How Contaminated are Pipetman?

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Previous research has shown that KeyPro™ (Phoseon Technology) rapidly and reliably decontaminates laboratory pipetman (1, 2). The unanswered question is, *how necessary* is this decontamination? As such, we set out to quantify the level of contamination residing on pipetman and the effectiveness of two of the most common preventative measures.

Experience tells us that clean pipettes are paramount to reliable results. Maintaining sample purity and preventing cross-contamination is expected in any molecular biology lab. Unfortunately, experience also tells us that contaminants such as viruses, nucleic acids, bacteria and more can come from the most unlikely of places. In order to determine how unlikely those places are and what the true contamination burden is we completed a three-group test.

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The first group examined a pipette which was left on an open benchtop and used for every-day laboratory activities without being cleaned. Sampling six locations on this benchtop pipette (three on the blue handle and three on the white shaft) we found that four showed contamination, with RFUs of these samples ranging from 65 to 825 (see Figure 1). Thus quantifying what has been institutionally known in almost any microbiology lab: your pipetman are not clean. Another notable result was the identity of the most contaminated sample, the blue handle sample C (see Figure 1C). Taken from the ejector button of the blue handle, this sample was highly contaminated in comparison to the rest of the group. Suggesting that not only are benchtop pipetman contaminated, but also where that contamination is likely to be concentrated. Armed with the knowledge of how contaminated pipetman can become we next set out to determine the effectiveness of two common treatment methods, chemical cleaning and protection in an RNase-free hood.

To test the effectiveness of an RNase decontamination solution we spotted a clean pipette with 1uL samples of 0.02u/mL RNaseA, allowed the samples to dry, then cleaned with the spray. Immediate re-suspension after cleaning revealed that while the solution did indeed eliminate RNase contamination as expected (see Figure 1) it was also subject to human error. The one sample showing contamination, sample 3A of the white shaft (see Figure 1B), implicates errors in wiping technique when using the spray. Showing that chemical decontamination is effective but fallible. Our last treatment group adds to this finding and hints that even without human error it is still possible for equipment to become contaminated.

For the last treatment group we tested a pipette that had been previously well-cleaned into the RNase-free hood and remained there for multiple days. Here we see sample 2A of the handle (Figure 1C) showing an RFU of 438. This significant level of contamination could potentially be a result of the aforementioned human error in chemically cleaning pipettes. Or, more ominously, it might also indicate fallibility of

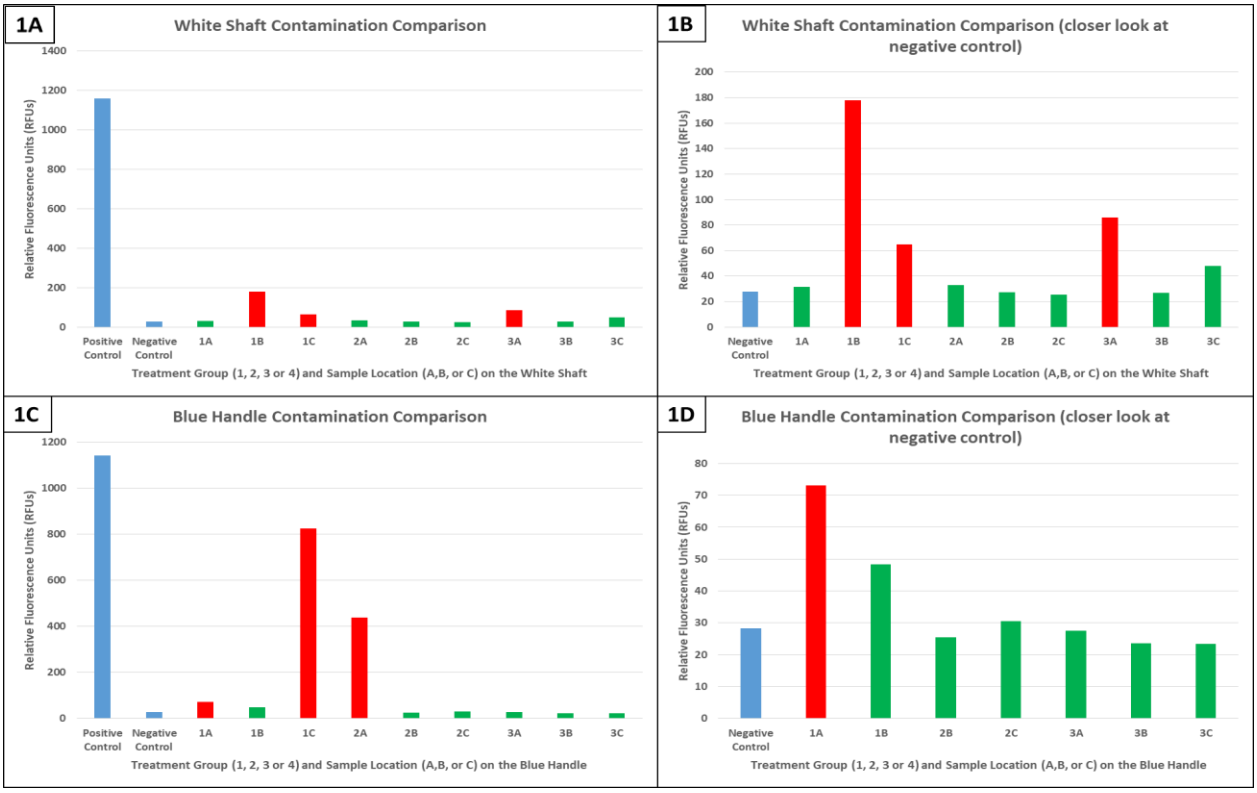

Figure 1: Contamination on Blue Handle and White Shaft in the Three Treatment Groups
This figure compares the level of contamination (in RFUs) present on the blue handles and white shafts of pipetman in three different treatment groups. Samples were re-suspended in nuclease free water and read in a Gemini XPS fluorimeter using IDT reagents. Data represented here is the last reading from the Gemini for each sample (or an average of the last readings for the three handle and shaft positive controls). Red columns represent contamination (significantly above negative control) and green columns represent no contamination (samples that are statistically within the negative control). The statistical cutoff for contamination was 60 RFUs.
Treatment Groups were as follows:

1. Benchtop: A pipetman that has been sitting on a common laboratory benchtop and used without being regularly cleaned.
2. RNase-free Hood: Pipetman that was cleaned into the RNase-free hood (using homemade RNase 🚫 Plastics spray) and has been used regularly but not re-cleaned since.
3. RNase Solution: Pipetman tested immediately after being manually cleaned with an RNase decontamination solution.

the RNase-free hood. Whether this pipette was improperly cleaned into the hood or contamination was realized while in the hood, the fact remains this hood can no longer be trusted. A problematic finding when operating under the assumption that all equipment and surfaces in the hood are RNase-free.

While it is intuitively known that contamination can happen fast and often it has not been known to what degree, particularly when common preventative measures are taken. Here we have shown that even the most common preventative measures (chemical decontamination and hood protection) cannot stop all contamination. Imperfect cleaning or minor changes in airflow contamination can ruin runs. As a possible solution we suggest KeyPro™ (Phoseon Technology).

Previous testing with KeyPro™ (1, 2) has shown that solid-state UV-LEDs present an efficient, reliable method of decontaminating laboratory equipment without erosion, human error, or the fear of unpredictable contamination.

Though we cannot always prevent contaminants from tainting laboratory equipment, there is a solution: KeyPro™.

Works Cited:

1. Phoseon Technology (2019). “Decontamination of Gilson® Pipettes Using High Intensity UV LED” *BioTechniques*. 66(2): 103.
2. Phoseon Technology (2019). “Decontamination of Gilson® Pipettes Using High Intensity UV LED (part 2)” *BioTechniques*. 67(1): 103.