CREOSOTE ODOR, THE NOSE, AND HUMAN HEALTH

The odor of creosote is easily identifiable, for good reason: creosote has a very distinct odor, and the human nose is able to detect it at extremely low concentrations. But just because it may smell bad doesn't mean it *is* bad!

The smell is primarily the presence of one substance among the many that comprise creosote – naphthalene. William Cain of the University of California, San Diego, is recognized worldwide as a leader in the field of chemical odor perception and human sensory irritation measurement. Dr. Cain has recently measured the human odor threshold for naphthalene along with its eye and nasal sensory irritation thresholds (Medeiros, et al, 2000) . He reports that the odor threshold for naphthalene is below three parts per billion (ppb), a very low concentration. To put this concentration into perspective, the odor threshold for nail polish remover is 7,000-133,000 times greater than naphthalene. Dr. Cain also showed that ocular and nasal response thresholds are 88,000 and 90,000 parts per billion (ppb) , respectively, again, much higher than the odor detection threshold.

According to the American Conference of Governmental Industrial Hygienists, the level of naphthalene that is considered safe for workers is ten thousand parts per billion. So the difference between being able to smell it and worrying about it is huge – four orders of magnitude, to be exact. Even workers at creosote treatment plants don't experience those levels of exposure.

In 2001 air assessments for naphthalene concentrations were made at four creosote pressure-treating plants (Bookbinder and Butala, 2001) . Measurements of airborne naphthalene <u>at the level of the treating worker</u> never exceeded 300 ppb (1.5 $mg/m^{3)}$ as an 8-hour average.
Naphthalene measurements included air concentrations at the treating cylinder during treating operation, opening and closing of the cylinder and off-loading creosote. All naphthalene air concentrations were well below the current health-based worker exposure limit of 10000 ppb and are nearly 300-fold below the eye and noise irritation threshold for naphthalene as determined by Dr. Cain. Again, these naphthalene air concentrations were measured within the treating plant during treating operations. As the distance from the treating area within a plant increases to areas outside of the plant, the concentration of airborne naphthalene (and other components of creosote) will diminish. So even though you may be able to smell it, say from a utility pole or nearby railroad tracks, these levels do not come anywhere close to the levels that might cause even minor health problems such as eye or nose irritation, much less a more serious health problem.

Sometimes, how humans react to an odor has more to do with the mind than with the nose. We all dislike odors we find unpleasant, and we are more likely to fear them,

and believe they really have caused some health problem. Pam Dalton of the Monell Chemical Senses Center of the University of Pennsylvania is considered a leader in the field of assessment of odor and taste perception in humans. Beginning in 1997, Dr. Dalton has authored a series of papers that describe human response to odor and the factors influencing their response (Dalton, 2003, 2002, 1998). In her work Dr. Dalton describes the subjectivity and variability that characterize human response to odor, but she has extended her observations to include evaluation of the effect of emotional bias on odor response (Dalton, 1997). Dr. Dalton found that what subjects were told about an "odor" before they actually were exposed to it greatly influenced their reaction to it. Subjects were asked to rate odor intensity and health symptoms during and following exposure to an airborne chemical. All subjects were exposed to the same material under identical exposure conditions, but one group of test subjects was told that the test material to which they would be exposed had beneficial medical effects, and another was told that the material was an industrial chemical waste material. A third group was told nothing about the substance to which they were exposed. Dalton reports that those subjects believing that they were being exposed to a "beneficial" substance exhibited the most adaptation to its odor and the lowest perceived irritation. Following exposure they reported the fewest health symptoms. In contrast, the group who was given "negative" information about the exposure (industrial waste information) reported higher levels of odor intensity and, on average, the most overall irritation. Following exposure they reported significantly more health symptoms.

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