

Acetophenone – A Common Air Pollutant

Background

Acetophenone (C_8H_8O), also known as phenylethanone, acetylbenzene, or phenylacetone, is often found in products we use or consume. Acetophenone is commonly found in the indoor air and has reached levels up to $300 \mu\text{g}/\text{m}^3$ (61 ppb) in environments where operating electronic equipment such as computers and televisions are constantly warm. Lower levels of acetophenone are also frequently found in areas with operating 3D printers.

Acetophenone is a simple aromatic ketone with sweet odor and a low odor threshold. It is frequently used as a fragrance in soaps, lotion, detergent, and perfumes, and as a flavoring agent in some foods. However, its main presence in indoor air is associated with operating, heated electronics where emissions are associated with plastics and resins used in their housing, circuit boards, and other construction materials. Heated plastic print media are a likely source from 3D printer operation.

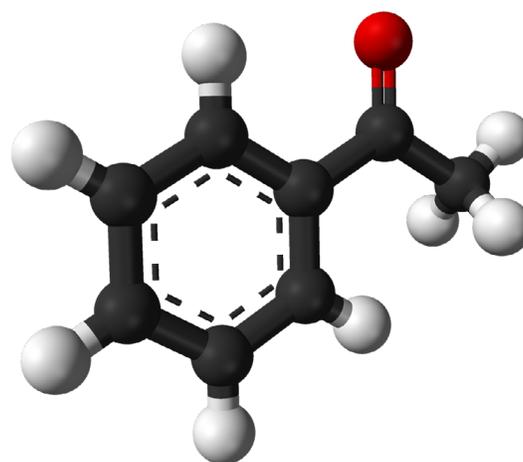


Figure 1: Acetophenone (Wikimedia Commons)

Health Concerns

Acetophenone is a known irritant, exacerbated by its low odor threshold, and can affect the central nervous system. When inhaled, acetophenone as an acute irritant can affect the nose and throat and can cause headaches, dizziness, and nausea. It can also irritate the skin causing a burning rash and a long skin exposure can remove fat from the skin leading to dryness or cracking. It can irritate and burn the eyes with possible transient corneal injury. While it has been tested for its chronic effects, acetophenone has not been classified to have reproductive, developmental, or carcinogenic effects.

Acceptable Exposure Levels

Following is a list of U.S. and global organizations with acetophenone odor thresholds and/or exposure limits (Table 1).



Figure 2: Row of microchips (iStock)

Table 1: Acetophenone Odor and Exposure Standards

Organization or Standard	Application	Exposure Limit	Additional Information
AgBB	General air/ indoor air	100 ppb	Ausschuss zur gesundheitlichen Bewertung von Bauprodukten (AgBB) sets Lowest Concentration of Interest (LCI) for VOC emissions from building products. LCI for acetophenone is 0.1 ppm (490 µg/m ³).
The United States Environmental Protection Agency (U.S. EPA)	Odor threshold	170 ppb	The odor threshold of acetophenone is 0.17 ppm (830 µg/m ³).
The United States Environmental Protection Agency (U.S. EPA)	Oral exposure	RfD: 0.1 mg/kg bw/day NOAEL: 10,000 ppm (1E7 ppb)	The U.S. EPA maintains the Integrated Risk Information System (IRIS), a database on information on noncancer and cancer health effects that may result from exposure to various substances in the environment, based on toxicological reviews. Acetophenone has a reference dose for oral exposure (RfD) of 0.1 mg/kg bw/day. RfD is an estimate of a daily exposure to the human population that is likely to be without an appreciable risk of deleterious effects during a lifetime. NOAEL of 10,000 ppm (423 mg/kg/day) from studies with rats.
American Conference of Governmental Industrial Hygienists (ACGIH)	Occupational/ indoor air	10 ppm (10,000 ppb)	Threshold Limit Values (TLV [®] s) are guidelines for the level of exposure that the typical worker can be exposed to without adverse health effects. They are not quantitative estimates of risk at different exposure levels or by different routes of exposure. The acetophenone TLV-8-hr time weighted average is 10 ppm (49 mg/m ³).
California PEL - TWA	Occupational/ indoor air	10 ppm (10,000 ppb)	California's Permissible Exposure Limits for Chemical Contaminants (CAPEL) has an 8 hr Time Weighted Average (TWA) of 10 ppm (49 mg/m ³).

References

1. US EPA. Acetophenone CASRN 98-86-2 | DTXSID6021828 | IRIS | US EPA, ORD. Accessed July 8, 2021. https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=321
2. Provisional Peer-Reviewed Toxicity Values for Acetophenone (CASRN 98-86-2). :29.
3. Acetophenone - an overview | ScienceDirect Topics. Accessed August 19, 2021. <https://www.sciencedirect.com/topics/medicine-and-dentistry/acetophenone>
4. PubChem. Acetophenone. Accessed August 19, 2021. <https://pubchem.ncbi.nlm.nih.gov/compound/7410>
5. Knadle S, Salocks CB. Development of Health Criteria for School Site Risk Assessment Pursuant to Health and Safety Code 901(G): Identification of Potential Chemical Contaminants of Concern at California School Sites Final Report. :135.
6. ACETOPHENONE | Occupational Safety and Health Administration. Accessed August 23, 2021. <https://www.osha.gov/chemicaldata/777>