User guide

Cleaning and inspection of pipettes

Modern quality management in the laboratory calls for **regular cleaning and inspection of dispensing systems.** How often a pipette needs to be cleaned and inspected depends on how it is used, for example: frequency of use, the number of people who use the pipette, the type of aggressiveness of the liquids being dispensed and, last but not least, the acceptable maximum permissible error specified by the user.

Sources of contamination and its prevention

There are three sources of contamination

- from pipette to the sample
- from sample to the pipette
- from sample to sample (also known as "carry over")

Pipette to sample contamination results from using a contaminated pipette or non-certified pipette tips. The contamination of samples can be prevented by using sterile pipette tips and by cleaning or autoclaving the pipette.

Sample to pipette contamination occurs if the sample or its aerosols enter the pipette. To avoid this, hold the pipette vertically when aspirating the liquid. Furthermore, it is recommended to immediately eject the pipette tip after use to prevent vapors from entering the pipette, and to store the pipette suspended in a pipette stand. In addition, the control button should generally be moved slowly upwards during aspiration. Filter tips offer the most effective way to prevent contamination. They prevent aerosols from entering the pipette and, thus, contamination of the pipette. Using positive displacement pipettes with tips featuring a piston with integrated sealing lip is also a way to prevent contamination of the pipette (Fig. 1).

Sample to sample contamination occurs if a part of sample A adheres in droplet form to the inside of the pipette tip during sample dispensing. This part of sample A is then mixed with sample B resulting in false test results (Fig. 2). To avoid this source of contamination the pipette tip should be replaced after each dispensing of a sample.

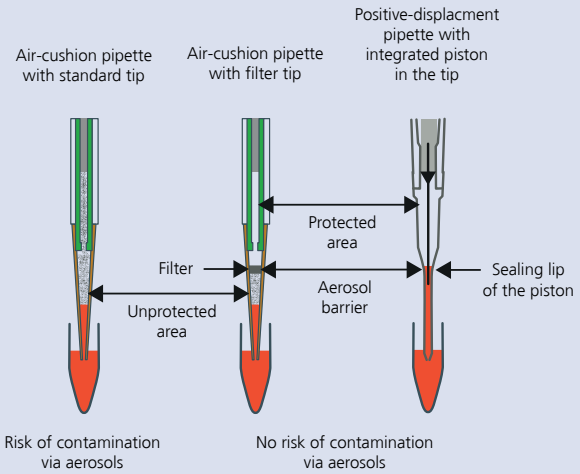


Fig. 1: Preventing contamination with piston-stroke pipettes

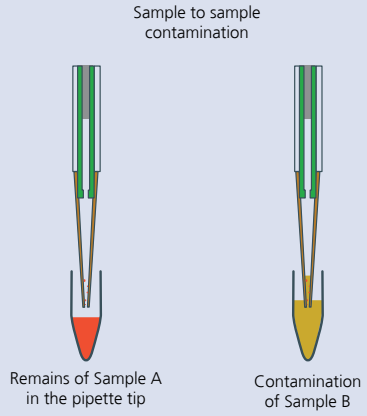


Fig. 2: Sample to sample contamination ("carry over")

Decontamination and cleaning

External contamination can be removed using soap solution or isopropanol. Afterwards, the components should be rinsed with distilled water and dried. Do not allow any liquid that has been aspirated to become dry; the piston must be cleaned and afterwards treated with a touch of silicone grease (table 1).

Decontamination and Cleaning		
Substance classification	**Handling, special features**	**Decontamination and cleaning**
Aqueous solutions and buffers	The pipette is calibrated with distilled water and, thus, provides very high levels of accuracy.	Open the pipette, rinse contaminated parts with distilled water, allow to dry at max. 60 °C in a drying cabinet, then lightly grease the piston[1].
Inorganic acids	In case of frequent pipetting of concentrated acids. it is advised to occasionally rinse the lower part of the pipette with distilled water.	The plastics used in STARLAB pipettes are resistant to acids. The same applies to the ceramic pistons (except hydrofluoric acid). However, aerosols from the acids may enter the lower part and negatively affect the performance of the pipette. Clean as described in "Aqueous solutions".
Bases	In cases of frequent pipetting of concentrated bases, it is advised to occasionally rinse the lower part of the pipette with distilled water. The use of filter tips is also recommended.	The plastics used in STARLAB pipettes as well as the ceramic pistons are resistant to bases. However, aerosols from the bases may enter the lower part and negatively affect the performance of the pipette. Clean as described in "Aqueous solutions".
Potentially infectious liquids	The use of filter tips is recommended to avoid contamination. Alternatively, use a positive displacement system.	Autoclave (121 °C, 20 mins) the contaminated parts. ErgoOne® pipettes are fully autoclavable; to increase effectiveness, we recommend removing the tip ejector. Also loosen the tip holder by rotating it once (single-channel only); if required, additionally immerse the lower part in standard laboratory cleaning agents; then thoroughly rinse with distilled water and dry at max. 60 °C in a drying cabinet, then lightly grease the piston[1].
Sterile solutions (eg. in a cell culture)	Sterile filter tips are recommended so sterility is not compromised.	Proceed as described above in "Potentially infectious liquids".
Organic solvents	1. The density is different to that of water. Therefore, the pipette must be adjusted. 2. Rapid pipetting is recommended (due to the high vapor pressure and changed wetting behavior). 3. After completion of the pipetting process, open the pipette and allow the solvents to evaporate.	Allowing solvents to evaporate is normally sufficient for liquids with high vapor pressure. If not, open the pipette and immerse the contaminated parts in detergents. Afterwards, rinse thoroughly with distilled water and allow to dry at max. 60 °C in a drying cabinet, then lightly grease the piston[1].
Radioactive liquids	Filter tips should be used to avoid contamination. Alternatively, use a positive displacement system.	Open the pipette and immerse parts in complex-forming liquids or special cleaning solutions. Afterwards, rinse thoroughly with distilled water and allow to dry at max. 60 °C in a drying cabinet, then lightly grease the piston[1].
Proteins / Nucleic acids	The use of filter tips is recommended to avoid contamination. Alternatively, use a positive displacement system.	Proteins: Open the pipette, wash off proteins with detergents, then rinse and allow to dry at max. 60 °C in a drying cabinet, then lightly grease the piston[1]. Nucleic acids: Decontamination by boiling in glycine/HCl buffer (pH2) over 10 mins (this ensures that no more DNA can be detected on agarose gel). Afterwards, rinse thoroughly with distilled water and allow to dry as described; lightly grease the piston[1]. Clean with sodium hypochlorite (5 %). Afterwards, rinse thoroughly with distilled water

[1] If required: for ErgoOne® pipettes, regreasing of the piston is not required after autoclaving.

Table. 1: Decontamination and cleaning of air-cushion pipettes

In cases of frequent use of highly volatile organic reagents, the sealing that is normally maintenance-free, may swell up and cause the pipette to become stiff. If this is the case, remove the lower part of the pipette and let out the sealed air overnight.

In cases of the frequent pipetting of saturated solutions, aerosols precipitating inside the pipette may lead to the formation of crystals that destroy the seal. To avoid this, regular cleaning and regreasing of the piston as well as regular inspection of the piston seal is recommended.

Autoclaving

Piston-stroke pipettes used today can either be fully autoclaved or just the parts that got contaminated due to improper use. This helps to dissipate any doubts the user may have regarding sterility, thus opening new fields of application for these devices. Air-cushion pipettes as well as pipette tips are normally autoclaved at 121 °C with a positive pressure of 1 bar (100 kPa) over a period of 20 mins.

Filter tips should not be autoclaved. Rather, it is recommended to use sterile products, if needed.

Before autoclaving a fully autoclavable pipette, open the pipette in the middle by 1 – 2 turns after removing the tip ejector sleeve to allow the vapor to enter more easily. After autoclaving, the pipettes or autoclaved parts must be allowed to completely dry and cool down at ambient temperature. Because warmed plastic parts may stretch or get damaged, pipettes must only be screwed back together once they have cooled down completely. With STARLAB pipettes, regreasing of the piston is not required after autoclaving.

UV Decontamination

The UV resistance of the plastics used in a pipette is of key importance for many areas of application. UV-resistant pipettes can be left in laminar flow rooms or laminar flow cabinets without any risk as the UV light required for disinfection of the workplace has no adverse effect on the pipette material and, thus, on the performance of the pipette. The following should be taken into account when decontaminating with UV light: Use a 30 Watt low-pressure mercury-vapor lamp with a characteristic wavelength of 254 nm. The optimum distance between the lamp and the pipette is 60 cm.

Regular inspection of the pipette's condition

Precise and correct dispensing of samples and reagents is of key importance for both research and diagnostics applications. To ensure reliable results, the dispensing devices used for these purposes should be checked for correct functioning at regular intervals. Corresponding guidelines should stipulate regular inspections of pipettes and dispensers as well as tools used for inspection.

Leak test

To perform a leak test, the nominal volume of a pipette is aspirated into the pipette tip (distilled degassed water) and the pipette is held vertically. The pipette, the pipette tip and the test liquid should have the same temperature. If a distinct drop has not formed at the tip after 30 seconds, the pipette is tight. (For volumes up to 20 µl the tip should always be pre-wetted.)

Function test

Pipettes should be visually checked for leaks, broken parts, air bubbles and contamination on a daily basis.

Volumetric Test

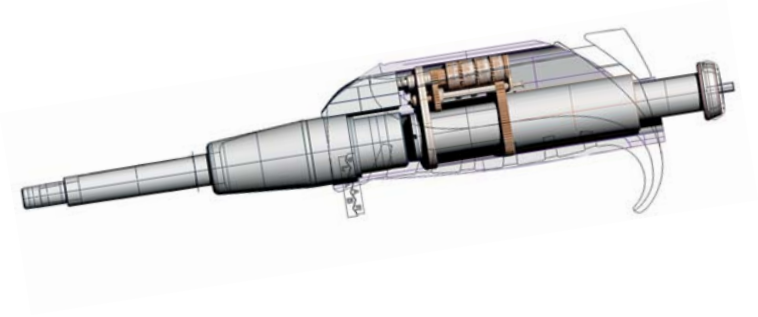
Single or duplicate determinations of the volumes specified for the respective pipette type should be carried out after relevant changes to the device (eg. new batch of pipette tips, exchange of volume-determining parts).

Quick Check

Four measurements of each of the volumes specified for the respective pipette type should be carried out on a monthly basis to roughly determine random and systematic errors.

Calibrations

Ten measurements of each of the volumes specified for the respective pipette type should be carried out by an accredited pipette service (eg. STARLAB) on a quarterly basis to determine random and systematic errors.



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