



# PIPETTING GUIDELINES THROUGH HISTORY

Pipetting was once a dangerous skill that proved hazardous to lab workers.

By Valerie Neff Newitt

**Y**ou'd likely think more than twice before sucking up a strain of Ebola through a straw. Who would pipette by mouth? Sadly, more people than you expect. Mouth pipetting, that dirty little detail of U.S. laboratories' past, is still practiced in some countries around the globe—regions where highly infectious diseases roost.

"Mouth pipetting is dangerous because materials that are being drawn up into the pipette by the user can get into the mouth. Users could be orally exposed to hazardous chemical agents, infectious organisms or radioactive materials, thereby causing poisoning and serious illness," confirmed Amy Helgerson, MS, RBP, biosafety specialist at Iowa State University.

## Looking Back

Yet consider the history of pipetting in the U.S.; it was once the norm to use one's own mouth closed around a pipette to draw up, measure and transfer liquids, regardless of what type of primordial ooze was at the other end of the instrument. Lab workers routinely placed a glass straw between their lips to suck up blood, cultures, urine and worse.

According to information from Tomos Life Science Group, pinpointing the exact beginnings of pipetting is tough, but its origins most

certainly date back more than 150 years.<sup>1</sup> "The use of fluids in scientific research and applications has always been necessary and many tools have been used in this environment, from the ubiquitous graduated test tubes to nanodrop robots. From what we can ascertain however the humble pipette's life starts in the 1800s," detailed the Tomos site.<sup>1</sup> "Official records from the U.S. patent office reach back as far as 1790, with over 20,000 records including the word 'pipette' up until recent times ... The earliest patent record we could find that is relevant, is from 1925, filed in 1924 for a pipette which dilutes blood for sugar testing. There are no mechanical elements attached to this device, so health and safety were of no concern then, just attach the sharp end to the patient and suck."<sup>1</sup>

According to a report from *Dark Daily*, the first recorded case of accidental infection from mouth pipetting dates to 1893, "when a physician accidentally sucked a culture of typhoid bacilli into his mouth."<sup>2</sup> The report went on to note that documentation provides an array of "ridiculous accidents" attributable to mouth pipetting. "A survey of 57 labs in 1915 found 47 infections associated with workplace practices, of which 40% were attributed to swallowing a corrosive or toxic substance or infectious lab specimen. A longitudinal study of 921 workplace laboratory infections between 1893 and 1950 found 17% were due to 'oral aspiration through pipettes or to splashes of culture fluids into the mouth.'"<sup>2</sup>

## More Recent Mishap

In fact, prior to the 1970s, mouth pipetting was the leading cause of laboratory-derived infections. And yet, even much later, mouth pipettes were in use and causing accidental harm. A 1998 paper, "The Microbiology Unknown Misadventure," published by the *American Journal of Infectious Control*, told of a 19-year-old nursing student who was hospitalized after several days of nausea, vomiting, diarrhea and fevers following mouth pipetting.<sup>3</sup>

The paper explained, "Salmonella paratyphi A was isolated from multiple blood cultures. Because this is an unlikely isolate in the United States, an investigation ensued. Two and a half weeks earlier, the student had been working on a microbiology laboratory" ➤

exercise ‘unknown.’ Both the ‘unknown’ organism and the patient’s blood culture isolates were identified as *S. paratyphi A*, with the same biochemical reactions and antimicrobial susceptibility results. The patient’s condition improved with antibiotic therapy, and she was discharged after nine days in the hospital. Conclusions related to our investigation are as follows: (1) relatively virulent organisms were unnecessary to fulfill the laboratory objectives, (2) pipetting by mouth must never be allowed, (3) proper labeling of specimens is imperative, (4) instructors should have knowledge of laboratory safety regulations, and (5) it is the obligation of laboratory directors and administrators to provide a safe academic environment.”<sup>3</sup>

While U.S. labs have moved past these dark ages of mouth pipetting, that progression is not necessarily true in labs round the world. A 2012 study found that 28.3% of lab technicians in Pakistan employed mouth pipetting.<sup>4</sup> And according to an insightful blog published by *Discover* magazine, “another study in 2008 found that Nigerian technicians working in clinical laboratories were not only improperly vaccinated against many of the preventable diseases that they were testing for (!) as well as eating and drinking in the lab, but one in 10 also reported mouth pipetting.”<sup>5,6</sup>

### Safety First

Safety remains at the forefront of concern in American labs. Every contribution to maintaining the integrity of tests and the safety of laboratory professionals allows for more reliable and vigorous testing and greater diagnostic prowess.

Toward that end, Iowa State University has provided a tip sheet to prevent aerosols and splashing while pipetting:<sup>7</sup>

- *Mouth pipetting is prohibited.* Mechanical pipetting aids should be used instead. “Mouth pipetting is dangerous because it can lead to accidental poisoning with chemicals or radioactive materials or illness from infectious organisms,” reminded Helgersen. “Mechanical pipetting aids remove the risk of oral exposure to the person pipetting and also removes the risk of contaminating the product that is being pipetted.”

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- *All biohazardous materials should be pipetted in a biosafety cabinet if possible.* Cotton-plugged pipettes should be used. “Pipettes have the potential to produce aerosols during usage. Aerosols are concerning because they are undetectable and may contain enough infectious organisms to make people sick,” Helgersen explained. “When working with biohazardous materials any procedure that produces aerosols should be done inside a biosafety cabinet. The cotton plugs protect the mechanical pipetting aids from being contaminated with the pipetted liquid.”
- *Biohazardous materials must never be forcibly discharged from pipettes.* “To-deliver” pipettes should be used instead of pipettes requiring blowout. Helgersen explained further, “The blowout pipettes must be blown out so that the last drop of liquid is expelled to get an accurate volume. The to-deliver pipette is designed so that a tiny bit of liquid is left in the tip and not delivered. The blowout pipette produces more aerosols because of the forceful expulsion of liquid.”
- *To avoid splashing, biohazardous material should be dispensed from a pipette by allowing it to run down the receiving container wall.* “The pipette tip should be placed against the inner wall of the container that the liquid is being dispensed into,” Helgersen added. “Then the button on the mechanical pipette aid should be depressed to deliver the liquid against the wall.”
- *After using reusable pipettes, they should be placed horizontally in a pan filled with enough liquid disinfectant to completely cover them and the entire pan autoclaved before cleaning the pipette for reuse.* “All disinfectants have a contact time or time it takes for the disinfectant to work to inactivate microorganisms. Pipettes should sit in the disinfectant for the appropriate contact time,” said Helgersen.
- *When working in a biosafety cabinet, all*

*waste and/or disinfecting containers must be kept inside the cabinet while they are being used.* “After work in the biosafety cabinet is completed and all materials are put away, the waste and disinfecting containers can be removed from the cabinet,” Helgersen noted. “The waste is decontaminated and then disposed. The materials in the disinfecting containers sit for the appropriate contact time and then are removed from the cabinet for disposal.”<sup>7</sup> ■

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