Health, said his study was designed to look specifically at bronchiolitis obliterans, a severe irreversible lung disease that results in the build-up of scar tissue blocking the airways.

He didn't look at effects of longer-term lower-level exposures.

"That doesn't mean you're not going to have other respiratory problems," Morgan said. "There is a huge difference between being exposed to short-term high concentrations and chronic long-term exposure. There's a difference in the type of disease you're going to come down with."

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Citation: New studies further show risk of chemicals to coffee roasters (2015, August 24)
retrieved 2 May 2024 from

<https://medicalxpress.com/news/2015-08-chemicals-coffee-roasters.html>

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