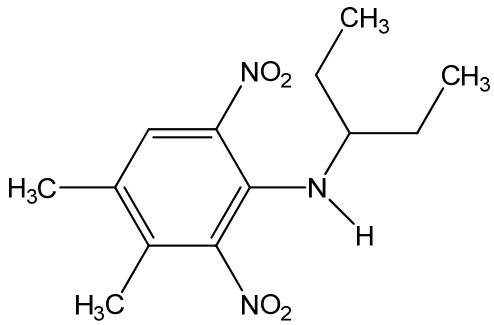
Pendimethalin [CAS No. 40487-42-1]

Potential Designated Chemical

February 9, 2010 Meeting of Scientific Guidance Panel
California Environmental Contaminant Biomonitoring Program (CECBP)



Exposure or potential exposure to the public or specific subgroups:

Pendimethalin is a dinitroaniline herbicide used to control broadleaf and grassy weeds. It is used on agricultural crops, on golf courses, for landscape maintenance and for residential lawn care. The California Department of Pesticide Regulation (CDPR) lists 58 products currently registered for use in California that contain pendimethalin (CDPR, 2010). CDPR reported that agricultural use of pendimethalin increased by 29% in 2008, with more than 1.4 million pounds used on agricultural commodities, including landscape maintenance and rights of way (CDPR, 2008), as shown in the table below.

Pounds pendimethalin applied in California (CDPR, 2003-2008)

Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Total pounds applied	**312,561**	**542,634**	**520,782**	**714,755**	**1,124,396**	**1,448,554**
Alfalfa	5,250	10,329	15,565	18,191	108,093	369,121
Almond	14,153	33,133	74,955	162,560	314,513	311,234
Cotton	118,214	158,450	154,790	114,583	78,323	72,159
Oranges	3,805	4,985	7,385	42,249	80,374	73,470
Pistachio	18,069	10,855	13,257	69,606	124,175	146,166
Landscape Maintenance + Rights of way	52,187	215,894	126,441	136,241	113,594	110,114

In sampling during 2003-2004, the U.S. Geological Survey (Vogel et al., 2008) found pendimethalin in approximately 50% of rainfall samples (n=108) taken from four agricultural watersheds across the United States (Maryland, Indiana, Nebraska and California), and in 78% of the California samples (n=23).

Known or suspected health effects:

Pendimethalin has been classified as a possible human carcinogen (Group C) by U.S. EPA based on increases in thyroid tumors in rats, which were hypothesized to be due to a thyroid-pituitary imbalance (U.S. EPA, 1997). Three epidemiologic studies from the large Agricultural Health Study cohort reported associations between exposure to pendimethalin and increased risk of certain cancers (Andreotti et al., 2009; Hou et al., 2006; Alavanja et al., 2004). These studies are not without limitations, however, and they are the first epidemiologic studies to look at the risks of exposure to this chemical.

A U.S. EPA 1997 review did not identify positive genotoxicity studies. Two recent publications have reported that pendimethalin increased the frequency of chromosomal aberrations in mouse bone marrow cells and of micronuclei in mouse bone marrow polychromatic erythrocytes (Dimitrov et al., 2006), and induced DNA damage in Chinese Hamster Ovary (CHO) cells (Patel et al., 2007). Pendimethalin also caused an increase in cell death by apoptosis in *in vitro* incubations of CD-1 mouse preimplantation embryos (Greenlee et al., 2004). Pendimethalin was found to have estrogenic and anti-androgenic activity in *in vitro* reporter gene assays in CHO cells (Kojima et al., 2004).

Potential to biomonitor:

Physical and chemical properties (HSDB):
Molecular weight: 281.31
Vapor pressure: 3×10^{-5} mm Hg
Water solubility: 0.3 mg/L at 20ºC
Octanol/water partition coefficient: Log K_{ow} = 5.18

Persistence and bioaccumulation: U.S. EPA identified pendimethalin as a PBT (persistent, bioaccumulative and toxic) chemical under the Emergency Planning and Community Right to Know Act of 1986 [EPCRA] (U.S. EPA, 1999). The PBT Profiler predicts a bioconcentration factor (BCF) of 1,900.

Past biomonitoring studies: No biomonitoring studies of pendimethalin were identified.

Need to assess efficacy of public health actions:

Pendimethalin is a high use agricultural pesticide in California. The above-cited *in vitro* studies published after US EPA's 1997 review suggest pendimethalin may be genotoxic and may potentially have endocrine disrupting effects. Recent findings from the above-cited

epidemiological studies indicate the need for further investigation. Biomonitoring pendimethalin would help the State assess the extent of exposure to California residents.

***Availability of analytical methods*:** Methods to analyze dinitroaniline herbicides in human blood and urine have been identified in the scientific literature (Guan et al., 1998). CECBP would likely develop its own methods for analysis.

***Availability of adequate biospecimens*:** Blood or urine.

***Incremental analytical cost*:** Analysis could be bundled with other dinitroaniline herbicides.

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