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SUBJECT: ESTIMATING THE LIMIT OF QUANTITATION (LOQ) FOR ANALYTICAL METHODS MEASURING PESTICIDE CONCENTRATIONS IN AMBIENT AIR

Pursuant to Section 14022 of the Food and Agricultural Code, the Department of Pesticide Regulation (DPR) requests that the Air Resources Board (ARB) conduct monitoring for pesticides in ambient air as part of the toxic air contaminant program. DPR provides the desired LOQ to ARB. This allows ARB to develop and validate the necessary analytical methods for the pesticides before air monitoring is conducted.

The estimated LOQs provided to ARB are based on cancer and noncancer effects identified by toxicologists of the Medical Toxicology branch as they review toxicity studies on each active ingredient. The following procedure describes how we estimate the LOQs for ARB.

The equation used for cancer effects is:

$$\frac{(10^{-x}/Q_1^*) \text{ X (Body Weight) X 365 Days per Year/ Number of Use Days}}{\text{Air Volume Inspired/ 24 Hours}} = \text{LOQ}$$

Where Q_1^* equals the cancer potency factor. The Q_1^* is expressed as $(mg/kg/day)^{-1}$. The 10^{-x} should be 10^{-6}, which is the risk factor historically used by DPR or 10^{-7}, which is the risk factor needed to identfy a pesticide with no threshold concentration for adverse health effects as a toxic air contaminant according to Title 3 California Code of Regulations (CCR) Section 6890. An LOQ estimated using the 10^{-7} factor is preferred. The number of use days is usually estimated from pesticide use data.

Cancer is assumed to result from lifetime exposure so annual exposure is assumed over a lifetime. For cancer effects adult males are used because they have the highest body weight to ventilation rate ratio for adults. Therefore, the body weight used in the equation is 77 Kg and the volume of air inspired in 24 hours is 15.2 m^3(1). The equation assumes that 100% of the pesticide is absorbed by the lungs.

The equation used for noncancer effects is:

$$\frac{\text{(NOEL X Body Weight)/ Margin of Exposure (MOE)}}{\text{Air Volume Inspired/24 Hours}} = \text{LOQ}$$

Where NOEL is the No Observable Effect Level of any biologically-significant adverse effect (noncancer) with the lowest dose identified in the toxicity studies. An MOE (uncertainty factor) of 100 or 1000 is typically used. The LOQ derived from an MOE of 100 is the highest default air level we can use since an uncertainty factor of 100 has been used historically to identify acceptable pesticide levels derived from animal toxicity data. An MOE of 10 may be used if acceptable data from studies on human subjects is available. We prefer an LOQ developed using the 1000 or larger factor because this is the MOE specified to identify pesticides as toxic air contaminants under Title 3 CCR Section 6890.

For noncancer effects children have the highest body weight to ventilation rate ratio. Therefore, the Body Weight used in the equation is 21.7 Kg and the volume of air inspired in 24 hours is 16.7 m^3(1). The equation assumes that 100% of the pesticide is absorbed by the lungs.

(1) U.S. EPA. (1997) Exposure Factors Handbook, Volume 1. Washington, DC: Office of Research and Development, National Center for Environmental Assessment.
EPA/600/P-95/002Fa.