A successful combination:

The Ellele Sampling Device from Ellele Health and the HPV profiler from Predica Diagnostics

A novel HPV detection test combined with a novel biospecimen collection tool.

ellele HEALTH

PREDICA Diagnostics

Introduction

Cervical cancer screening protocols typically involve testing cervical smears for the presence of DNA from high-risk genotypes of Human Papillomavirus (HPV), the principal cause of premalignant cervical intraepithelial neoplasia (CIN) and cervical cancer. While early detection of oncogenic HPV types enables timely clinical intervention, triage testing is essential, as only a small proportion of HPV infections progress to cervical cancer. Triage is currently performed using liquid-based cytology (Pap test), with women showing abnormal cells referred for further investigation. However, in practice, around 50% of these referrals are for women without clinically significant disease. Therefore, innovation in this testing pathway is desperately needed.

The standard method for obtaining cervical smears involves speculum-assisted sampling, requiring a healthcare professional to visualise the cervix and collect cells using a cytobrush or spatula. This procedure can cause discomfort and deters many women from participating in screening, contributing to suboptimal uptake[1]. Moreover, the quality of samples depends on operator skill, and the cellularity of smears varies widely. Cytology itself is a subjective method, prone to misinterpretation, leading to both missed high-grade lesions and unnecessary referrals due to equivocal results. A method that negates the speculum and also removes subjectivity is therefore of pressing need.

Ellele Health and Predica Diagnostics have partnered to address these challenges by introducing an innovative combination of a medical device and a diagnostic platform. Their goal is to improve identification of women with active high-risk HPV infections and underlying high-grade disease (CIN2+), which current screening systems often fail to detect efficiently.

1 Hon, H. J., Chong, P. P., Choo, H. L., & Khine, P. P. (2023). A Comprehensive Review of Cervical Cancer Screening Devices: The Pros and the Cons. In Asian Pacific Journal of Cancer Prevention (Vol. 24, Issue 7, pp. 2207–2215). Asian Pacific Organization for Cancer Prevention. https://doi.org/10.31557/APJCP.2023.24.7.2207

Ellele Health has engineered a novel biospecimen collection tool — the *Ellele Sampling Device* — intended to offer a non-speculum-based alternative for vaginal sampling (*Figure 1*). The device utilizes an air-inflated balloon mechanism that contacts the vaginocervical wall, allowing for reproducible sample collection without the need of direct cervical visualization.

A feasibility study[2] assessed the clinical usability and patient acceptance of the **Ellele Sampling Device**. Participants underwent dual sampling using the Ellele Sampling Device followed by standard speculum-based collection. The study found that:

- All participants preferred the Ellele Sampling Device over the speculum
- In 42 of 44 samples taken, clinicians expressed a preference for the Ellele Sampling Device, citing ease of use and favourable patient feedback as primary factors.

These findings demonstrate the Ellele Sampling Device as a viable and deployable sampling method.

Predica Diagnostics has developed the *HPV Profiler and CervicaDx tests*, easy to perform molecular assays for analysis of cervicovaginal samples, designed to detect HPV genotypes (HPV-Profiler), CIN lesions and cancer (CervicaDx triage) with high sensitivity and specificity. The tests are based on targeted next generation sequencing of RNA from the most important HPV-types, together with a number of RNA biomarkers that strongly associate with CIN and cancer. This high specificity test reduces the incidence of false positives, thus alleviating the downstream impact on healthcare services and improving patient triage.

Given the high concordance between clinician satisfaction and patient preference for the Ellele Sampling Device, and the diagnostic potential of Predica's HPV Profiler Test, a scientific collaboration has been initiated between **Ellele Health** and **Predica**. This partnership aims to validate the performance of Predica's assay using biospecimens collected via the Ellele Sampling Device. The joint objective is to establish a more accessible, patient-centric, and diagnostically robust approach to HPV-based cervical cancer screening.

Figure 1. The Ellele Sampling Device

2 Study Details | Feasibility of the Oricol™ Sampling Device to Retrieve Vagina Mucus (Wall) Samples for Genomic & Epigenetic Analysis. | ClinicalTrials.gov

Results

To evaluate the performance of the HPV Profiler Test on Ellele samples, DNA was extracted from 24 Ellele-collected specimens. Using equal volumes of sample that provided a range of total DNA from 100 to 500 ng, libraries were prepared and sequenced as per the HPV Profiler Test workflow.

Due to limited clinical history associated with the samples, only two (Participant O and Participant L) were from confirmed HPV-positive individuals and served as internal positive controls. As illustrated in *Figure 2*, the HPV Profiler Test successfully detected HPV in both confirmed cases. Additionally, HPV was detected in five other samples with unknown clinical background, showing positivity not previously documented.

To assess sample quality and extraction efficiency, the test includes probes for the human *ACTB* (beta-actin) gene as an internal control. ActB read counts from Ellele DNA extractions were compared to those from clinically collected ThinPrep swabs. As shown in *Figure 3*, Ellele samples yielded an average of 18,594 ± 4,391 ActB reads from 0.92% of the original sample volume. ThinPrep swabs yielded 3,312 ± 3,148 ActB reads from 0.125% of the original volume, indicating similar high-quality DNA recovery from both sampling methods with a more consistent recovery from the Ellele sample.

Figure 2. Relative signal of high-risk papillomavirus (HPV) found in Ellele samples listed by participant ID.

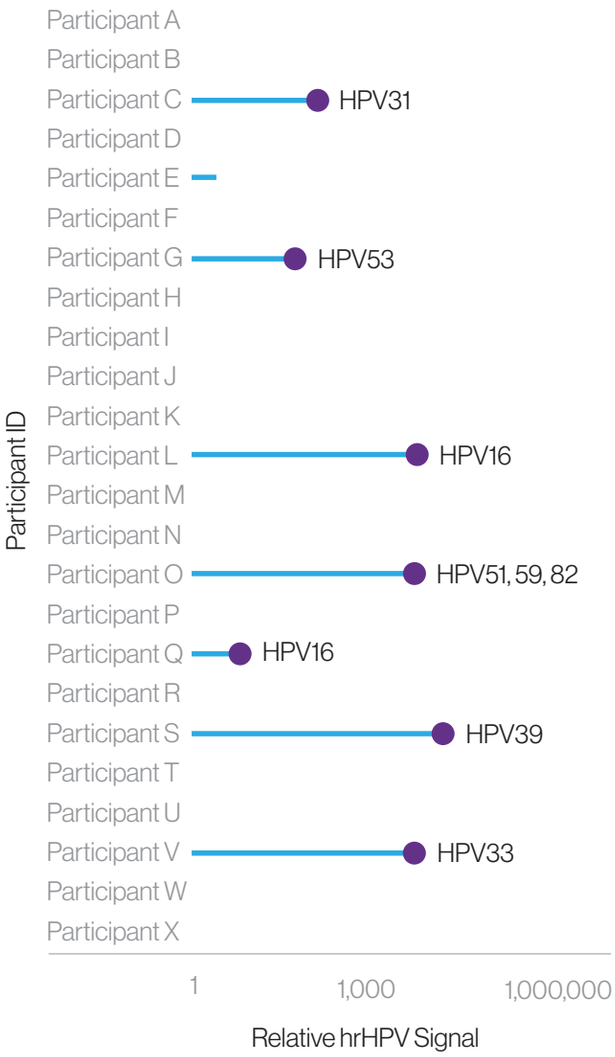
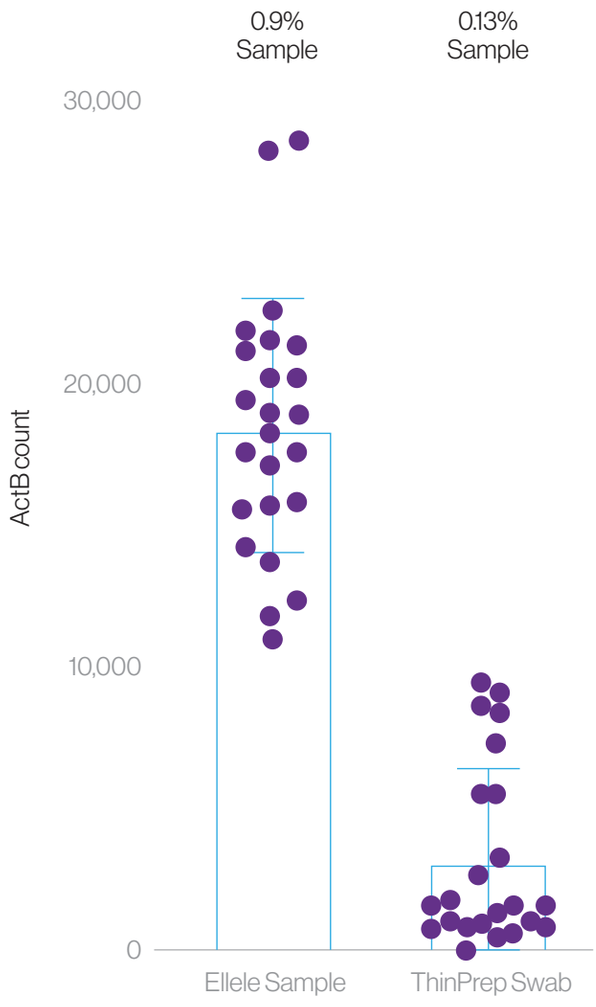


Figure 3. ActB read count on Ellele samples compared to swabs from a percentage of total sample.



Conclusion

The Ellele Sampling Device and brush demonstrated comparable performance in terms of *ACTB* (actin) read counts, with the Ellele samples showing greater consistency across replicates. This suggests that the Ellele Sampling Device provides reliable sample quality suitable for molecular testing without the need for direct cervical brushing.

Predica's HPV Profiler Test can be effectively used with Ellele-collected samples. The HPV test delivers robust performance using Ellele specimens that can be collected by any healthcare professional, therefore reducing the burden on general practitioners and gynecologists, whilst being compatible with a patient-preferred, minimally invasive sampling method.

Future Work

To further explore the applications of Ellele sampling and assess test sensitivity, Ellele sampling will be employed for RNA detection. This would enable a fully integrated molecular screening solution, with an HPV-DNA profiling test first, followed by CervicaDx triage on HPV positives utilizing RNA from the same sample.

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