

Requirements and Eppendorf Solutions for MALDI-TOF Analyses

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

Leachables: The Invisible Threat to MALDI-TOF Analyses

Made of polypropylene, pipette tips feature good chemical-resistance properties – a crucial characteristic as the tips come into direct contact with the reagents and samples used for MALDI-TOF analyses. But no material, no matter how good its chemical-resistance qualities, can withstand all chemicals: Certain chemicals, especially organic solvents, cause substances to dissolve from plastic. This creates invisible leachables such as biocides, plasticizers and slip agents that can significantly affect your analyses without you even being aware of it [1]. What does this mean for MALDI-TOF? In MALDI-TOF analyses, leachables can produce abnormal peaks and/or peaks that overlay the actual signal. You may think

the interaction time between sample and plastic is too short for leachables to cross over, but the evidence suggests a cumulative effect occurs with pipette tips [1]. Analysis protocols that require mixing the sample using frequent up and down pipetting result in longer contact time compared with single dosing. For this reason, be sure the manufacturer of the tips and other consumables you purchase can demonstrate and certify the following: Dispensable additives such as plasticizers, biocides and slip agents were not used and other additives, including trace metals, were only used at a minimum. By taking this important step, you will limit the invisible threat posed by leachables to your MALDI-TOF analyses.

Overall requirements for Liquid Handling systems

Diagnostic MALDI-TOF analyses place particularly difficult demands on liquid handling systems. Here, safeguarding the analysis has less to do with achieving high dosing accuracy or preventing contamination. Rather, it is the chemical resistance of the materials used in the tips and other consumables and the absence of leachables that are key. Liquid handling tools should be resistant to a broad range of chemicals. Unfortunately, no material exists that is resistant to all chemicals. This makes the chemical-resistance specifications provided by manufacturers of tips and other consumables crucially important for choosing the right liquid handling system. It is also the reason that Eppendorf, whenever possible, uses materials for its liquid handling tools that are both autoclavable and resistant to a significant number of the aggressive chemicals commonly used in laboratories for analyses such as MALDI-TOF.

For some air-cushion pipettes, for instance, laboratories can obtain a different chemical resistance (e.g., 100 % TFA resistant) by obtaining replacements for the standard lower pipette parts that are made of different material. Laboratories should pay special attention to their liquid handling tools with built-in electronics, displays or other technology: These parts are especially sensitive to aggressive chemicals and their vapors, so using these tools should be carefully considered. Leachables, on the other hand, present a different type of issue, one related to the reproducibility of results: The additives frequently used in producing pipette tips and other consumables create leachables that have a significant impact on analytical results. Manufacturers should therefore avoid using them as much as possible, and disposable consumables should not contain plasticizers, biocides or slip agents.

Eppendorf product solutions

Requirement	Key aspect	Recommended Eppendorf product		Healthcare diagnostic work
		Liquid handling system: Air-cushion	Liquid handling system: Positive-displacement	MALDI-TOF Analyses
Dosing accuracy	Maintenance and calibration: Close-meshed inspection ensures high dosing accuracy.	> epServices for all pipettes	> epServices for all Repeater® 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	> Repeater® M4	
	Electronic control of liquid movement: Electronically controlled liquid aspirations and dispensings at predefined speeds allow maximum control.	> Eppendorf Xplorer® family	> Repeater® 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	> Repeater® M4 > Repeater® 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.	<i>not applicable due to construction principle (air-cushion)</i>	> Repeater® M4 > Repeater® 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	<i>not necessary: sample is hermetically sealed within Combitips® advanced due to construction principle (positive displacement)</i>	
	Dispenser tips: Sample is hermetically sealed within the dispenser tip without aerosol formation.	<i>not applicable due to construction principle (air-cushion)</i>	Combitips® advanced for > Repeater® M4 > Repeater® 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	<i>not available</i>	
	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®	<i>not necessary: sample is hermetically sealed within Combitips® advanced due to construction principle (positive displacement)</i>	
	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	> Repeater® M4	
	Electronic control of liquid movement: Electronically controlled liquid aspirations and dispensings at predefined speeds allow maximum control.	> Eppendorf Xplorer® family	> Repeater® 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 > sterile	
Decontamination	Pipette/Dispenser autoclavable	> Eppendorf Reference® 2 family > Eppendorf Research® plus family > All lower parts of Eppendorf Xplorer® family	<i>not applicable</i>	
	Pipette/Dispenser tips autoclavable	> epT.I.P.S.®	<i>not applicable</i>	
	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 > Repeater® M4 > Repeater® E3(x)	
	Advanced surface robustness: PTFE in surfaces strengthens cleaning and decontamination properties.	> Eppendorf Reference® 2 family > Eppendorf Research® plus family	<i>Surface does not contain PTFE.</i>	
	Smooth surface: Surface without interrupted surfaces or recesses enable easy and effective wipe disinfection.	> Eppendorf Reference® 2 family	<i>not applicable</i>	
Chemical resistance	Robust chemical resistance	> Eppendorf Reference® 2 family (1), [6] > Eppendorf Research® plus family (1), [7] > All lower parts of Eppendorf Xplorer® family	> Repeater® 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)	<i>not applicable</i>	
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] Grzeskowiak R, Gerke N. Leachables: Minimizing the Influence of Plastic Consumables on the Laboratory Workflows. Eppendorf White Paper 26. 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.

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Eppendorf SE · Barkhausenweg 1 · 22339 Hamburg · Germany
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