What is a Micropipette?

Micropipettes are crucial laboratory instruments used to measure and transfer small volumes of liquid. This makes them suitable for various applications, such as molecular biology, biochemistry, and cell culture. By the end of this video, you should be able to identify the parts of the micropipette, recall the two basic pipetting techniques, and explain the difference between precision and accuracy.

Micropipettes come in different volume ranges, typically spanning set intervals between zero point five microliters to one thousand microliters. You should select the smallest micropipette capable of transferring your desired volume.

For example, to transfer twenty microliters, select a two to twenty microliter micropipette instead of a twenty to two hundred microliter micropipette for more accurate results.

Micropipettes also come in different types, including single-channel, multichannel, manual, and electronic. Single-channel micropipettes handle one liquid at a time, while multichannel micropipettes transfer several volumes of liquid simultaneously. Electronic micropipettes are controlled by a motor, which allows for less variation between operators, better ergonomics, and faster pipetting.

It's not an exaggeration to say that micropipettes are the backbone of laboratory diagnostic testing. The micropipette is a precision instrument, and slight differences in how the operator uses the instrument can lead to variability in your results. By teaching the best practices, we can reduce that variability and increase the integrity of our laboratory results.

Accuracy refers to how closely the transferred volume matches the set volume on the micropipette. Precision refers to the consistency of the volume dispensed across replicates.

Now, let us learn the parts of the manual micropipette.

Plunger- Be sure to feel the difference in the pressure required to meet the first and second stop of the plunger. The first stop is best described as a slight resistance in the depression of the plunger. The hard stop, or “blowout,” dispenses the last drop, which is essential when working with small volumes.

The remaining parts of the micropipette include: Micropipette body. Volume display. Ejector. Volume lock. Shaft. Piston, internal.

The manual micropipette uses a piston and spring to create volumetric air displacement when the plunger is depressed. This means that the micropipette expels the exact air volume the user has set to display. This displacement creates a vacuum, and liquid is aspirated into the micropipette tip. Several factors affect the accuracy of the volume transferred, including the angle at which the micropipette is held, the consistency in pipetting rhythm, and the consistent pressure and immersion depth of the tip. More on these best practices can be found in the video on the forward pipetting technique.

There are two basic techniques for pipetting: forward and reverse pipetting. The two techniques differ in how the plunger is operated.

To forward the pipette, immerse the tip with the micropipette's plunger depressed to the first stop, aspirate the target volume, and dispense. After dispensing, a separate blowout step is used to empty the tip by pressing the plunger to the second stop. This technique is beneficial for most applications.

On the other hand, reverse pipetting is when you immerse the micropipette tip into the liquid with the plunger depressed to the second stop. This allows for an excess volume to enter the micropipette tip. Unlike forward pipetting, the laboratorian does not perform the blowout step. The excess liquid is discarded with the tip. The error is captured in the excess volume rather than shorting the volume transferred. This is useful for pipetting liquids that foam, are viscous, or are volatile.

Lastly, it is important to consider ergonomics while pipetting to reduce repeated strain injuries. Pipetting is one of the most common actions performed in the laboratory, so good posture and wrist position are imperative.