

Diacetyl and 2,3-Pentanedione in Popcorn, Coffee and Other Food Products

Diacetyl (also known as 2,3-butanedione) (CAS 431-03-08) and 2,3-pentanedione (CAS 600-14-6) are two compounds that have been linked to a medical condition known as obliterative bronchiolitis (aka popcorn lung, in reference to afflicted microwave popcorn workers). Diacetyl is a flavoring compound found in coffee roasting facilities [1], microwave popcorn facilities, and many other food processing plants. The 2,3-pentanedione is structurally similar and has been used as a replacement compound for diacetyl.

NIOSH recently published new exposure guidelines for both compounds [2]. The recommended exposure level (REL) (TWA, 8-hr work day) for diacetyl and 2,3-pentanedione were determined to be 5 ppb (18 ng/L) and 9.3 ppb (39 ng/L), respectively. The short-term exposure levels (STEL) (15-min exposure) were established at 25 ppb (89 ng/L) and 31 ppb (~ 130 ng/L), respectively. FTIR studies were performed at a coffee-roasting facility to monitor the real-time airborne concentrations of these compounds. Concentrations were highest (e.g., diacetyl peaked at 10.9 ppb) during coffee grinding operations where dust formation and dispersal were the greatest [3].

In general, consumers need not be concerned about the incidental exposure they face when microwaving popcorn or blending or grinding coffee in their homes. However, both compounds have also been found in flavored e-cigarette liquids leading to concerns for substantial exposure risks for individuals who regularly vape e-cigarettes [1]. Finally, diacetyl is found in beer, cheese, dairy, and other food products and are generally not considered harmful when ingested in the quantities found in these products. The danger is in the inhalation of the vapors.

[1] <https://www.cdc.gov/niosh/topics/flavorings/exposure.html>

[2] <https://ohsonline.com/Articles/2017/02/01/NIOSH-Proposes-RELS.aspx?Page=1>

[3] <http://www.sciencedirect.com/science/article/pii/S2214750017300045>