

How to select the best bioconcentration tool for your application by calculating your potential concentration factor

Application Note (Revision B)

The concentration of microparticles, including whole cells, bacteria, protozoa, fungi, molds, parasites, pollens, viruses, free DNA, and proteins is typically performed by either centrifugation or filtration, or combination. Both approaches have limitations on how large the starting sample volume can be and how small the final concentrate volume can be achieved.

For optimum detection of dilute organisms, a large sample volume paired with the smallest concentrate volume possible achieves the highest **liquid to liquid concentration factor (LCF)**.

Efficiency (the percentage of target microparticles that are concentrated and recovered) is important too, but a high LCF is what gives the most target particles to the analytical device, kit, strip, or etc.

How to Calculate Concentration Factor:

1. Calculate the liquid-to-liquid concentration factor (LCF) i.e. starting sample volume divided by final concentrate volume.
2. Multiply that figure by the percent recovery efficiency (%RE).
3. The result is the concentration factor (CF).

InnovaPrep Concentration Systems

InnovaPrep's FluidPrep™ Systems provide exponential concentration factors. They work by capturing dilute microparticles from large volumes of liquid using robust filtration on high surface-area filters, followed by instant recovery into a small final volume using our patented [Wet Foam Elution™ \(WFE\)](#) process.

[The CP Select™](#)

Concentrating Pipette can be used with sample volumes up to 5 liters (depending on the pore size of the filtered pipette tip) and delivers a final concentrate of about 250 microliters (µL)



FluidPrep CP Select™



FluidPrep EasyElute™ LVC Kit

[The EasyElute™ Large Volume Concentration Kit](#)

can be used with sample volumes from 1 liter to 100+ liters. It delivers a final concentrate of about 70 milliliters (mL)

Which Concentration Method is Right for Me?

The following table shows potential concentration factors (CF) using the CP Select, the EasyElute LVC Kit, and a combination of both (for two-stage concentration). Examples are based on various sample input volumes and two example recovery efficiencies*.

InnovaPrep Concentration Method	Method	Sample Volume Range	Approximate Elution Volume	Example Recovery efficiency*	Conc. factor w/ various starting sample volumes						
					10ml	50 ml	500 ml	1L (1,000 ml)	5L (5,000 ml)	10L (10,000 ml)	100L (100,000 ml)
CP Select	Single Step	Up to 5L	~250 ul	70%	28X	285X	1400X	2800X	14,000X	N/A	
				40%	16X	80X	800X	1600X	8,000X		
EasyElute LVC	Single Step	1-100L+	~70 ml	70%	N/A			10X	50X	100X	1000X
				40%				5.7X	28X	57X	571X
EasyElute LVC + CP Select	Two Step	5-100L+	~250 ul	70%	N/A			9,800X	19,600X	196,000X	
				40%				5,488X	11,172X	111,916X	

* Efficiency is affected by a range of physical factors of both the matrix and the organisms. Efficiencies higher than 70% are common. For tips on optimizing recovery see the app note - *Approaches for Improved Concentration of Microbes from Environmental Waters Using the Concentrating Pipette*

Takeaways:

- The CP Select is a superior method for volumes up to 10 L because of the smaller elution volume it provides.
- Sample volumes up to 10 liters can be split and concentrated on the CP Select using more than one pipette tip and then combine the eluants for analysis.
- The EasyElute is the method of choice for volumes 5-10 liters or more.
- Matrix effects can influence all concentration processes, thereby limiting the volume of any sample that can be processed, meaning that while the example volumes demonstrated here may not be achievable in all instances, they can occasionally be exceeded.

See innovaprep.com/products for more information.