4717.8500 EQUATIONS FOR CALCULATION OF HRVs FOR ACUTE TOXICITY.

Subpart 1. **Scope.** This part establishes the method for determining the health risk value (HRV) for toxicants having acute toxicity effects.

Subp. 2. **General equation for calculating an HRV for an acute irritant.** The equation for calculating an HRV for an acute irritant is:

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

or

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

or

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

Where:

A. HRV is expressed in units of micrograms per cubic meter ($\mu g/m^3$) of air;

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

C. uncertainty factors and modifying factor are unitless;

D. the default value for modifying factor is one unless otherwise specified in part 4717.8200; and

E. 1,000 is a factor to convert milligrams to micrograms.

Subp. 3. **Methods of calculation for acute irritant; study exposure time from 30 minutes to two hours.** For acute irritants where the study time is 30 minutes to two hours, the study NOAEL or LOAEL will be used without adjustment. For studies where the exposure time is 30 minutes to two hours and a BMC approach is used, a time adjustment may be necessary. When a BMC approach is used, the equation for calculating a $\text{BMC}_{[\text{ADJ}]}$ is:

$$BMC_{[ADJ]} \times 60 \text{ minutes} = BMC_{(study)} \times \text{exposure duration}$$

Where:

A. $BMC_{(study)}$ is expressed in units of milligrams of a chemical or defined mixture of chemicals per cubic meter (mg/m^3) of air used in the study as the exposure concentration; and

B. $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air.

Subp. 4. **Equation for acute irritant; study exposure time from two to eight hours.** The equation for calculating a $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ for an acute irritant based on data from a study where the exposure time or adverse health effect onset time is greater than two hours but less than or equal to eight hours is:

$(NOAEL_{(study)}^{n}$ or $LOAEL_{(study)}^{n}$ or $BMC_{(study)}^{n})$ (exposure duration or onset of critical effect) = $NOAEL_{[ADJ]}$ or $LOAEL_{[ADJ]}$ or $BMC_{[ADJ]}$

Where:

A. $NOAEL_{(study)}$, $LOAEL_{(study)}$, or $BMC_{(study)}$ is expressed in units of milligrams of a chemical or defined mixture of chemicals per cubic meter (mg/m^3) of air used in the study as the exposure concentration;

B. the default value for n is 2 unless noted otherwise;

C. the exposure duration represents the time at which the critical effect occurred. This most often is the exposure duration, but in some instances the critical effect may differ from the exposure duration, depending on the critical endpoint being observed; and

D. $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air.

Subp. 5. **Calculation of HRV for chemical causing reproductive/developmental toxicity.** The equation for calculating an HRV for a chemical or defined mixture of chemicals causing reproductive/developmental toxicity is:

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

Where:

A. HRV is expressed in units of micrograms per cubic meter ($\mu g/m^3$) of air;

B. NOAEL, LOAEL, or BMC 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 4717.8200; and

E. 1,000 is a factor to convert milligrams to micrograms.

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