

CONCENTRATION CALCULATIONS
Convert molarity to mg/ml and mg/ml to molarity

Normally, our concentrations are given in units of milligrams per milliliter (mg/ml), but often data sheet quality assurance data are expressed in molarity (moles per liter, M) or fractions of that (e.g., micromolar (μM), 10^{-6} M, or nanomolar (nM), 10^{-9} M). Here is how to convert between these units.

FROM (mg/ml) TO molarity (M):

Divide the concentration (mg/ml) by the molecular weight. We will use the example of a typical immunotoxin that has a molecular weight of 210,000 grams per mole (or mg/mmol or kDa) (the molecular weight is usually found on the data sheet) and a common concentration is 1.0 mg/ml.

$$\frac{1.0 \text{ mg/ml}}{2.1 \times 10^5 \text{ mg/mmol}} = 0.48 \times 10^{-5} \text{ mmol/ml}$$
$$= 4.8 \times 10^{-6} \text{ mmol/ml}$$

In the first line, the mg units cancel each other, leaving units of mmol/ml that is equal to moles/liter or molar (M). Therefore, $0.48 \times 10^{-5} \text{ mmol/ml} = 0.48 \times 10^{-5} \text{ M}$ or $4.8 \times 10^{-6} \text{ M}$. This, of course, can be expressed as $4.8 \mu\text{M}$, or 4.8 micromolar.

In summary: concentration (grams per liter) \div molecular weight (grams per mole) = moles per liter.

FROM molarity (M) TO (mg/ml):

Multiply the molar concentration (M, or moles per liter) by the molecular weight. In an example of an immunotoxin at 1.0 nM concentration (1.0 nmoles per liter or 1.0×10^{-9} M or 1.0×10^{-9} moles per liter) again using as an example, a targeted toxin of molecular weight 210,000 grams per mole (or mg/mmol or kDa):

$$1.0 \times 10^{-9} \text{ moles per liter} \times 2.1 \times 10^5 \text{ grams per mole} = 2.1 \times 10^{-4} \text{ grams per liter}$$
$$= 2.1 \times 10^{-1} \mu\text{g/ml}$$
$$= 0.21 \mu\text{g/ml}$$

In summary: molar concentration (moles per liter) \times molecular weight (grams per mole) = grams per liter.