

Implementation of Tecan® automation with Neoteryx Mitra® volumetric absorptive microsampling (VAMS) for reagent preparation for an Anti-Drug Antibody (ADA) assay

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Abstract

There are many benefits of microsampling for sample collection in clinical trials, including the ability of at-home sampling, room temperature storage and shipping, and low sample volume requirements (<50 μ L), which is particularly impactful for patients who otherwise couldn't be tested due to low blood volume availability (e.g. pediatric). The Neoteryx Mitra® volumetric absorptive microsampling (VAMS) has been used for drug level (PK) sampling for both small and large molecules, and recently we have extended the technology to collect anti-drug antibody (ADA) samples in the clinical space. The ADA application presented a challenge in the creation of assay controls in VAMS form, as over 10,000 VAMS tips (positive and negative controls) were required to support testing over the entire 3-year clinical trial. Manual generation of controls would require multiple analysts to individually dip VAMS tips one-by-one for 5 seconds into the blood samples. An automation solution using the Tecan® platform was prioritized to avoid risk of processing consistency and ergonomics. An off-the-shelf solution was not available for the Tecan® system, so a custom-built solution was designed, tested, and implemented in less than 3 months. The poster will summarize the successful implementation of the Tecan® automation process with Mitra® VAMS tips, which demonstrated high concordance with data from manually processed VAMS.

Two Versions of VAMS

Neoteryx manufactures two versions (manual use and automation use) of VAMS tips in 96-well racks. The yellowish-green rack contains the finned version of VAMS tips, which are meant to help avoid touching the side of the blood tube during manual preparation. The purple rack will fit any standard SBS format and the tips are the smooth version of VAMS tips so as to easily glide in and out of tubes and racks. See Figure 1 and Figure 2:

Figure 1 – two version of VAMS tips manufactured by Neoteryx®



Image credit to neoteryx.com



Figure 2: Aerial view for the difference between VAMS tips (Finned tip on the left versus smooth tip on the right)



Comparison of the Two VAMS Versions

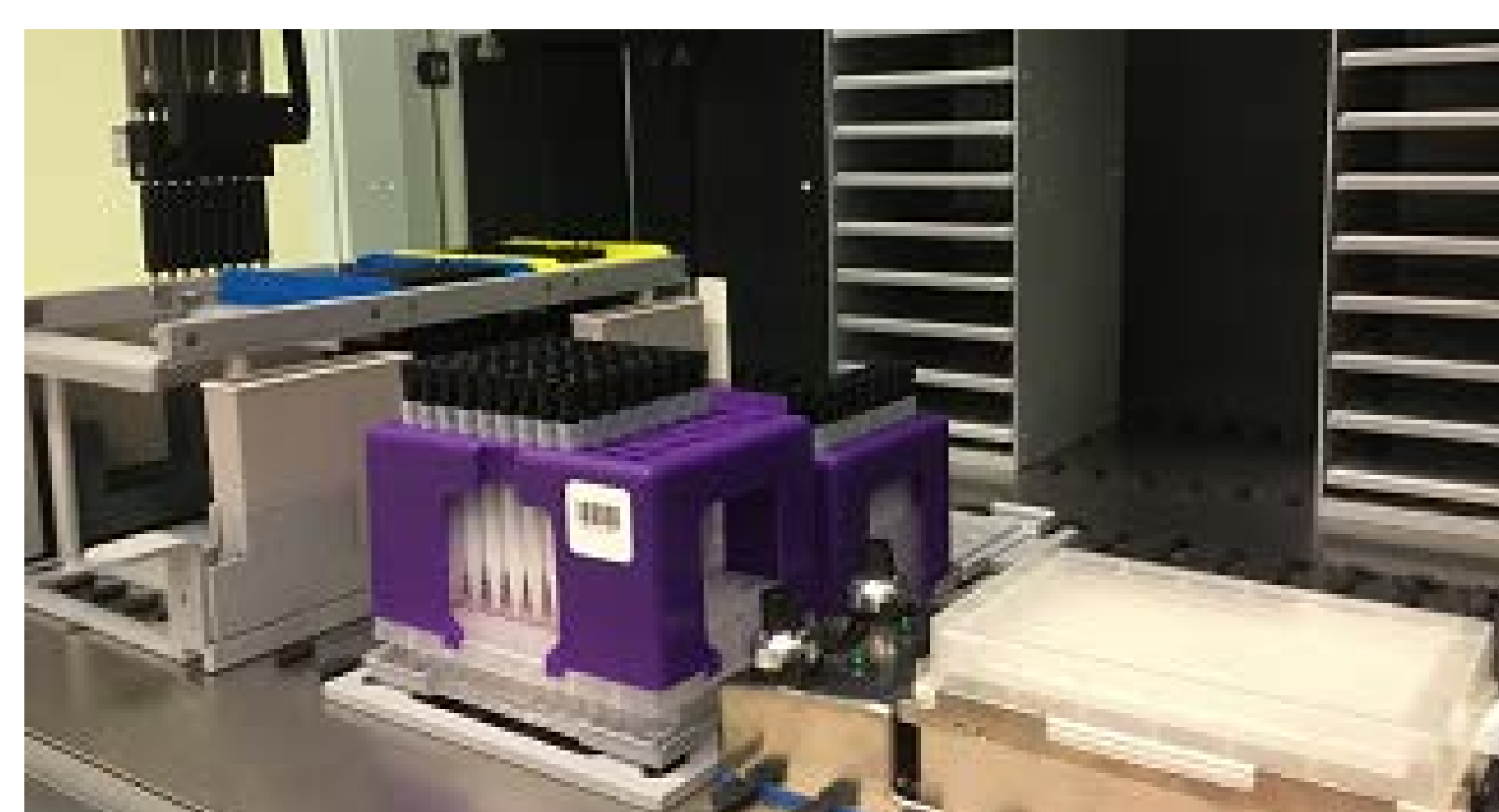
Green Rack	Purple Rack
Direct utilization on Tecan liquid handling arm (LIHA) with finned VAMS tip	Smooth VAMS tip does not fit directly onto Tecan LIHA
High Tecan liquid handling arm (LIHA) tip mount failure rate due to suboptimal tip slot diameter	Low crash rate as diameter for tip slot was designed for Hamilton automation platform

Challenges

- The preparation of 20,000 blood-dipped VAMS tips are needed within a short period of time
 - Avoid manual dipping:
 - Manual processing inconsistencies including differential sample exposure time
 - Ergonomic risks for analysts
 - Significant analyst time commitment
- Neither commercially available version of VAMS tip types may be utilized directly by the Tecan system
- Utilization of existing regulated Tecan automation system was required
- Vendor modification of any VAMS tip will require longer than 3 months for production

Solution

Tecan disposable tips (DITIs) were added automatically into the smooth VAMS tips for direct utilization by Tecan LIHA.

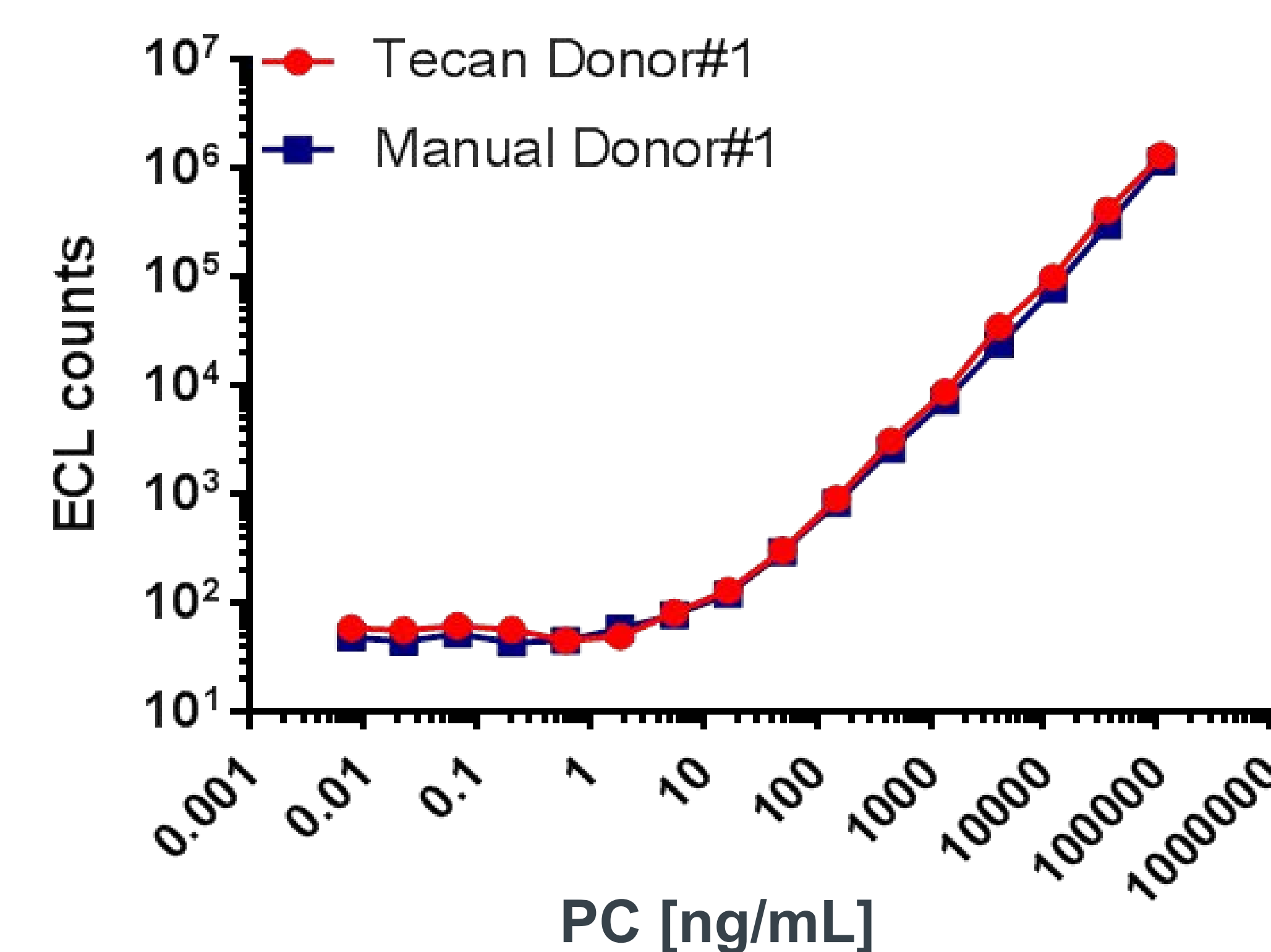


Customization of Tecan Components and Parameters

- Customization of carriers is necessary to accommodate the Z-height difference introduced by the tip-in-tip solution
 - As DITIs (labware specification) are used globally, the customization is focused on carriers specifically used with this work flow
 - Incorporation of Big Bear® shaker on Tecan deck to provide orbital shaking for prevention of blood-plasma settlement
 - One and eight channels reservoirs as custom carriers
- Extensive fine tuning of heights to achieve optimal processing performance
 - VAMS submersion height to account for decrease in volume in reservoirs
 - Timing of submersion
 - Speed of LIHA movement (minimizing splashing)

Representing Data Comparison

Microsampling: Tecan vs Manual



Conclusion

- Data from multiple individuals has shown no significant difference in assay performance via assessment of raw ECL count, S/N and % inhibition between manually and Tecan processed VAMS.
- Over 20000 VAMS tip has been prepared in the course of 3 days by 1 analysts
 - At least 3 folds time saving compared to manual process with no ergonomic risk nor inconsistency in processing
- Unconventional tip-in-tip solution in short timeframe using existing tools and Tecan system.
- Bypassed the need for any product modification

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