CONTINUOUS INFUSION RATE CALCULATION GUIDE

Important: Use Table 1 to convert the concentration of the solution to the same unit of measure as used in the ordered dose rate (i.e. microgram, mg, etc.) **before** using the formulas.

Table 1. Unit Conversions

microgram/mL → mg/mL	Divide by 1000
NANOgram/mL → microgram/mL	Divide by 1000
milliunit/mL → unit/mL	Divide by 1000
per L → per mL	Divide by 1000
mg/mL → g/mL	Divide by 1000
% (or g%) → g/mL	Divide by 100
mEq% → mEq/mL	Divide by 100
mg/mL → microgram/mL	Multiply by 1000
microgram/mL → NANOgram/mL	Multiply by 1000
unit/mL → milliunit/mL	Multiply by 1000
per mL → per L	Multiply by 1000
g/mL → mg/mL	Multiply by 1000

Calculate the hourly rate (mL/h)

$$Rate\ (mL/h) = \frac{ordered\ dose\ rate\ x\ weight\ (kg)}{concentration\ of\ solution} \times *time\ conversion$$

***time conversion** is only necessary if:

- ordered dose is per minute rather than per hour…convert minutes to hours by **multiplying** by **60.**
- ordered dose is per day rather than per hour…convert days to hours by **dividing** by **24**

Calculate the bolus dose rate or loading dose rate (mL/h)

$$Rate\ (mL/h) = \frac{ordered\ dose\ x\ weight\ (kg)}{concentration\ of\ solution} \div admin\ time\ (min) \times 60\ min/h$$

Calculate the dose rate when provided with the rate (mL/h)

$$Dose\ rate = \frac{rate\ (mL/h) \times concentration\ of\ solution}{weight\ (kg)} \div *time\ conversion$$

***time conversion** is only necessary if you want to find the ordered dose per minute rather than per hour. Convert hours to minutes by dividing by **60.**

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EXAMPLES WHERE ORDERED DOSE RATE IS ***PER HOUR:***

Example 1: Concentration units are the same as order dose units

morphine (1 mg/mL) 0.01 mg/kg/hour for a 10 kg patient

$$\frac{0.01\ mg/kg/h \times 10\ kg}{1\ mg/mL} = 0.1\ mL/h$$

Example 2: Concentration units are different than order dose units

HYDROmorphone (0.2 mg/mL) 2 microgram/kg/hour for a 10 kg patient

Convert 0.2 mg/mL to microgram/mL:

$$0.2\ mg/mL \times 1000\ microgram/mg = 200\ microgram/mL$$

then

$$\frac{2\ microgram/kg/h \times 10\ kg}{200\ microgram/mL} = 0.1\ mL/h$$

Example 3: Concentration is expressed as %

fat emulsion 20% (SMOFlipid®) 0.125 g/kg/h (3 g/kg/day delivered over 24 hours) for a 10 kg patient

Convert 20% to g/mL:

$$20\ g/100\ mL \div 100\ mL = 0.2\ g/mL$$

$$\frac{0.125\ g/kg/h \times 10\ kg}{0.2\ g/mL} = 6.25\ mL/h$$

EXAMPLES WHERE ORDERED DOSE RATE IS ***PER MINUTE*:**

Example 4: Concentration units are the same as order dose units

alprostadil (6 microgram/mL) 0.1 microgram/kg/min for 2 kg patient

$$\frac{0.1\ microgram/kg/min \times 2\ kg}{6\ microgram/mL} \times 60\ min/h = 2\ mL/h$$

Example 5: Concentration units are different than order dose units

DOPamine (3.2 mg/mL) 5 micrograms/kg/min for 10 kg patient

Convert 3.2 mg/mL to microgram/mL:

$$3.2\ mg/mL \times 1000\ microgram/mg = 3200\ microgram/mL$$

then

$$\frac{5\ microgram/kg/min \times 10\ kg}{3200\ microgram/mL} \times 60\ min/h = 0.94\ mL/h$$

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EXAMPLES WHERE ORDERED DOSE RATE IS ***PER DAY*:**

Example 6 : Concentration units are the same as order dose units

arginine (100 mg/mL) 600 mg/kg/day for a 10 kg patient

$$\frac{600\ mg/kg/day\ \times 10\ kg}{100\ mg/mL} \div 24\ h/day = 2.5\ mL/h$$

EXAMPLES OF BOLUS DOSE OR LOADING DOSE RATE

Example 7: Concentration units are the same as order dose units

heparin (50 units/mL) 75 mg/kg for a 10 kg patient over 10 minutes

$$\frac{75\ units/kg \times 10\ kg}{50\ units/mL} \div 10\ min \times 60\ min/h = 90\ mL/h$$

Example 8: Concentration units are different than order dose units

HYDROmorphone (0.2 mg/mL) 2 microgram/kg for a 10 kg patient over 5 minutes

Convert 0.2 mg/mL to microgram/mL:

$$0.2\ mg/mL \times 1000\ microgram/mg = 200\ microgram/mL$$

then

$$\frac{2\ microgram/kg\ \times 10\ kg}{200\ microgram/mL} \div 5\ min \times 60\ min/h = 1.2\ mL/h$$

EXAMPLES USING RATE (mL/h) TO CALCULATE THE DOSE RATE

Example 9: IV fluid with potassium chloride 40 mmol/L for a 10 kg patient but heart rate must be monitored for dose rates greater than 0.2 mmol/kg/hour. What is the maximum rate (mL/h) that can be administered without a monitor?

Convert mmol/L to mmol/mL:

$$40\ mmol/L \div 1000\ mL/L = 0.04\ mmol/mL$$

then

$$\frac{0.2\ mmol/kg/h\ \times 10\ kg}{0.04\ mmol/mL} = 50\ mL/h$$

IV fluid with potassium chloride 40 mmol/L is ordered at a rate of 60 mL/h for a 10 kg patient. Determine the dose rate in mmol/kg/h.

Using the dose rate formula (not the hourly rate formula):

$$\frac{60\ mL/h \times 0.04\ mmol/mL}{10\ kg} = 0.24\ mmol/kg/h$$