

4717.8300 EQUATIONS FOR CALCULATION OF HRVs FOR NONCARCINOGENIC EFFECTS OF TOXICANTS.

Subpart 1. **Scope.** This part establishes the method for determining the health risk values (HRVs) for noncarcinogenic effects of toxicants.

Subp. 2. **General equation; calculating HRV for noncarcinogenic effect of toxicant.** The equation for calculating an HRV for a noncarcinogenic effect of a toxicant is:

$$\text{HRV} = \frac{\text{NOAEL}_{[\text{ADJ}]} \text{ or } \text{LOAEL}_{[\text{ADJ}]} \text{ or } \text{BMC}_{[\text{ADJ}]}}{(\text{Uncertainty factor})(\text{Modifying factor})} \times 1,000$$

or

$$\text{HRV} = \frac{\text{NOAEL}_{[\text{HEC}]} \text{ or } \text{LOAEL}_{[\text{HEC}]} \text{ or } \text{BMC}_{[\text{HEC}]}}{(\text{Uncertainty factor})(\text{Modifying factor})} \times 1,000$$

Where:

- A. HRV is expressed in units of micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air;
- B. $\text{NOAEL}_{[\text{ADJ}]} \text{ or } \text{LOAEL}_{[\text{ADJ}]} \text{ or } \text{BMC}_{[\text{ADJ}]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;
- C. uncertainty factor and modifying factor are unitless;
- D. the default value for modifying factor is one unless otherwise specified in part 4717.8100 or 4717.8150; and
- E. 1,000 is a factor to convert milligrams to micrograms.

Subp. 3. **Equation for $\text{NOAEL}_{[\text{HEC}]}$, $\text{LOAEL}_{[\text{HEC}]}$, or $\text{BMC}_{[\text{HEC}]}$; particles with respiratory effect.** The equation for calculating a $\text{NOAEL}_{[\text{HEC}]}$, $\text{LOAEL}_{[\text{HEC}]}$, or $\text{BMC}_{[\text{HEC}]}$ for a particle having a respiratory effect is:

$$\text{NOAEL}_{[\text{HEC}]} \text{ or } \text{LOAEL}_{[\text{HEC}]} \text{ or } \text{BMC}_{[\text{HEC}]} = \text{NOAEL}_{[\text{ADJ}]} \text{ or } \text{LOAEL}_{[\text{ADJ}]} \text{ or } \text{BMC}_{[\text{ADJ}]} \times \text{RDDR}$$

Where:

- A. $\text{NOAEL}_{[\text{HEC}]}$, $\text{LOAEL}_{[\text{HEC}]}$, or $\text{BMC}_{[\text{HEC}]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;
- B. $\text{NOAEL}_{[\text{ADJ}]}$, $\text{LOAEL}_{[\text{ADJ}]}$, or $\text{BMC}_{[\text{ADJ}]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air; and
- C. RDDR is the regional deposited dose ratio and is unitless.

Subp. 4. **Equation for NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC]; particles with extrarespiratory effect.** The equation for calculating a NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC] for particles with an extrarespiratory effect is:

$$\text{NOAEL}_{[\text{HEC}]} \text{ or LOAEL}_{[\text{HEC}]} \text{ or BMC}_{[\text{HEC}]} = \text{NOAEL}_{[\text{ADJ}]} \text{ or LOAEL}_{[\text{ADJ}]} \text{ or BMC}_{[\text{ADJ}]} \times \text{RDDR}_{\text{ER}}$$

Where:

A. NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC] is expressed in units of milligrams per cubic meter (mg/m³) of air;

B. NOAEL_[ADJ], LOAEL_[ADJ], or BMC_[ADJ] is expressed in units of milligrams per cubic meter (mg/m³) of air; and

C. RDDR_{ER} is the regional deposited dose ratio for extrarespiratory effects and is unitless.

Subp. 5. **Equation for NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC]; gas with respiratory effect.** The equation for calculating the NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC] for a gas having a respiratory effect is:

$$\text{NOAEL}_{[\text{HEC}]} \text{ or LOAEL}_{[\text{HEC}]} \text{ or BMC}_{[\text{HEC}]} = \text{NOAEL}_{[\text{ADJ}]} \text{ or LOAEL}_{[\text{ADJ}]} \text{ or BMC}_{[\text{ADJ}]} \times \text{RGDR}$$

Where:

A. NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC] is expressed in units of milligrams per cubic meter (mg/m³) of air;

B. NOAEL_[ADJ], LOAEL_[ADJ], or BMC_[ADJ] is expressed in units of milligrams per cubic meter (mg/m³) of air; and

C. RGDR is the regional gas dose ratio in the specific region of the respiratory tract and is unitless.

Subp. 6. **Equation for NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC]; gas with extrarespiratory effect.** The equation for calculating the NOAEL_[HEC], LOAEL_[HEC], or BMC_[HEC] for a gas having an extrarespiratory effect is:

$$\text{NOAEL}_{[\text{HEC}]} = \text{NOAEL}_{[\text{ADJ}]} \times \frac{(H_{\text{b/g}})_{\text{A}}}{(H_{\text{b/g}})_{\text{H}}}$$

or

$$\text{LOAEL}_{[\text{HEC}]} = \text{LOAEL}_{[\text{ADJ}]} \times \frac{(\text{H}_{\text{b/g}})_{\text{A}}}{(\text{H}_{\text{b/g}})_{\text{H}}}$$

or

$$\text{BMC}_{[\text{HEC}]} = \text{BMC}_{[\text{ADJ}]} \times \frac{(\text{H}_{\text{b/g}})_{\text{A}}}{(\text{H}_{\text{b/g}})_{\text{H}}}$$

Where:

A. $\text{NOAEL}_{[\text{HEC}]}$, $\text{LOAEL}_{[\text{HEC}]}$, or $\text{BMC}_{[\text{HEC}]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

B. $\text{NOAEL}_{[\text{ADJ}]}$, $\text{LOAEL}_{[\text{ADJ}]}$, or $\text{BMC}_{[\text{ADJ}]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air; and

C. $(\text{H}_{\text{b/g}})_{\text{A}}/(\text{H}_{\text{b/g}})_{\text{H}}$ is the ratio of the blood:gas (air) partition coefficient of the chemical in the experimental animal to the blood:gas (air) partition coefficient of the chemical in a human; the ratio is unitless. If $(\text{H}_{\text{b/g}})_{\text{A}} > (\text{H}_{\text{b/g}})_{\text{H}}$ or if the partition coefficient values are unknown, $(\text{H}_{\text{b/g}})_{\text{A}}/(\text{H}_{\text{b/g}})_{\text{H}} = 1.0$.

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