Gravimetric Evaluation of Syringe and VAX-ID® Dead Volume and Its Impact on Dose-Sparing Intradermal Rabies Vaccination

Koen Beyers | Heleen Nauwelaers | Nour Medjdoub | Manon Randrianantoandro | Vanessa Vankerckhoven

Idevax BV, Belgium

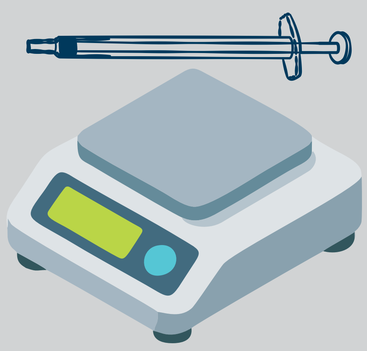
INTRODUCTION

Intradermal (ID) vaccination offers dose sparing potential, reducing vaccine requirements up to one-fifth or even one-tenth of the standard intramuscular dose. While ID is recommended to expand access to rabies vaccines in LMICs—where costs and shortages are common—conventional techniques like the Mantoux method lack reproducibility and ease of use. VAX-ID® is a novel ID injection adaptor designed for standardized, user-friendly delivery using a microneedle to minimize pain. To optimize dose-sparing advantages, VAX-ID was designed to have a low dead volume—the residual liquid remaining after full ejection—to limit vaccine loss. This study aims to evaluate the dead volume of syringes used with VAX-ID to quantify actual liquid losses.

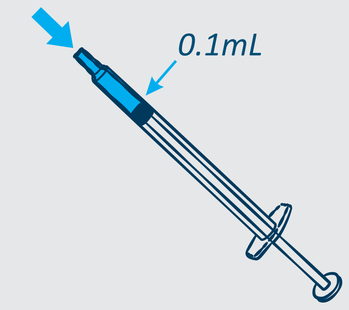
METHODS

Dead volume was measured in 50x 1mL Tuberculin HENKE-JECT; green and 50x Eco LDS; white syringes. The sample size was determined by an AQL sampling plan according to ISO 2859-1.
The dead volume was determined using the Gravimetric method described in ISO7886-1 Annex C:

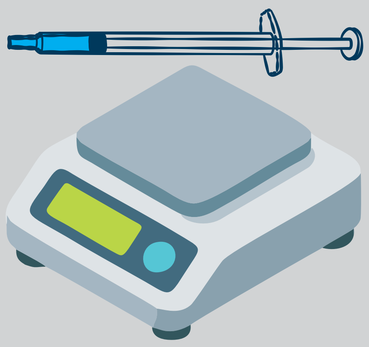
1. Weigh the syringe empty ('**empty**')



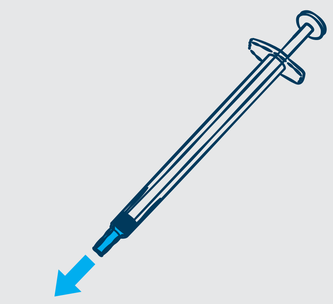
2. Fill the syringe with 0.1 mL water (density 1g/mL at room temperature) based on the volume marks on the syringe



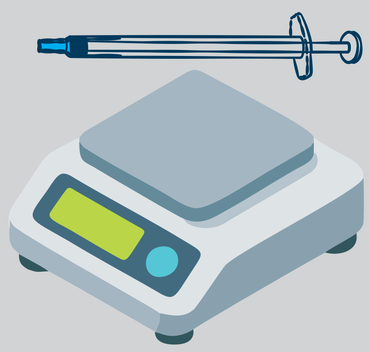
3. Weigh filled syringe ('**Drawn**')



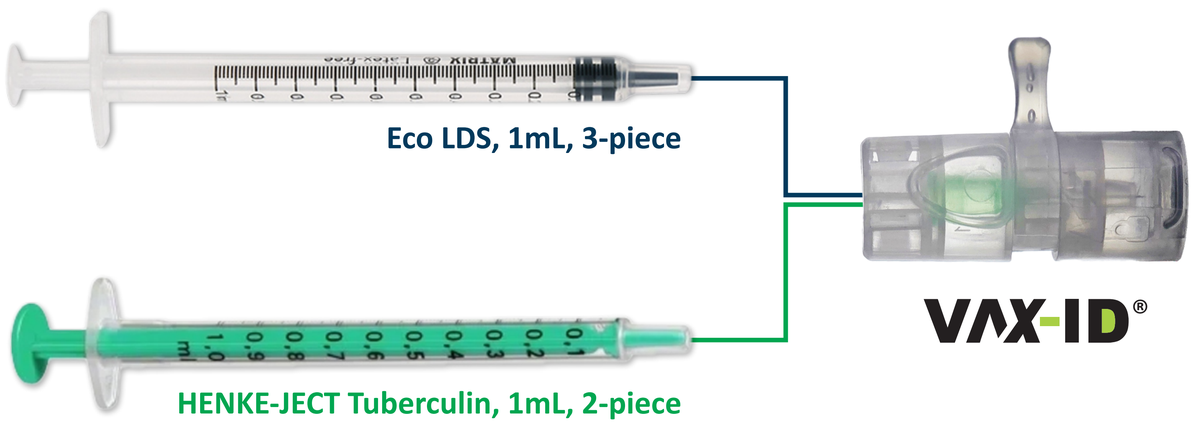
4. Eject the complete volume of the fluid



5. Weigh the syringe again ('**Residual**')

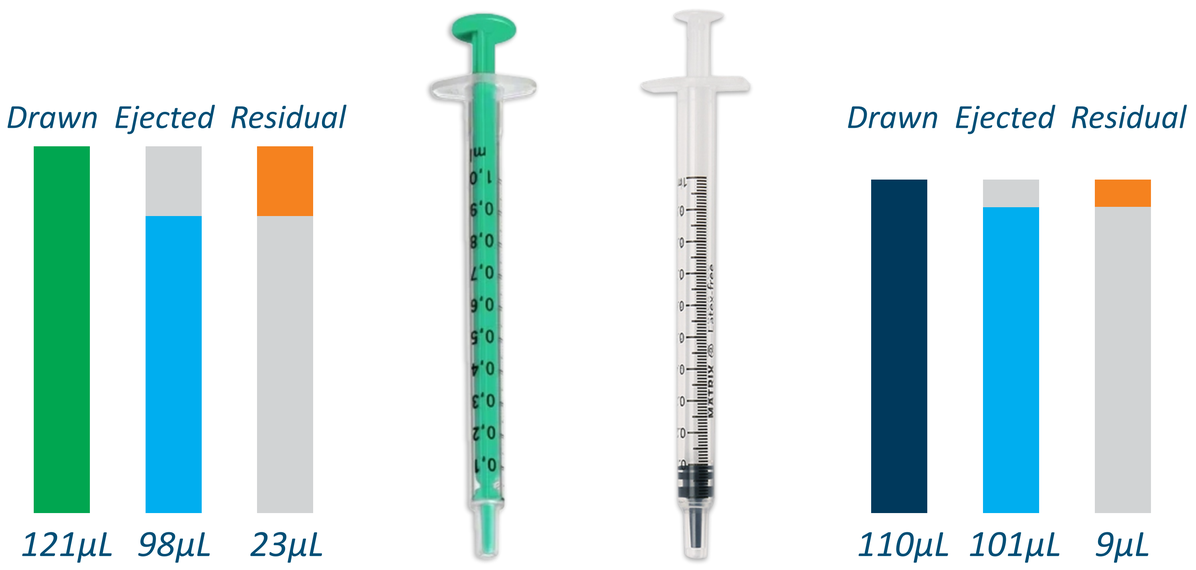


'Liquid'	**= 'Drawn' - 'Empty'**
'Ejected'	**= 'Drawn' - 'Residual'**
'Dead volume'	**= 'Residual' - 'Empty'**



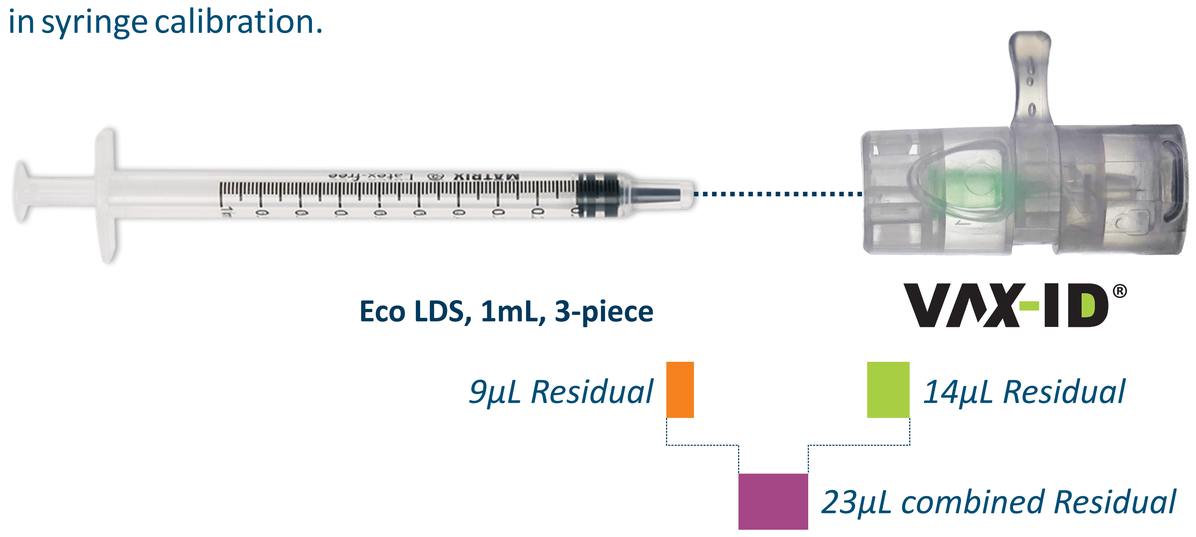
RESULTS

Fifty Tuberculin (green) syringes and fifty Eco LDS (white) syringes were evaluated using the ISO7886-1 gravimetric method. The mean liquid volume drawn was 121µL ± 4.56µL for the Tuberculin syringe and 110µL ± 3.45µL for the Eco LDS syringe. Mean ejected volumes were 98µL ± 5.30µL and 101µL ± 3.13µL, respectively. The calculated dead volume was significantly lower for the Eco LDS syringe than for the Tuberculin syringe, measuring 9µL ± 1.17µL versus 23µL ± 2.42µL, respectively.



CONCLUSION

Using a gravimetric method, this study quantified and compared the dead volume of a conventional Tuberculin syringe and an Eco LDS syringe. The Tuberculin syringe demonstrated a substantially higher dead volume than the Eco LDS syringe (23µL vs 9µL), confirming the advantage of low-dead-space designs in minimizing product loss. Despite this difference, both syringes accurately delivered the target 0.1mL dose (mean ejection volumes of 98µL for Tuberculin and 101µL for Eco LDS), indicating that dead volume is accounted for in syringe calibration.



Similar gravimetric experiments with the Eco LDS 1mL syringe attached to a 32G VAX-ID device resulted in a combined dead volume of 23µL ± 6µL. Deduction of the 9µL attributed to the Eco LDS syringe, indicates that VAX-ID 32G contributes approximately 14µL of additional dead volume. These findings clarify liquid losses within VAX-ID and inform the selection of optimal syringe-device combinations for dose-sparing rabies vaccination. Notably, in-house testing by a UK-based travel clinic confirmed that VAX-ID used for a 0.1mL Verorab rabies vaccination was effective and highly user-friendly.

VAX-ID® ISV Annual Congress | The International Society for Vaccines | October 12-14 2026 | Antwerp, BE | Poster 428
Idevax, Bijkhoevelaan 32c, 2110 Wijnegem, Belgium | koen.beyers@idevax.com