INTERPRETATION OF 24-HOUR SAMPLING DATA

Both the Ontario Ministry of the Environment (MOE) and the Texas Commission on Environmental Quality (TCEQ) set science-based ambient air quality values to protect human and environmental health, prevent damage to the physical environment and minimize offensive odours. The MOE sets ambient air quality criteria (AAQC) and the TCEQ sets air monitoring comparison values (AMCVs). This case study will discuss different approaches the agencies use to set health-based values to interpret 24-hour (hr) ambient air monitoring data.

Both agencies review the toxicology of the substance. From this, the dose-response relationships for an array of adverse health effects considered critical are assembled. For chemicals with a threshold, a point of departure is determined and uncertainty factors are applied to set the limit that represents the AAQC or AMCV. For chemicals without a threshold, a risk-based approach is followed and a unit risk factor is developed. The MOE has a risk goal of 10^{-6} excess cancer risk for AAQCs whereas the TCEQ has a risk goal of 10^{-5} excess cancer risk for AMCVs. The panel is not asked to comment on the different risk goals of the agencies. The major differences between the two agencies are the approaches used to evaluate different averaging times. Different air permitting procedures/regulations contribute to the need for different approaches.

TCEQ

For chemicals detected in the TCEQ ambient air monitoring network, acute 1-hr AMCVs based on acute studies and chronic AMCVs based on chronic studies have generally been derived to evaluate 1-hr measured concentrations of chemicals of interest or calculated annual average concentrations, respectively. These averaging times correspond to averaging times evaluated in air permitting. However, 24-hr ambient air samples (i.e., canister samples collected every 3rd or 6th day) may be collected and used to calculate annual averages for comparison to chronic AMCVs. A 24-hr sample is an acute-exposure duration significantly longer than 1-hr. It is not appropriate to use a short-term, 1-hr AMCV or long-term AMCV to evaluate a 24-hr ambient air sample. Thus, the development of a 24-hr health-based AMCV to evaluate a single 24-hr exposure would allow the TCEQ to evaluate 24-hr data for possible health concerns. Ideally, an acute study of 24-hr exposure duration would be used to develop a 24-hr AMCV, but such toxicity studies are rare. Therefore, the purpose of this case study is to obtain comments from the panel on guidelines presented in the case study to develop health-based 24-hr AMCVs and the strengths and limitations of using effects-based 24-hr AMCVs. Since the 24-hr AMCV is specific to the exposure period and health effect being considered, it may be used to conduct a risk assessment in combination with 1-hr and annual AMCVs, although it cannot replace the 1-hr or annual AMCVs.

Ontario MOE

The vast majority of the MOE AAQCs are based on chronic effects and are used as targets for general air quality. A challenge of the annual AAQC, however, is that air quality can only be assessed after sufficient air quality data are collected to reflect an annual average. That is, annual AAQCs are not useful for evaluating individual 24-hr exposures. The MOE has addressed this issue by converting AAQCs with annual averaging times to 24-hr AAQCs via a meteorological-based conversion factor. Therefore, two AAQCs are set for a single substance: an effects-based annual average AAQC, and a converted 24-hr AAQC. In this case, the converted 24-hour AAQC is used to provide an indication of whether the annual AAQC would be exceeded rather than to evaluate possible health concerns within the 24-hour timeframe. The MOE may also set 24-hour AAQCs directly from chronic data, for cases in which a critical and/or short-term window of exposure is associated with an adverse effect (e.g., developmental effects). The purpose of this case study is to demonstrate how both toxicological and implementation considerations

may influence the setting of an AAQC and, in turn, the interpretation of 24-hr air quality data. Comments are invited from the panel on the strengths and limitations of the approaches employed by the MOE to set and interpret 24-hr AAQCs, as outlined in their case study.