

Osmotic Processor for Sensitive, Rapid Tuberculosis Detection

Tuberculosis (TB) kills over 1.5 million people a year, 90% of them in developing countries with limited healthcare access. To improve the ease and sensitivity of TB screening, an osmotic processor is developed to concentrate easy-to-collect urine samples, improving the sensitivity of urine-based lateral flow tests by over 100 times.

What is the Problem?

Tuberculosis is a leading cause of death from a single infectious agent. According to the World Health Organization, TB sickens 10 million people and claims 1.5 million lives worldwide in 2021 alone. A major barrier to effectively managing TB is the inability to reliably diagnose disease in low-resource, TB-endemic settings. Currently available diagnostic tests with adequate sensitivities have prolonged turnaround time and/or require samples that are difficult and risky to collect. Companies like Abbott developed urine-based lateral flow tests, test strips like pregnancy tests. But because the concentration of tuberculosis markers in urine is very low, these tests have abysmal sensitivities lower than 20% and therefore are not clinically useful. As of now, there is still no WHO approved point-of-care test for TB.

What is the Solution?

Our osmotic processor addresses these issues by exploiting osmosis to concentrate urinary antigen in a rapid, simple and power-free process. After a 20-min treatment via the osmotic processor, urine samples are concentrated 100-fold and can be directly applied onto existing LFAs. We showed that treatment with our osmotic processor lowers the limit of detection of a commercially available TB LFA by at least 100-fold, increasing sensitivity from 14% to above 90%. With its simplicity and flexibility, this device demonstrates a great potential to be used with existing lateral flow assays to improve the early detection of TB and beyond in low-resource settings.

What is the Competitive Advantage?

- Broad Applicability: This innovation can be in various methods outside of TB testing in urine. Aside from urine, saliva and cell culture media could be similarly processed to look for a variety of biomarkers such as proteins, nucleic acids, and extracellular vesicles.
- Accuracy: Using this innovation, the sensitivity of easy-to-use existing LFAs improves to over 90%, above even the existing gold-standard culture test methods

Technology ID

BDP 8952

Category

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- Affordability: With no electronics and easy manufacturing, the devices could be made for a few dollars per unit at scale

- Portability: The device's small size, inexpensive manufacturing, and no requirement for external power allows on-site processing of samples wherever a TB screening might need to take place

- Ease of Use: Enabling existing LFA tests removes many training-related barriers to the collection and processing of sputum samples. In total, a screening using the LFA and osmotic concentrator takes only 40 minutes requiring minimal training in its use

Patent Information:

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