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Application Note

Filterability Assay of the VacuCap® Bottle-Top Filter Device

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Introduction

Sterile filtration is a critical procedure that involves processing sterile fluids of biological importance. By choosing the correct filter device, throughput can be maximized and operating costs can be reduced. The VacuCap and VacuCap PF, with an integrated pre-filter, bottle-top filter device with Supor® PES membrane and integrated pre-filter provides fast filtration of viscous solutions. Their small unit size ensures less waste and reduces the chance of contamination by filtering directly into the final container, such as bottles or flasks.

In this study we report the VacuCap and VacuCap PF bottle-top filters performance by subjecting the device to filterability assays using three different suspension types; water, model suspension having a turbidity of 1.2 Nephelometric Turbidity Unit (NTU), and cell culture media with 10% calf serum supplementation.

Results

Water Permeability Test

The water flux was determined by filtering water for one minute under constant pressure. The mean value of water flux per filter media was calculated and plotted in Kg/min. It was found that the VacuCap filter device outperformed both the VacuCap PF and a single competitor filter device by achieving the highest permeability indicating lowest flux resistance. Representative graphs, as shown in Figure 1, indicate the performance of the filter devices at a constant pressure of – 507.9 mbar.

Filterability Test with Model Suspension

A pre-filtered suspension containing 1% brown cane sugar in 0.9% saline was used as a model suspension. The turbidity of the solution was measured to be 1.2 NTU at 20 °C. The solution was then filtered through the VacuCap, VacuCap PF and competitor filter device at constant vacuum of -507.9 mbar until the continuous flow slowed down to distinct drops. The mean value of filtrate collected was then plotted for each filter. Figure 2 shows that the VacuCap PF was able to filter the maximum amount of solution.

Filterability Test for Cell Culture Media with Supplement

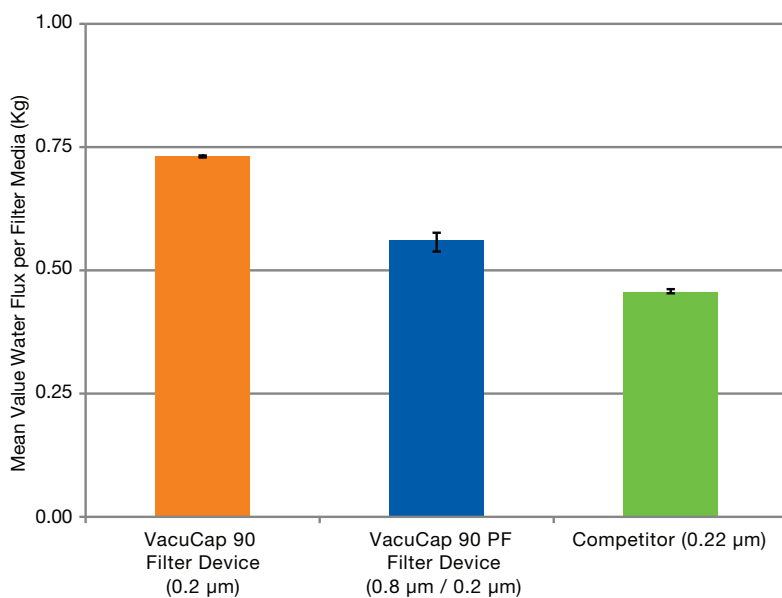
The VacuCap, VacuCap PF and competitor filter device were subjected to isobaric filtration at -507.9 mbar to filter DMEM with 10% calf serum supplementation. Filtration was monitored by calculating the filtrate weight over time at 20 °C. Results show that the VacuCap PF achieved the highest throughput compared to the VacuCap and a single competitor device. Figure 3 shows the mean output of a VacuCap PF device is more than 3 kilograms when filtering cell culture media with 10% calf serum.

Conclusion

The filterability study conducted indicates that the VacuCap device with a pre-filter (VacuCap PF) is well suited for daily cell culture applications, such as DMEM + 10% calf serum (Figure 2). The differentiation of the compared devices was most evident in the filtration test with model suspension and cell culture media with serum supplementation where higher volume was filtered through the VacuCap PF filter device in both experiments (Figure 2 and 3), three of each device were tested, individual results may vary. The unique design of the VacuCap PF filter device incorporates a proprietary pre-filter membrane that demonstrates higher filtration performance compared to The VacuCap filter device with a single membrane.

Figure 1

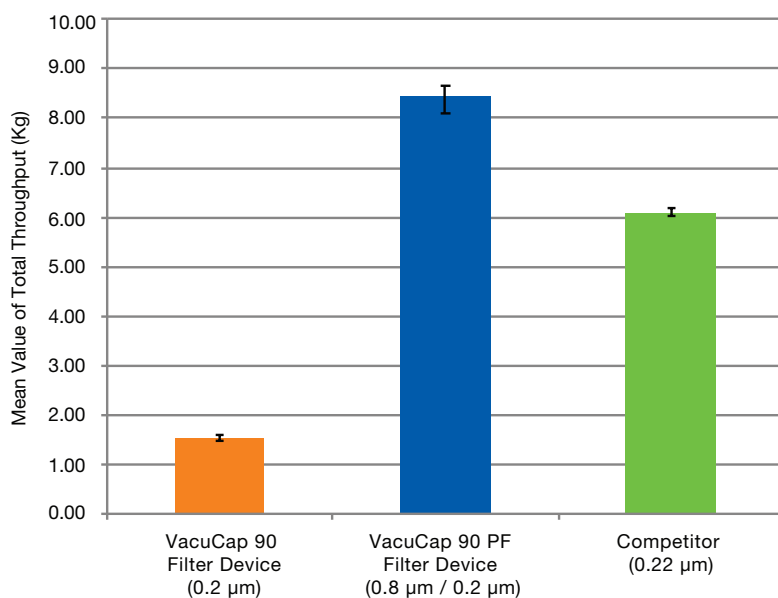
Water Permeability Per Filter Media



0.2 µm pre-filtered water was filtered through each device under constant vacuum of 507.9 mbar at 20 °C (n=3). Mean value of total throughput after 1 min was plotted for each device. Error bars indicate standard deviation. Individual results may vary.

Figure 2

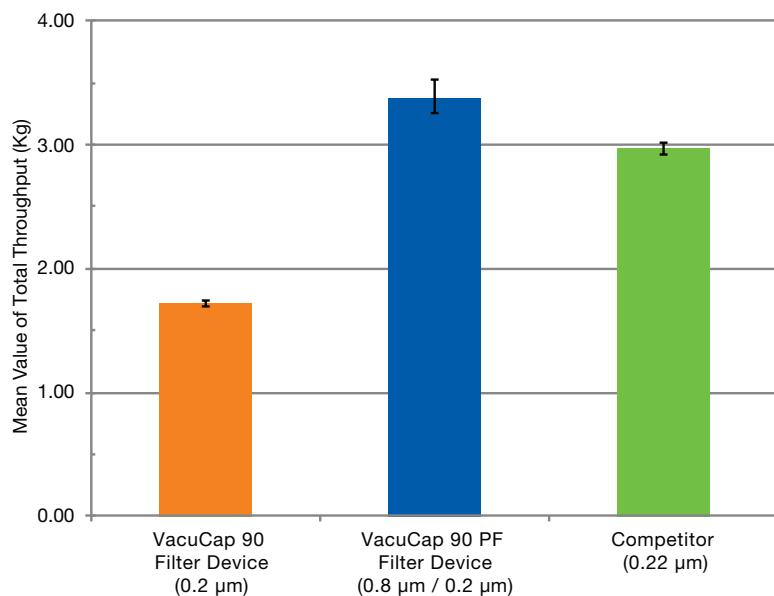
Mean Value of Total Throughput per Device With a Model Suspension



Model suspension was filtered through the same devices used to determine water flux. Filtration was done at constant vacuum of 507.9 mbar at 20 °C (n=3). The mean value of total throughput after filtration was plotted. Error bars indicate standard deviation. Individual results may vary.

Figure 3

Mean Value of Total Throughput per Device with DMEM + 10% Calf Serum



DMEM+10% calf serum (10.2 NTU) was filtered through each device under constant vacuum of 507.9 mbar at 20 °C (n=3). The mean value of total throughput after filtration was plotted. Error bars indicate standard deviation. Individual results may vary.



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