

Recommendations of the Scientific Advisory Panel

Polycyclic Aromatic Hydrocarbons (PAHs)

July 20, 1995

In the past, for purposes of the evaluation of carcinogenic PAHs predicted ambient impacts for compliance with Rule 230 - 232, there has only been a screening level value available for benzo(a)pyrene (B(a)P). Screening levels have not been available for other carcinogenic PAHs, since toxicity data on other carcinogenic PAHs were not suitable for deriving unit risk values. During the evaluation of other carcinogenic PAHs, it was traditionally assumed that all carcinogenic PAHs were equipotent to B(a)P. This approach was recognized to be conservative, as limited available data (in most cases in vitro data) indicate that many of the carcinogenic PAHs were likely to be less potent than B(a)P. Therefore, the Panel and the Air Quality Division (AQD) considered other approaches for dealing with the carcinogenic PAHs.

The primary difficulty in establishing a screening level for PAHs is that while many of these compounds are considered to be carcinogens, data are not suitable for calculation of quantitative risk estimates by conventional methods. In lieu of having actual specific PAH toxicity data, the Panel found that the next best method for assessing the carcinogenic risk from exposure to PAHs was a method from the US Environmental Protection Agency, which provides comparative potency estimates (EPA 1993). At this time, the Panel recommends that this methodology may be utilized for sources emitting carcinogenic PAHs, whenever more specific data regarding PAH containing mixtures are not available. The Environmental Protection Agency (EPA) method for PAH comparisons is similar to the toxic equivalent factor (TEF) methodology utilized for adjusting the potency of various dioxin isomers to a factor of 2,3,7,8-TCDD potency. In the case of PAHs, EPA used the potency of benzo(a)pyrene as the basis for comparing the potencies of the other carcinogenic PAHs. For each carcinogenic PAH, EPA developed an estimated potential potency that is based upon the relative carcinogenic potency compared to B(a)P. EPA developed the estimated potential potencies for a limited number (six in addition to benzo(a)pyrene) of carcinogenic PAHs. These values are listed in the following table.

PAH	Estimated Potential Potency
benzo(a)anthracene	0.1
benzo(a)pyrene	1
benzo(b)fluoranthene	0.1
benzo(k)fluoranthene	0.01
chrysene	0.001
dibenzo(a,h)anthracene	1
indeno(1,2,3-cd)pyrene	0.1

The Panel recommends that the above list of estimated potential potency values be used to estimate the carcinogenic risk for these PAH compounds. The Panel realizes that the use of the above limited list may not be adequate for all situations, as PAHs are often present as complex mixtures containing many more PAHs, including carcinogenic PAHs other than those identified in EPA's list. The Panel recommends that the 'average' of the estimated potential potencies be used for the other carcinogenic PAHs. The Panel believes this is a reasonable way to estimate the unknown potency of the other PAHs. The arithmetic mean of potential potencies for the above seven PAHs is 0.3, while the median value is 0.1. It is recommended that the median value of 0.1 be used for those carcinogenic PAHs without estimated potential potency values established by EPA.

Another method to consider for estimating potency has been developed by the California EPA-Air Resources Board. This group has developed PEF or potency equivalency factors, another similar system to TEFs, for many additional carcinogenic PAHs. The Panel recommends that before adoption and use, these PEFs would need to be reviewed by a national body such as, but not limited to, the EPA or the National Academy of Science (NAS) to ensure that they are based on appropriate data.

For their information and to get an idea on how wide an impact this evaluation might have, the Panel requested a list be compiled of facilities/sources that may be emitting PAHs. However, the AQD staff found that there is no easily available listing of these types of facilities. The AQD Permit Section compiled a partial listing of PAH sources that includes: coal combustion; oil combustion; charcoal manufacturing; coke production; incineration of scrap wood; municipal waste incinerators; woodstoves; fireplaces; and hot-mix asphalt plants.

References:

California EPA-Air Resources Board. 1994. Benzo(a)pyrene as a toxic air contaminant. Part B: Health effects of benzo(a)pyrene.

EPA. 1993. Provisional guidance for quantitative risk assessment of polycyclic aromatic hydrocarbons. EPA/600/R-93/089.