WHITE PAPER No. 84 I Liquid Handling in Healthcare Applications 02

Requirements and Solutions for Molecular Biological Analyses

Ulrike Gast, Nadine Mellies (corresponding author)
Eppendorf SE, Hamburg, Germany

Separate Pre- and Post-PCR Areas, for Unidirectional Use of PCR Tubes and Plates
Avoiding contamination is one of the greatest challenges faced by molecular biology laboratories. False-positive and false-negative results can create tremendous problems. For this reason, laboratories are well advised to set up pre- and post-PCR areas whenever possible and provide each area with its own pipettes and tips. Only the tube or plate containing the completed reaction mixture should leave the pre-PCR area. Doing this ensures samples are not contaminated by aerosols that already contain amplified nucleic acids. Using double-layered filter tips in the separate work areas further reduces the risk of contamination.

Overall Requirements for Liquid Handling Systems

Molecular biological analyses are an important detection method in healthcare applications, but also one with many potential pitfalls. The main focus is on dosing accuracy and the prevention of contamination. Dosing accuracy can be maintained if the performance of the dosing system and the control over liquid movement are balanced. The dispensing accuracy of the liquid handling system can only be ensured by regular calibration. Tip and liquid handling tool form a system, so tips can significantly impact dispensing results [1]. Pipettes are always adjusted to a specific tip, so that alternative pipette tips should be checked before use.

To avoid contamination, the generation and spread of aerosols should be minimized as far as possible. Slow pipetting using air-cushion pipettes not only increases dispensing accuracy, but also minimizes the generation of aerosols. Good dualfilter tips can prevent the transfer of aerosols into the pipette cone. In contrast, due to their construction principle, positive displacement systems do not allow aerosols to form at all- the sample is hermetically sealed within the tip. A broad chemical resistance of liquid handling tools also facilitates decontamination of the devices to remove contamination with nucleic acids, etc.

Eppendorf product solutions

Requirement	Key aspect	Recommended Eppendorf product		Healthcare diagnostic work
		Liquid handling system: Air-cushion	**Liquid handling system: Positive-displacement**	**Molecular Biological Analyses**
Dosing accuracy	**Maintenance and calibration:** Close-meshed inspection ensures high dosing accuracy.	> epServices for all pipettes	> epServices for all Multipette® multi-dispensers	
	Manual control of liquid movement: Smooth and balanced stroke of the operating button allows precise dispensing control.	> Eppendorf Reference® 2 family > Eppendorf Research® plus family	> Multipette® M4	
	Electronic control of liquid movement: Electronically controlled liquid aspirations and dispensings at predefined speeds allow maximum control.	> Eppendorf Xplorer® family	> Multipette® E3(x)	
	Challenging liquids: Increased accuracy for safe transfer of challenging liquids (foaming, viscous, aggressive)	> Eppendorf Xplorer® family with liquid adjustment > Eppendorf Xplorer® family with liquid types managed via Pipette Manager	> Multipette® M4 > Multipette® E3(x)	
	LH device and tips are a system: Using original pipette or dispenser tips enhances the reproducibility of pipetting results with maximum precision and accuracy.	> epT.I.P.S.® pipette tips	> Combitips® advanced dispenser tips	
	Dispenser tips: Integrated piston wipes the liquid from the inner surface of the tips during dispensing.	*not applicable due to construction principle (air-cushion)*	> Multipette® M4 > Multipette® E3(x)	
Contamination prevention	**Aerosol accumulation in the pipette cone:** Single-button operation of pipettes reduces aerosol-carrying air flow into the pipette cone.	> Eppendorf Reference® 2 family	*not necessary: sample is hermetically sealed within Combitips® advanced due to construction principle (positive displacement)*	
	Dispenser tips: Sample is hermetically sealed within the dispenser tip without aerosol formation.	*not applicable due to construction principle (air-cushion)*	Combitips® advanced for > Multipette® M4 > Multipette® E3(x)	
	Long-distance pipette tips: Select tip shape according to the vessel (e.g. Vacutainer®) to ensure easy access to your sample when working with deep, slim vessels.	> epT.I.P.S.® 5 mL L > epT.I.P.S.® 1,250 µL L	*not available*	
	Tips wrapping: Using individually sterile-packed tips helps to avoid contaminating the rest of a tip box.	> epT.I.P.S.® Singles	> individually blister-wrapped Combitips® advanced	
	Pipette filter tips: Filters of EPA class 12 according to ISO 1822 (equivalent to ISO 25 E according to DIN EN ISO 29463-5) prevent the entry of aerosols and biomolecules into the pipette cone.	> ep Dualfilter T.I.P.S.® > ep Dualfilter T.I.P.S.® SealMax®	*not necessary: sample is hermetically sealed within Combitips® advanced due to construction principle (positive displacement)*	
	Manual control of liquid movement: Smooth and balanced stroke of the operating button allows precise dispensing control.	> Eppendorf Reference® 2 family > Eppendorf Research® plus family	> Multipette® M4	
	Electronic control of liquid movement: Electronically controlled liquid aspirations and dispensings at predefined speeds allow maximum control.	> Eppendorf Xplorer® family	> Multipette® E3(x)	
	Purity of pipette and dispenser tips: Purchasing tips in required and externally certified purity from manufacturers ensures sample safety.	> epT.I.P.S.® in: PCR clean, PCR clean and sterile > ep Dualfilter® T.I.P.S. in: PCR clean and sterile > ep Dualfilter® T.I.P.S. SealMax® in: PCR clean and sterile	Combitips® advanced in: > PCR clean > Biopur	
Decontamination	**Pipette/Dispenser autoclavable**	> Eppendorf Reference® 2 family > Eppendorf Research® plus family > All lower parts of Eppendorf Xplorer® family	*not applicable*	
	Pipette/Dispenser tips autoclavable	> epT.I.P.S.® pipette tips	*not applicable*	
	Tips box/rack autoclavable	> epT.I.P.S.® Box (2.0)	> Combitips® advanced Rack (without consumables)	
	Using decontamination agents: Broad chemical resistance to common decontamination agents facilitates decontamination of devices.	> Eppendorf Reference® 2 family > Eppendorf Research® plus family > All lower parts of Eppendorf Xplorer® family	Decontamination with alcohol recommended > Multipette® M4 > Multipette® E3(x)	
	Advanced surface robustness: PTFE in surfaces strengthens cleaning and decontamination properties.	> Eppendorf Reference® 2 family > Eppendorf Research® plus family	*Surface does not contain PTFE.*	
	Smooth surface: Surface without interrupted surfaces or recesses enable easy and effective wipe disinfection.	> Eppendorf Reference® 2 family	*not applicable*	
Chemical resistance	**Robust chemical resistance**	> Eppendorf Reference® 2 family (1), [6] > Eppendorf Research® plus family (1), [7] > All lower parts of Eppendorf Xplorer® family	> Multipette® M4 [8]	
	Option: Advanced chemical resistance	Special lower part available with resistance to highly aggressive chemicals (e.g. TFA) > Eppendorf Reference® 2 variants (2) > Eppendorf Research® plus variants (2)	*not applicable*	
Leachables	**Certified absence of additives:** Plasticizer, biocides, slip agents cannot interfere with biological analyses.	> epT.I.P.S.® > ep Dualfilter T.I.P.S.® > ep Dualfilter T.I.P.S.® SealMax®	> Combitips® advanced	

> Light labelling: applicable, dark labelling: recommended
> Family includes all pipette variants (fixed and variable volumes, single- and multi-channel, Move It®)

(1) Variants > 20 µL without metal pistons, except 16- and 24-channel pipettes
(2) Available for Reference 2 and Research plus single-channel pipettes: 1,000 µL (color code: blue); 5 mL (color code: violet); 10 mL (color code: turquoise); available for Reference 2 single-channel pipettes only: 2.5 mL; 2 mL, fixed (color code for both: red).

References

[1] Art M, Dufey V, Gast U, Gligor I, Koch L, Kubasch R. The Tip of the Iceberg: How Pipette Tips Influence Results. Eppendorf Application Note 354. www.eppendorf.com

For more information, technical specifications and article numbers for Eppendorf pipettes, dispensers and pipette tips, visit **www.eppendorf.com/pipettes**.

Interested in learning more about requirements for liquid handling systems and suitable solutions in healthcare applications? Then take a look at White Paper No. 82 "What Really Matters: Manual Liquid Handling Tools for Healthcare Applications".

About Eppendorf

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 more than 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.

Your local distributor: www.eppendorf.com/contact
Eppendorf SE · Barkhausenweg 1 · 22339 Hamburg · Germany
eppendorf@eppendorf.com · www.eppendorf.com

www.eppendorf.com

No. AA01 026 920/EN2/0323/PDF/WEB/ME