

Advanced Cell Handling: Seamless 96-Well Pipetting in a Single Step

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Executive Summary

The analysis of cellular responses using e.g. cell-based assays in microtiter plates is important in almost all fields of biological science. Consistency in liquid handling is a key factor influencing the performance of any cell-based experiment. Aseptic handling of the cells in the non-ergonomic workspace of a biosafety cabinet represents a challenge that can further influence the experimental outcome. The Eppendorf epMotion® 96 Flex, a semi-automated 96-channel pipette, is our ideal tool for convenient and contamination-free handling of cells and plates in the confined environment of a biosafety cabinet.



Introduction

Consistency in the performance of cell-based experiments is crucial to obtain reliable data and to make valuable scientific statements. Assays measuring cell parameters such as viability, apoptosis, proliferation, metabolism, etc. are a powerful tool which is widely used in basic research, drug discovery, and other application areas.

Besides optimizing general handling and environmental conditions of the cells, the choice of liquid handling tool along the different workflow steps can have an impact on the reproducibility of experimental data [1].

With the epMotion 96 Flex you can fill a 96-well plate in one single pipetting step. Thus, the sample throughput can be significantly increased, especially when using the multidispense mode. That way the overall time that the cells are outside their optimal conditions in the CO₂ incubator is reduced compared to standard hand-held pipettes.

Unlike hand-held pipettes, the performance of the epMotion 96 Flex is not influenced by distinct pipetting skills of the user or aspects like the pipetting angle or the immersion depth of the tip into the liquid. By optimizing pipetting parameters according to the type of liquid that is used, the epMotion 96 Flex can easily handle a variety of reagents and solvents in both pipetting and multidispense mode [2]. Adjusting factors like pipetting speed, using the pre-wetting function, or reverse pipetting makes handling of liquids that are viscous, tend to foam, or drip out of the pipette tip much more reliable. In addition, the standardized and reproducible procedure of automated pipetting can decrease variation in seeding cell numbers from well-to-well and plate-to-plate by applying controlled and optimized mixing of the cell solution before it is transferred into the target plate.

From the first step of seeding the cells into the plate to the last step of analysis, the choice of liquid handling tool can have a big impact on reliability and reproducibility of experimental data.

Increasing reproducibility of cell-based experiments

In the pursuit of improving reproducibility in cell culture, the choice between automatic and manual pipetting methods can play a pivotal role. The aim is to minimize user-dependent variations in pipetting technique, ensuring consistent and reliable results from well to well and between plates (Fig 1A). Using a semi-automated liquid handler like the epMotion 96 Flex provides standardized pipetting and therefore increased reproducibility of results without the major investment in a fully automated solution.

In addition to enhancing reproducibility, a focus on time-saving strategies is crucial. By implementing efficient pipetting techniques, such as utilizing the multidispense mode for seeding cells in multiple plates, the time required per plate is reduced to just a few minutes (Fig. 1B). Although seemingly modest, these time savings accumulate significantly when handling multiple plates, contributing to overall workflow efficiency. Of course, the time needed for the assay may differ with the skills and experience of the person handling the pipette.

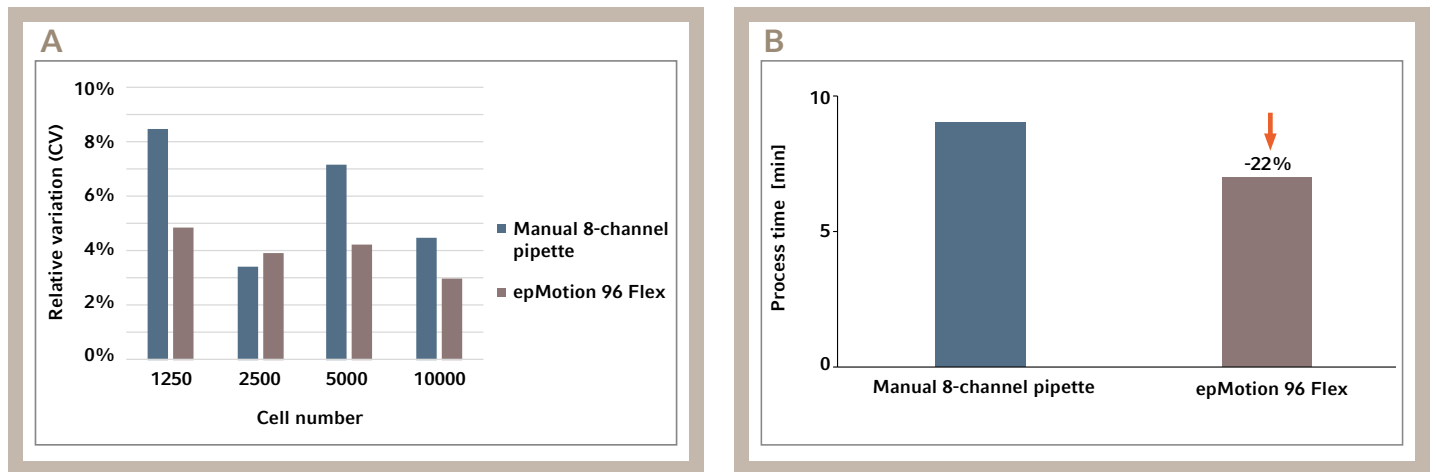


Figure 1: Comparison of manual versus semi-automated pipetting in cell-based assays. A) Well-to-well variations in cell viability measured 48 hours post seeding. epMotion 96 Flex shows less variability compared to a hand-held multichannel pipette. B) Up to 22% time saving per plate could be achieved for the whole workflow. Process time may vary depending on the user.

Taken together, using the epMotion 96 Flex for pipetting cell-based assays not only increases reproducibility and reduces the time you must work in a biosafety cabinet. Your cells will also benefit from the fact that the exposure time to ambient conditions is decreased. Getting the cells back into the ideal conditions of a CO₂ incubator as quick as possible will contribute to overall reproducibility of the experiment.

Ergonomic working in the biosafety cabinet

Working in the limited workspace of a biosafety cabinet for extended periods can be physically demanding. Researchers need to maintain proper posture and hand positioning to minimize the risk of fatigue or discomfort. The design of the epMotion 96 Flex makes it ideal for the usage in a biosafety cabinet. The footprint of the device is small enough to be placed inside the cabinet without taking up too much space that is needed for other items like pipette tips, media containers, and plates. The main interaction elements of the epMotion 96 Flex are the touch display located at the device base and the work-table hosting plates, tips, and reagent reservoirs (Fig. 2).



Figure 2: Using the epMotion 96 Flex in a biosafety cabinet. All interaction elements can be easily reached. Convenient and safe operation due to the touch screen located at the device base and automatic tip loading/ejection procedures.

Operation is convenient and ergonomic, no need of stretching your arm to reach the display or lift the worktable. The procedure of loading and ejecting the tips is fully automatic. The only element that needs to be moved manually is the worktable. So overall the user's arm movement inside the cabinet is reduced to a minimum.

Keeping it clean – Disinfection made easy

Contamination is an everyday challenge and a major cause of frustration when culturing cells. Germs are often spread unintentionally by the personnel through cross-contamination of infected cultures, lab surfaces, or equipment. This can be prevented by applying good aseptic techniques and regular

cleaning and maintenance of equipment like water baths, CO₂ incubators, and pipettes [3]. If necessary, the epMotion 96 Flex can be wiped with a cloth soaked in 70% ethanol for disinfection (Fig. 3A). In case of any spillages on the device it is recommended to remove them immediately and not let the liquid dry on the surface. The touchscreen is spill-protected and can even be locked for cleaning.

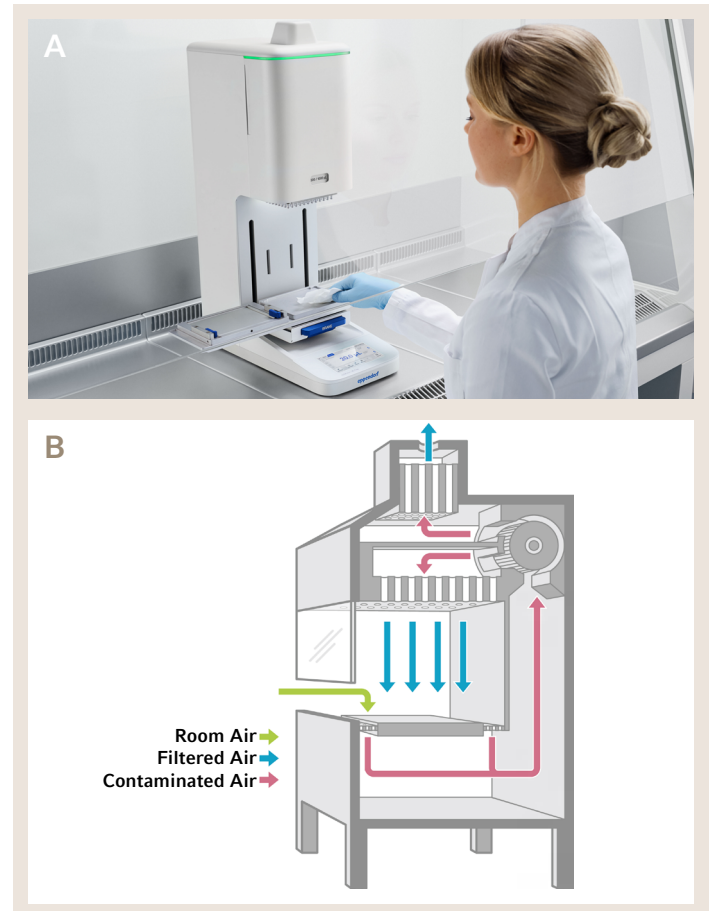


Figure 3: Preventing contamination with epMotion 96 Flex. A) Easy cleaning and decontamination of all interaction elements including the spill-protected touchscreen. B) Biosafety cabinet class II providing guided laminar air flow and HEPA filtration.

When biosafety cabinets are used correctly, they provide a safe work environment by filtering ambient air and preventing air-borne contaminants from passing the laminar air-flow (Fig. 3B). An additional measure that is employed in many labs is UV decontamination of the worksurface in the cabinet. The germicidal performance of UV light in biosafety cabinets is controversial though [4]. Its efficiency is limited and may therefore offer a false sense of security in many cases. Nonetheless, if UV decontamination is part of the daily routine in your cell culture lab, the epMotion 96 Flex will not be negatively affected by exposure to UV light.

Conclusion

In conclusion, the incorporation of the epMotion 96 Flex in your routines offers a practical solution to minimize the risk of contaminating valuable cell cultures, allowing for increased experimental reliability. Using the epMotion 96 Flex for your plate handling in cell culture applications is a pragmatic approach to drastically reduce tedious pipetting steps. Consequently, the epMotion 96 Flex can optimize your research outcomes, emphasizing reliability and efficiency in cell culture workflows.

References

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Ordering information	
Description	Cat. No.
epMotion® 96 Flex base device, without dispensing head, with 2-position slider, including TipHolder for epMotion 96 Flex for use of epTIPS Motion Reloads, 100 - 240 V, 50 - 60 Hz.	30090330
Dispensing Head 96-channel 0.5 - 300 µL, for epMotion 96 Flex in hard shell case.	30040081
Dispensing Head 96-channel 5 - 1000 µL, for epMotion 96 Flex in hard shell case.	30040079
TipHolder for epMotion 96 Flex	30040083

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Since 1945, the Eppendorf brand has been synonymous with customer-oriented processes and innovative products, such as laboratory devices and consumables for liquid handling, cell handling and sample handling. Today, Eppendorf and its approximately 5,000 employees serve as experts and advisors, using their unique knowledge and experience to support laboratories and research institutions around the world. The foundation of the company's expertise is its focus on its customers. Eppendorf's exchange of ideas with its customers results in comprehensive solutions that in turn become industry standards. Eppendorf will continue on this path in the future, true to the standard set by the company's founders: that of sustainably improving people's living conditions.

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