

CLASS ACTIVITY: USING EXPOSURE FACTOR DATA

Instructions: Develop relevant scenarios for exposure to Chemical A based on the setting described in the text box below. Choose up to *six* average daily dose exposure estimates to calculate.

EXPOSURE SETTING

A spill of Chemical A at a former industrial site has resulted in contamination of the groundwater below the site, and the plume of contaminant has traveled offsite. The plume is now under Mayberry, a residential neighborhood that includes homes as well as a daycare center. The concentration of Chemical A in groundwater under Mayberry is 0.01 mg/L.

Assumptions:

- Oral exposure to Chemical A has been shown to cause adverse effects at low levels in children less than 2 years old. Exposures are believed to be possible for children in utero, and the substance can partition to the breast milk of lactating women.
- The sole source of drinking water for Mayberry is well water. All of the children attending the day care are residents of Mayberry.
- There are no site-specific data on drinking water consumption by residents of Mayberry.
- Estimated exposures will be used by the local public health agency to determine possible health risks for the residents. They are interested in estimating typical and high-end exposures. (Calculation of risks is not part of the current exercise.)

$$\text{ADD} \frac{\text{mg}}{\text{kg-day}} = \frac{C \times IR \times CF \times ED \times EF}{AT \times BW}$$

Where:

C = Concentration (mg/m³, mg/kg, mg/L)

IR = Intake rate (mg/day, mL/day)

CF = Contact fraction (unitless)

ED = Exposure duration (minutes, hours, days, years)

EF = Exposure frequency (days/yr, events/day)

AT = Averaging time (minutes, hours, days, years)

BW = Body weight (kg)

Exposure Factors Handbook: Recommendations for Drinking Water Consumption – Per Capita

Age Group per capita	Mean (mL/day)	95 th Percentile (mL/day)	Confidence Rating
Birth to <1 month	184	839	High
1 to <3 months	227	896	High
3 to <6 months	362	1,056	High
6 to <12 months	360	1,055	High
1 to <2 years	271	837	High
2 to <3 years	317	877	High
3 to <6 years	327	959	High
6 to <11 years	414	1,316	High
11 to <16 years	520	1,821	High
16 to <18 years	573	1,783	High
18 to <21 years	681	2,368	High
≥21 years	1,043	2,958	High
>65 years	1,046	2,730	High
All Ages	869	2,717	High
Pregnant women	819	2,503	Medium to high
Lactating women	1,379	3,434	Medium to high

(Source: Tables 3-1 and 3-3 in EFH 2011)

Exposure Factors Handbook: Recommendations for Body Weight

Age Group	Mean (kg)	Confidence Rating
Birth to <1 month	4.8	High
1 to <3 months	5.9	High
3 to <6 months	7.4	High
6 to <11 months	9.2	High
1 to <2 years	11.4	High
2 to <3 years	13.8	High
3 to <6 years	18.6	High
6 to <11 years	31.8	High
11 to <16 years	56.8	High
16 to <21 years	71.6	High
Adults	80.0	High
Pregnant Women	73.0	N/A

(Source: Table 8-1 in EFH 2011)