

# Smart Urine Analyser for the use in Low-Resource Environments

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There is a need for developing new solutions that enable rapid diagnostic tests in low resource settings. CSEM is working on the development of a handheld fluidic cartridge, containing an array of printed electrochemical sensors for the digital recording of urinary glucose and pH. The system is being developed for the Swiss Tropical and Public Health Institute (Swiss TPH) to assist clinical decision making in low-resource settings such as refugee camps.

## Novel Integrated Interactive Platform for Diagnosis and Surveillance of Diseases among Migrants

**Refugee camp health center (within camp)**  
**Regional district level hospital (1 hour)**  
**Reference level hospital and research laboratory (6 hours)**

**ETHIOPIA**

**NIIDS**  
Point of Care Urine Analysis  
Quantitative Electrochemical Sensor Array  
**csem**  
Swiss TPH  
Swiss Tropical and Public Health Institute

**MACHINE LEARNING**

Connection to tropical health databases and machine learning data extraction

**Sensor array to extract clinically relevant data**

**Clinically relevant outputs at point-of-care level**

Limited access to basic medical facilities and health care services during the journey

### Why Urine?



- Easily accessible body fluid
- Urinalysis common diagnostics
- Early triage tool based on urinalysis in low resources setting
- Up to 0.6 to 2.6 L of urine a day. 91-96% of urine consists of water

### Disposable and Quantitative Sensor

- Low-cost printed sensor array integrated into microfluidic device
- Electrochemical detection and digital readout
- Measurement time: < 5 min
- Reader cost: ~100 EUR



### Measurement Targets

**pH**  
Target Range: 5.0 - 8.5

**Ions**  
Target Range: 10 - 100 mM

**Metabolites**  
Target Range: 0.1 - 5 mM

**Proteins**  
Not selected

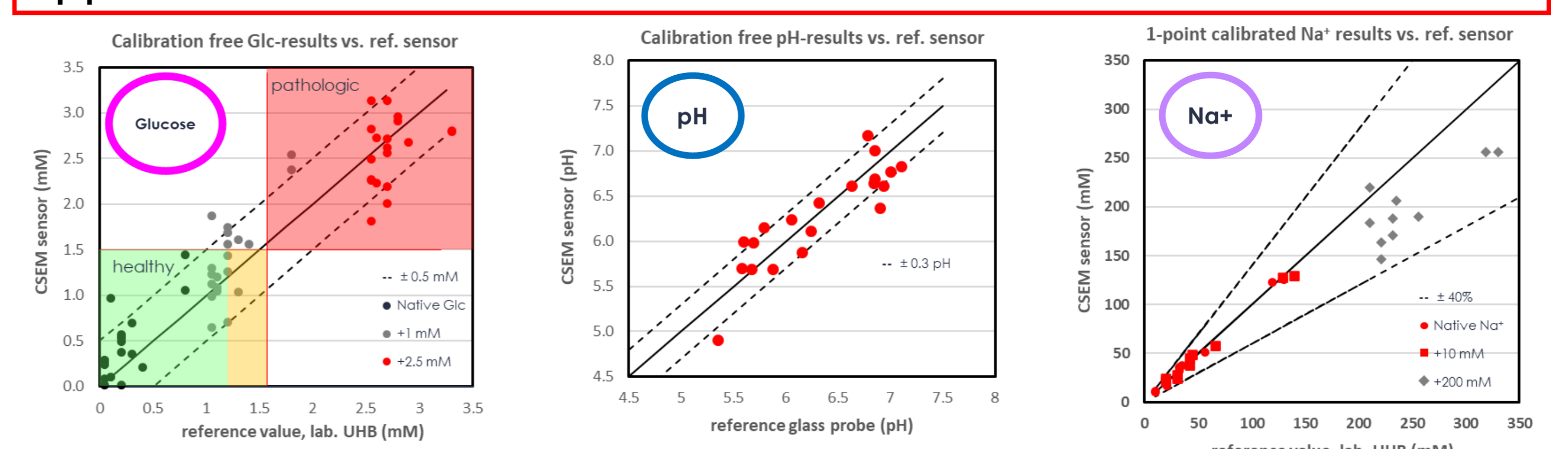
Urine is indicated in the battery of diagnostics tests for prolonged febrile illness.

- **Traditional approach:** detection of specific biomarker
- **NIIDS approach:** holistic approach → target of generic markers

### Validation in Urine Samples

The cartridge was validated with 20 different urines

Good accuracy by using a **calibration free / 1 point calibration** approach



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