

Averaging Time

The Rules Advisory Committee (RAC) for Cleaner Air Oregon (CAO) Health Risk Based Permitting Program provided comments on the topic of averaging time. This handout was developed in response to RAC comments and was created by state agency staff involved in the CAO rule writing process. The comments provided by the RAC influence decisions for risk based concentration averaging times for chronic and acute exposures, as reflected in sections 4 through 7 of the “Discussion Draft: Proposed Framework for Cleaner Air Oregon”.

Summary of RAC Comments

- *Why are we using 24 hour averaging and not 1 hour?*
- *Why aren't we including an 8 hour averaging time in addition to annual averaging?*

Time Averaging Options Summary

	24 hour	1 hour	Annual	8 hour
Overview	Reflects average air concentration over 24hr period	Reflects average air concentration over 1hr period	Reflects average air concentration over a 1 year period	Reflects average air concentration over repeated exposures at 8 hours per exposure
Benefits	Provides 24hr of air quality data. Useful in many exposure scenarios. For example, people who live, work, learn and play nearby an emission source.	Provides 1hr of air quality data. Useful in limited exposure scenarios, for example a child that plays for 1 hour on 1 day nearby emission source.	Allows for assessment of risks over the long-term in many scenarios. For example, people who live, work, learn and play nearby an emission source.	Applicable for people who spend only 8hr at a time in an area near an emission source. For example an outdoor worker, or children going to school in the area while spending the rest of their time away from the emission source.
Limitations	Not possible to narrow in on peaks of time where emissions are higher or lower since air concentrations are combined throughout the day	Difficult to apply to risk based calculations for populations living, working, learning, and playing nearby. Limited exposure scenarios for 1 hour increment.	Model only as good as assumptions and monitoring that go into it. The more air monitoring data the more robust the model.	Misses 16 hours of potential exposures to emissions. Doesn't capture risks for populations that spend their whole day nearby emission source.
Regulatory considerations	Most cost effective and conservative / health protective.	Limited applicability. Highest agency labor and laboratory costs.	Allows for the assessment of health risks from chronic or long-term exposure.	Worker exposure scenarios will be accounted for by adjusting risk calculated using annual air concentration. Annual averaging time is more health protective than the 8 hour.

ACUTE: 24 hour time averaging vs. 1 hour averaging time

Monitoring

If ambient air monitoring is to be a part of the program, 24 hour averaging time is much more protective of health than a 1 hour averaging time. A sample collected over 24 hours captures all air toxics present at the monitor over the entire period, including spikes. A sample collected over a 1 hour period will always be subject to question about whether or not that 1 hour snapshot captured the worst-case conditions over the course of the day. A 1 hour snapshot is 24 times more likely to miss a 1 hour spike in air concentrations than a 24 hour snapshot.

Modeling

Air dispersion modeling can produce a worst-case 1 hour air concentration, but model outputs are much less certain over such a short time increment than over a longer increment.

Toxicology

Most toxicity studies are not designed to detect the exact minimum amount of time required to cause a health effect.

- Researcher exposes animal with a dose
- Researcher records the dose and route of exposure
- Researcher leaves the laboratory
- Researcher comes back some time later (e.g. 6 hours) and records observable effects

This limitation means that typical toxicological studies cannot be used to distinguish health effects that follow a 1 hour exposure and ones that follow a 24-hour exposure. Agencies adopt policies to apply either a 1 hour or a 24 hour exposure period to toxicological studies that were not designed to distinguish which averaging time is more appropriate.

Health effects that one could measure following a single 1 hour exposure would be acute enough that emergency response may be appropriate. Agencies intend to regulate in a way that is more congruent with the public health value of primary prevention. If health is protected from health effects following a 24 hour exposure, it will also be protected from more acute health effects relevant to a much higher intensity 1 hour exposure.

Chronic: Annual vs. 8 hour (occupational) Averaging Time

California's 8-hour Reference Exposure Level (REL)

The 8 hour reference exposure levels (RELs) promulgated by California's Office of Environmental Health Hazard Evaluation (OEHHA) are designed to be protective of workers and school children who are chronically exposed to air toxics in an area but only for 8 hours a day. In other words, OEHHA's 8 hour RELs are chronic toxicity values as opposed to acute toxicity values. OEHHA's 8 hour RELs are typically higher air toxics concentrations (i.e. less health protective) than their chronic RELs because they assume that individuals are only exposed for 8 hours a day as opposed to the 24 hours per day assumption in their chronic RELs.

Cleaner Air Oregon's Proposed Approach to Chronic Annual and Non-Residential Scenarios

CAO's chronic (annual) risk based concentrations (RBCs) are proposed to assume an individual is exposed 24 hours per day, 7 days per week. CAO proposes to address non-residential scenarios by adjusting risk calculated from annual average concentrations.