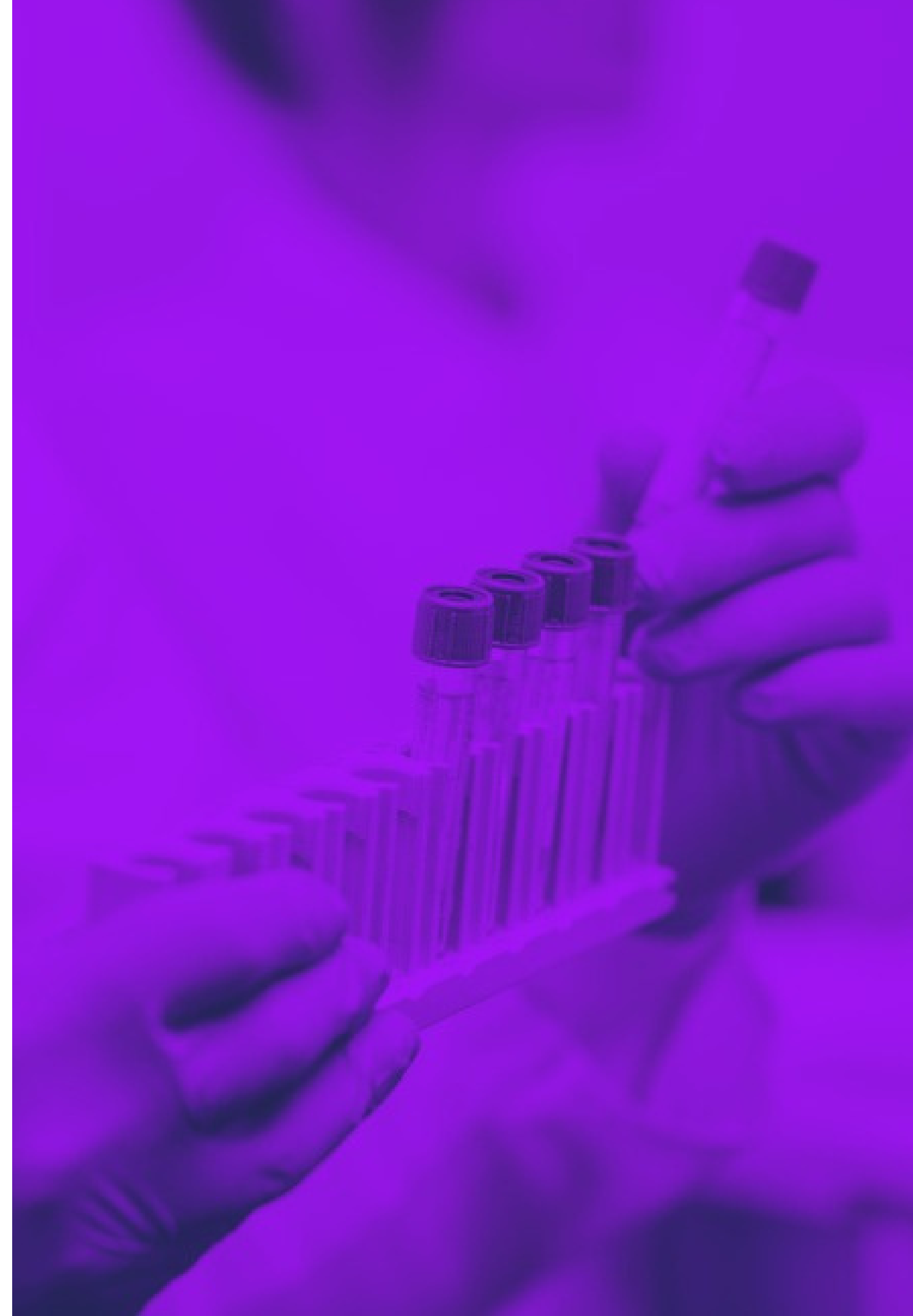# AqsensHealth

URINE AND SALIVA BASED TESTS FOR URINARY TRACT CANCERS AND INFECTIOUS DISEASES

Timo Teimonen, CEO and Co-founder
2024

Aqsens Health in a nutshell

Aqsens Health develops urine-based tests for urinary tract cancers, and saliva-based tests for lethal infectious diseases like malaria, cholera and TB

- Founded 2017 by **Professor Pekka Hänninen, Dean of the Turku University Medical Faculty**, today employing 9 professionals with primary background in biosciences and in international businesses.

- Strong **patent portfolio** around E-TRF and use of biosensors with **several scientific** publications.

- Research studies in the US and **clinical trial projects** in Finland, China and Ghana with highly merited research institutes, their senior researchers and private companies.

Renewing disease detection with phage-based biosensors.

Meet our core team

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Timo Teimonen,
CEO, co-founder

Riikka Erkkilä, LMM, EMBA
Chief Operating Officer

Ville Pimenoff, PhD.
VP, Clinical Research
and Validation

Janne Kulpakko, PhD.
Chief Scientific
Officer

Vilhelmiina Juusti,
MSc. (Tech)
Head of Laboratory

Elizabeth Cusdjoe, MSc.
Senior Application
Scientist

Milja Virtanen, MSc.
Application Scientist

Zhao Zhao, MSc.
Senior Project
Coordinator

Benjamin Michelin, MSc.
Process and quality
specialist

Riikka Saari, MA.
Market Communications
specialist

Scientific publications

- Time-resolved fluorescence- based assay for rapid detection of Escherichia coli. Anal Biochem. 470, 1–6. / Kulpakko J., Kopra K. and Hänninen P. (2015).

- Rapid time-resolved luminescence based screening of bacteria in urine with luminescence modulating biosensing phages. Analytical Biochemistry, 570, 21–26. / Kulpakko, J., Rantakokko-Jalava, K., Eerola, E., & Hänninen, P. E. (2019).

- Detecting disease associated biomarkers by luminescence modulating phages. Scientific Reports, 12, 2433. / Kulpakko J., Juusti V., Rannikko A., and Hänninen P. (2022).

- Biophysical properties of bifunctional phage-biosensor / Juusti V., Kulpakko J. Cudjoe E., Pimenoff V, and Hänninen P. (12/2022)

Publication under the work:
- Phage-based fast Biosensors for Malaria detection from Saliva / Juusti V., Kulpakko J., Amoah L., PImenoff V. and Hänninen P. (1/2023)

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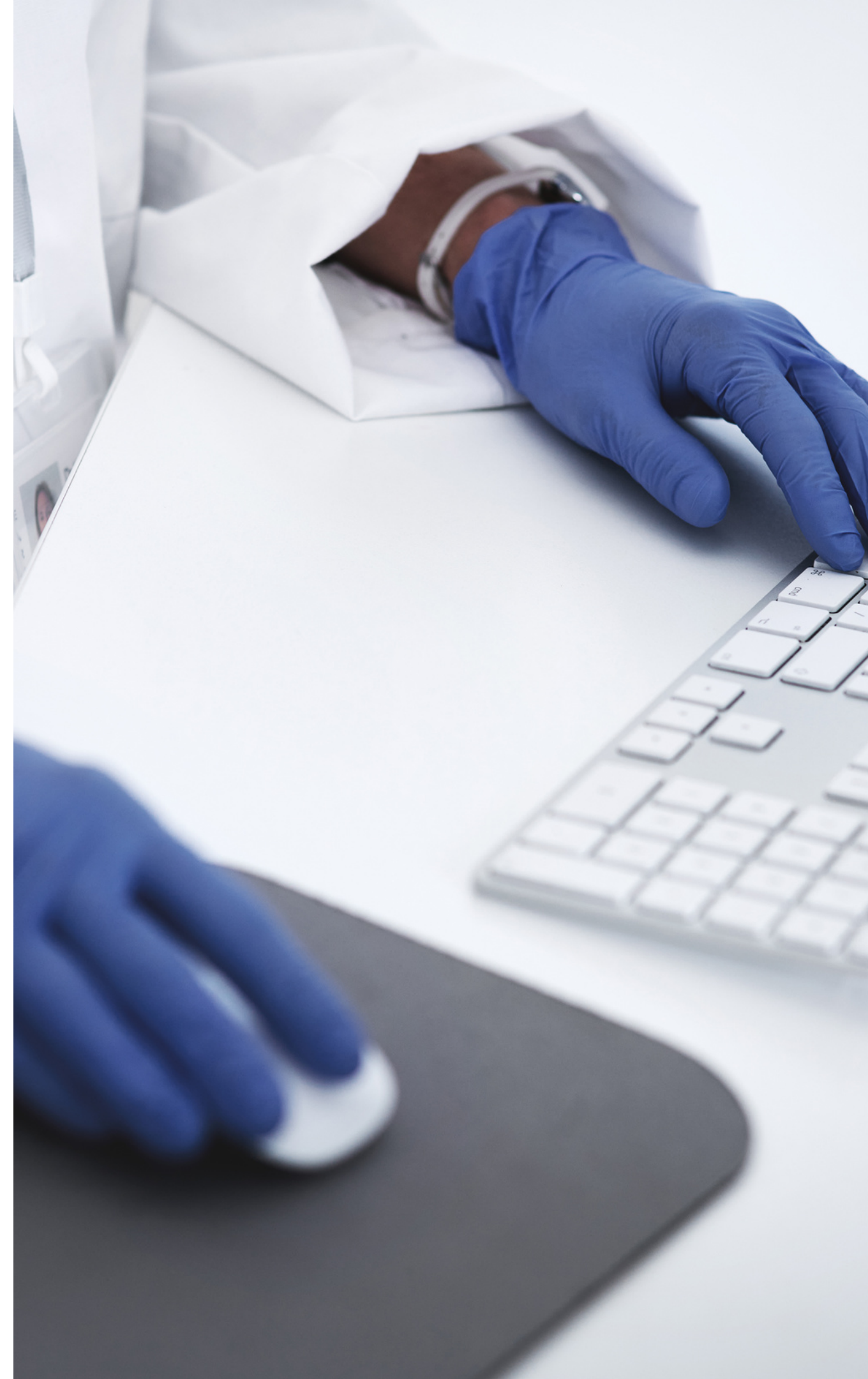
Diagnostic market is evolving to favour non-invasive samples

Size of in-vitro diagnostics market in 2022 is over

80 billion*

US dollars.

* CAGR estimate 6,6%

- Due to the increasing costs of healthcare new more cost efficient screening and diagnostic methods are needed

- Non-invasive samples hold an enormous amount of untapped health information and biomarkers for severe diseases

In 2021 the global Urinalysis market was valued at

3.4 billion

US dollars.

* CAGR estimate 10%

The Urinalysis market is expected to reach

6.34 billion

US dollars by the year 2030.

Non-invasive samples carry critical information
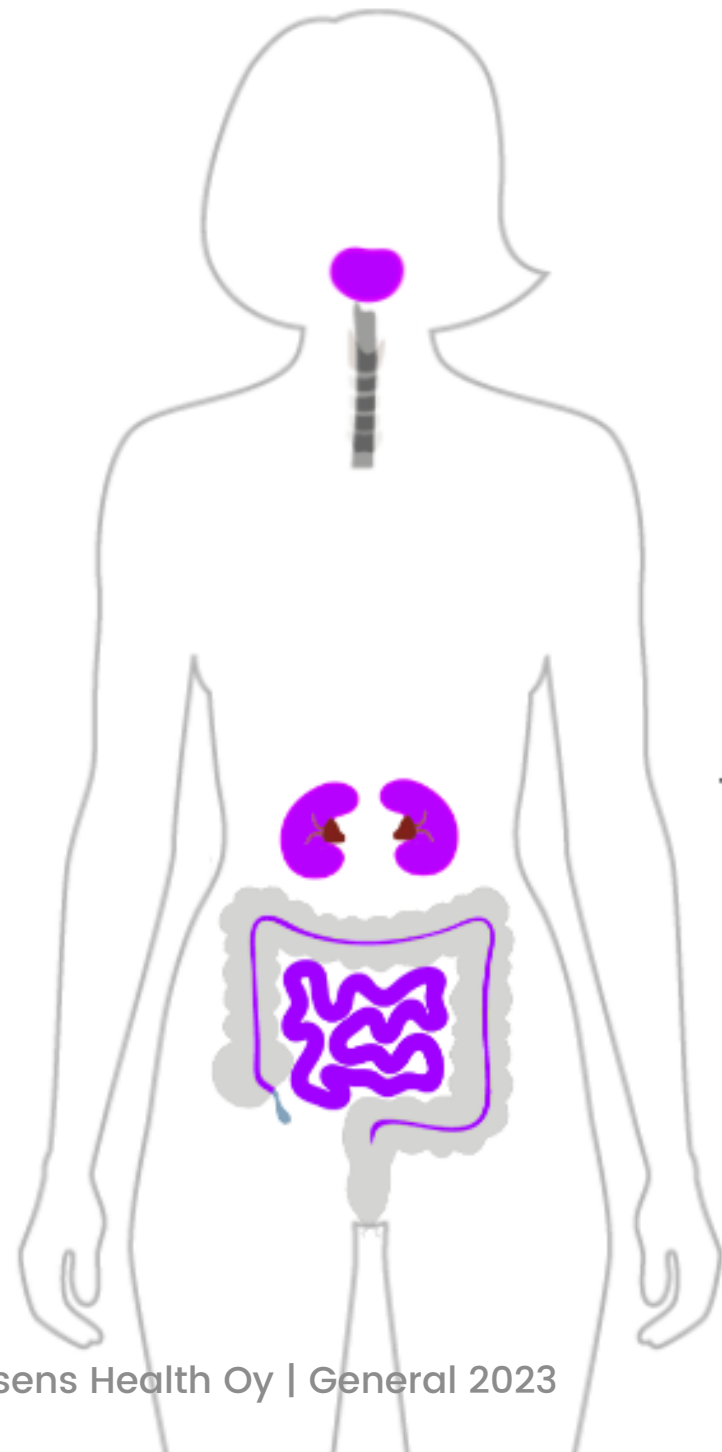
Saliva
Saliva reflects both the physiological and pathological state of our bodies. In diagnostics it can be used for the detection of various different abnormalities. The collection of saliva is inexpensive, fast and easy.

Urine
Urine can be used to diagnose both acute and chronic conditions of the urinary tract, such as UTIs or cancer. It can also give a general overview of our well-being. As a sample urine is stable, quick to collect and easy to transport and store. It's available in large quantities and requires minimal sample preparation.
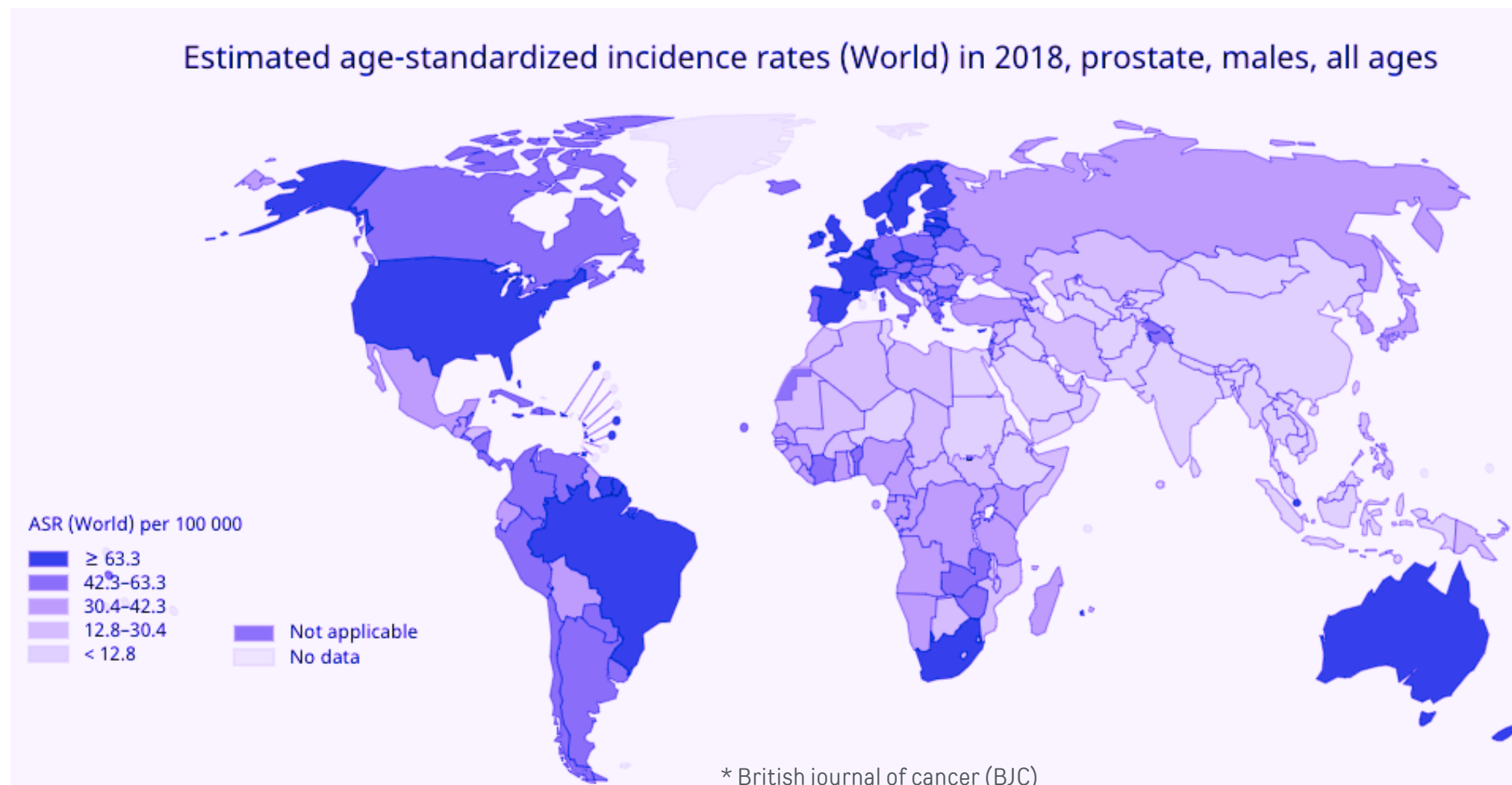
Feces
Fecal, or stool, samples are an extremely rich source of information about our health. They can be used to determine the presence of parasites or bacteria, and they give a detailed picture of overall gut health.

World needs a better prostate cancer test

- The global annual economic burden of prostate cancer is over 10 billion Euros

Estimated age-standardized incidence rates (World) in 2018, prostate, males, all ages

ASR (World) per 100 000

- ≥ 63.3
- 42.3–63.3
- 30.4–42.3
- 12.8–30.4
- < 12.8

- Not applicable
- No data

* British journal of cancer (BJC)

PSA and its derivative tests **are not feasible for large scale screening***

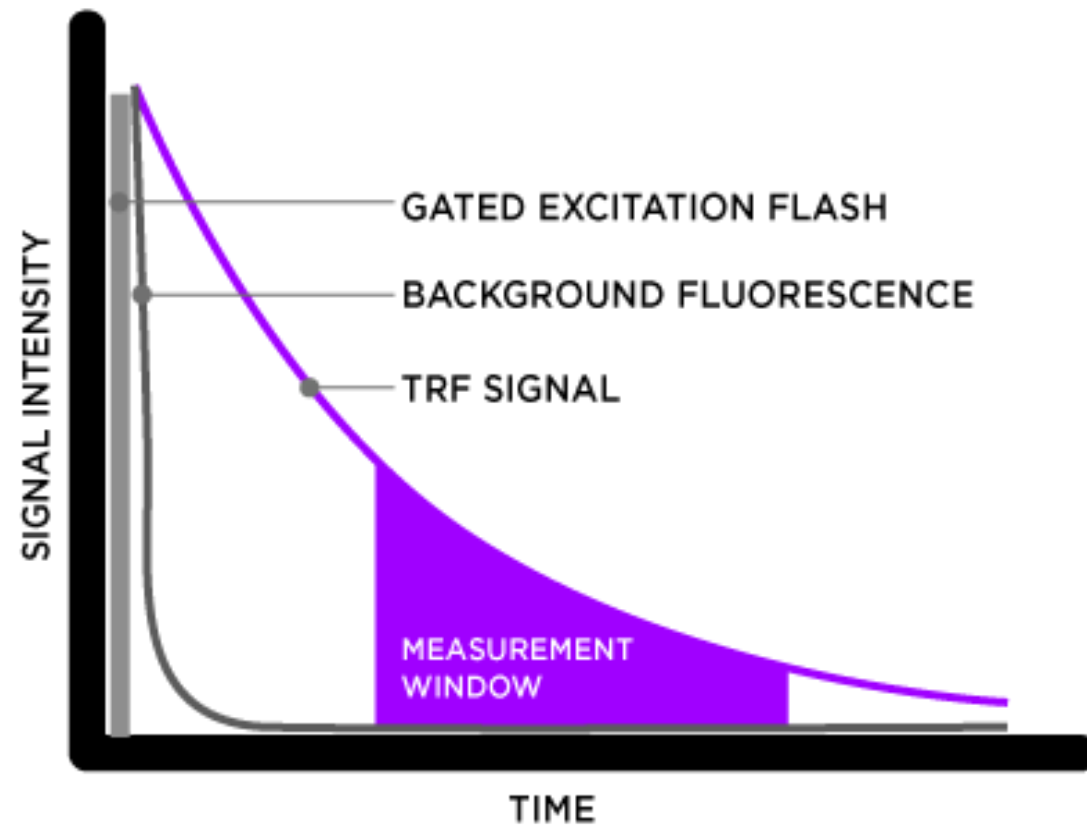**Urine based test will change the** way how prostate cancer screening is done.

The annual testing costs of prostate cancer in **Europe alone is over €1 billion****.

* Due to the low prediction power of PSA and cost of testing process

**https://www.researchandmarkets.com/reports/3339327/prostate-specific-antigen-psa-testing-market

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Aqsens Health's method: Enhanced-TRF

Time Resolved Fluorescence

SIGNAL INTENSITY

GATED EXCITATION FLASH

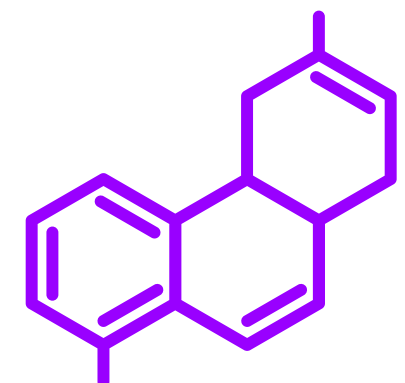BACKGROUND FLUORESCENCE

TRF SIGNAL

MEASUREMENT WINDOW

TIME

- No background fluorescence interference
- Can be optimized eg. by used wavelength and measurement window.

Disease-specific biological and chemical sensors

+
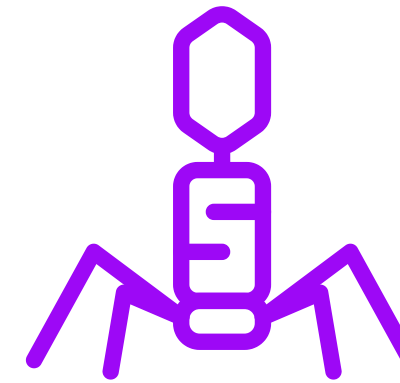
Biosensor

Detects biomarkers or groups of biomarkers in a sample.

Chemical sensor
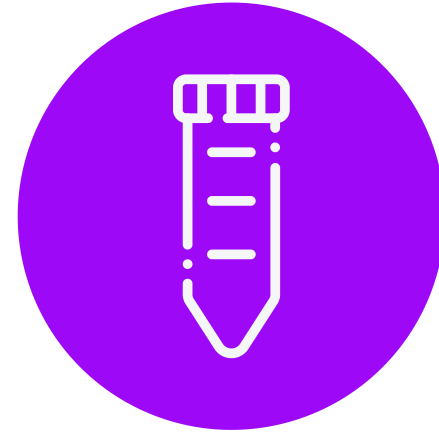
Measures the metabolic conditions in a patient sample.

Simple and (very) low cost testing process

STEP 1
Centrifuging

The urine or saliva sample is centrifuged to remove solid matter.

STEP 2
Diluting

The liquid part called the supernatant of the sample is diluted (saliva approx 1 to 15, Urine 1 to 30).

STEP 3
Pipetting

a) by hand   b) by robot

Assay reagents are added to the wells:

- Bio- or chemical sensor (–s)
- Label (EU)

STEP 4
Measurement*

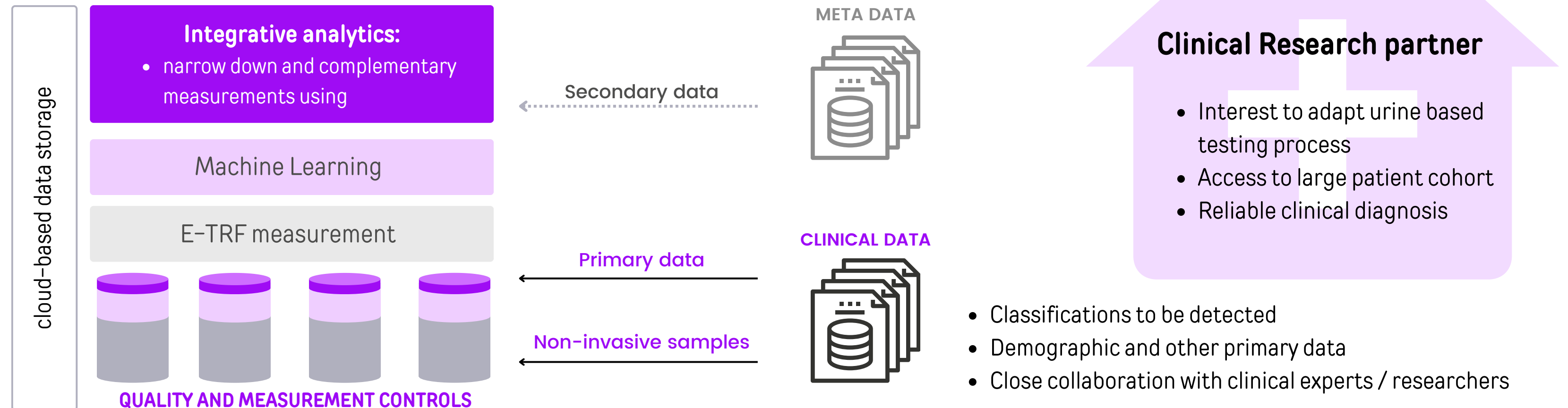Measurement using standard TRF microplate reader.

* Reference TRF plate reader: Tecan Spark multimode reader

Development framework with clinical partners

Samples, clinical data, measurements and narrow down analytics

Biomarker discovery

- Clinical research consultancy
- ROC curve and other statistical presentation forms
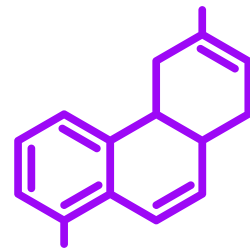- Complementary analysis using MS, NMR or other relevant methods

META DATA

Integrative analytics:
- narrow down and complementary measurements using

Machine Learning

E-TRF measurement

cloud-based data storage

Secondary data

Primary data

Non-invasive samples

QUALITY AND MEASUREMENT CONTROLS

CLINICAL DATA

Clinical Research partner

- Interest to adapt urine based testing process
- Access to large patient cohort
- Reliable clinical diagnosis

- Classifications to be detected
- Demographic and other primary data
- Close collaboration with clinical experts / researchers

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BIOURICA

Project timeline: 2023 – 12 / 2024

Focus: Urinary tract cancers

✓ Ongoing

- Large scale (5 000 patient cohort) clinical trial project under the bilateral research collaboration agreement between the Ministry of Science and Technology, China and the Ministry of Economic Affairs and Employment, Finland to perform large scale prostate and bladder cancer preclinical and clinical trials in China, and to screen likely biomarkers for the detection of solid-tumor cancers and their metastasis.
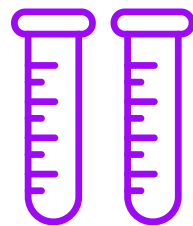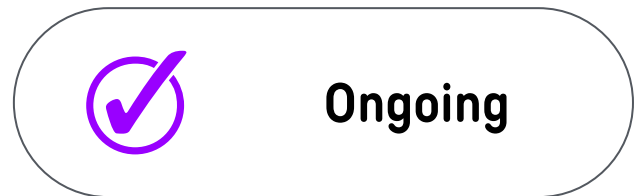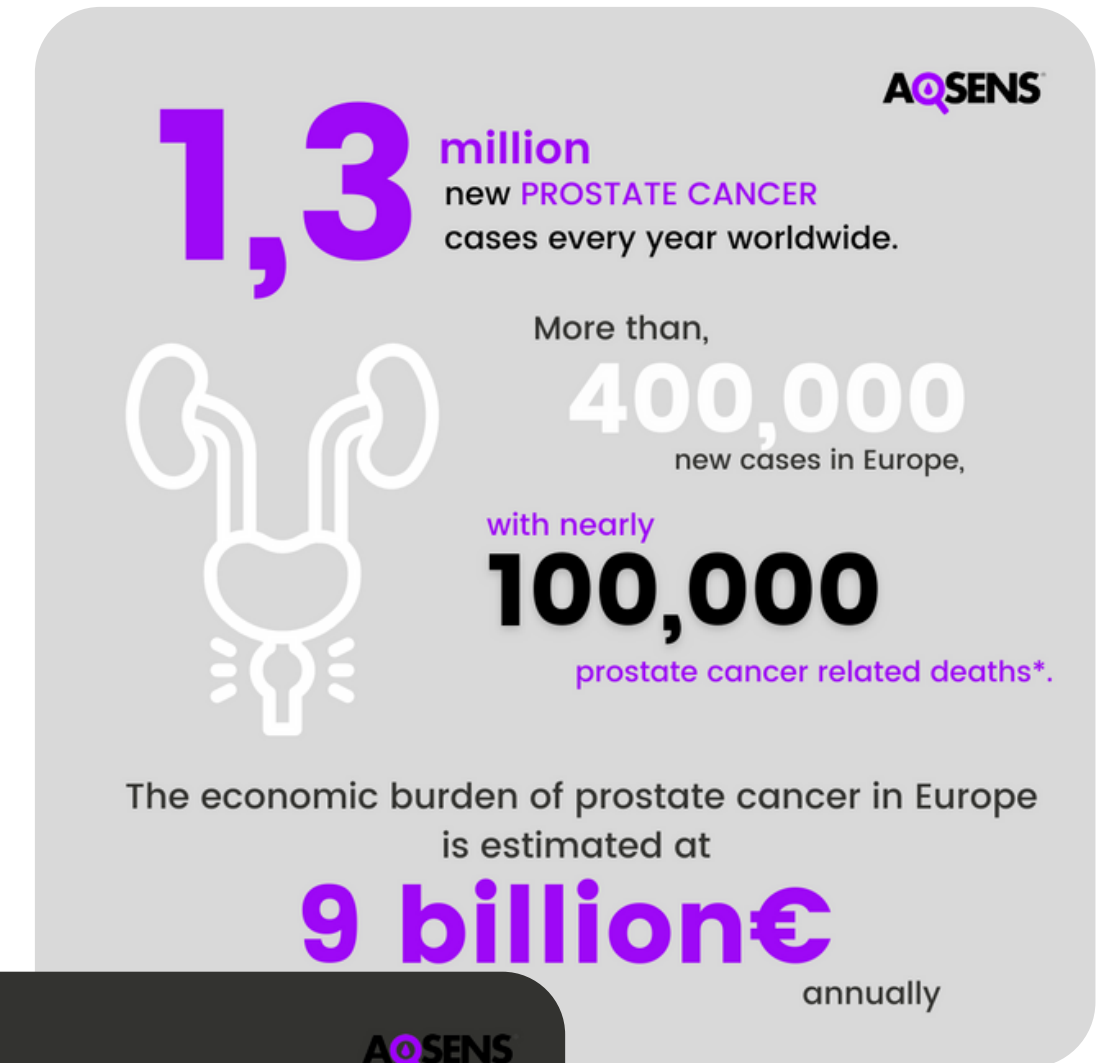
- **Collaborating parties:** Aqsens Health Ltd. (Helsinki and Turku University Hospitals) and OG Pharmaceuticals (Nanjing) and regional hospitals in Jiangsu province.

The aims of **BIOURICA** project are:

- To improve the sensitivity and specificity of the AQ biosensors to detect the metastatic state of different solid-tumor cancers.
- To validate the accuracy of the E-TRF measurement for sensitive detection of different solid-tumor cancers and their metastasis from urine samples.
- To complete both pre-clinical and clinical trials for AQ Prostate and AQ Bladder test

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1,3 million new PROSTATE CANCER cases every year worldwide.

More than, **400,000** new cases in Europe,

with nearly **100,000** prostate cancer related deaths*.

The economic burden of prostate cancer in Europe is estimated at

9 billion€ annually

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573,000 new BLADDER CANCER cases were diagnosed in 2020, with

212,000 deaths worldwide.

Bladder cancer is associated with high per patient costs that are usually upwords from

US $65,000 per patient.

Source: WHO Globacan survey 2020

![AQSENS logo]

Detection and management of Malaria

Project timeline: 2021 – 2024

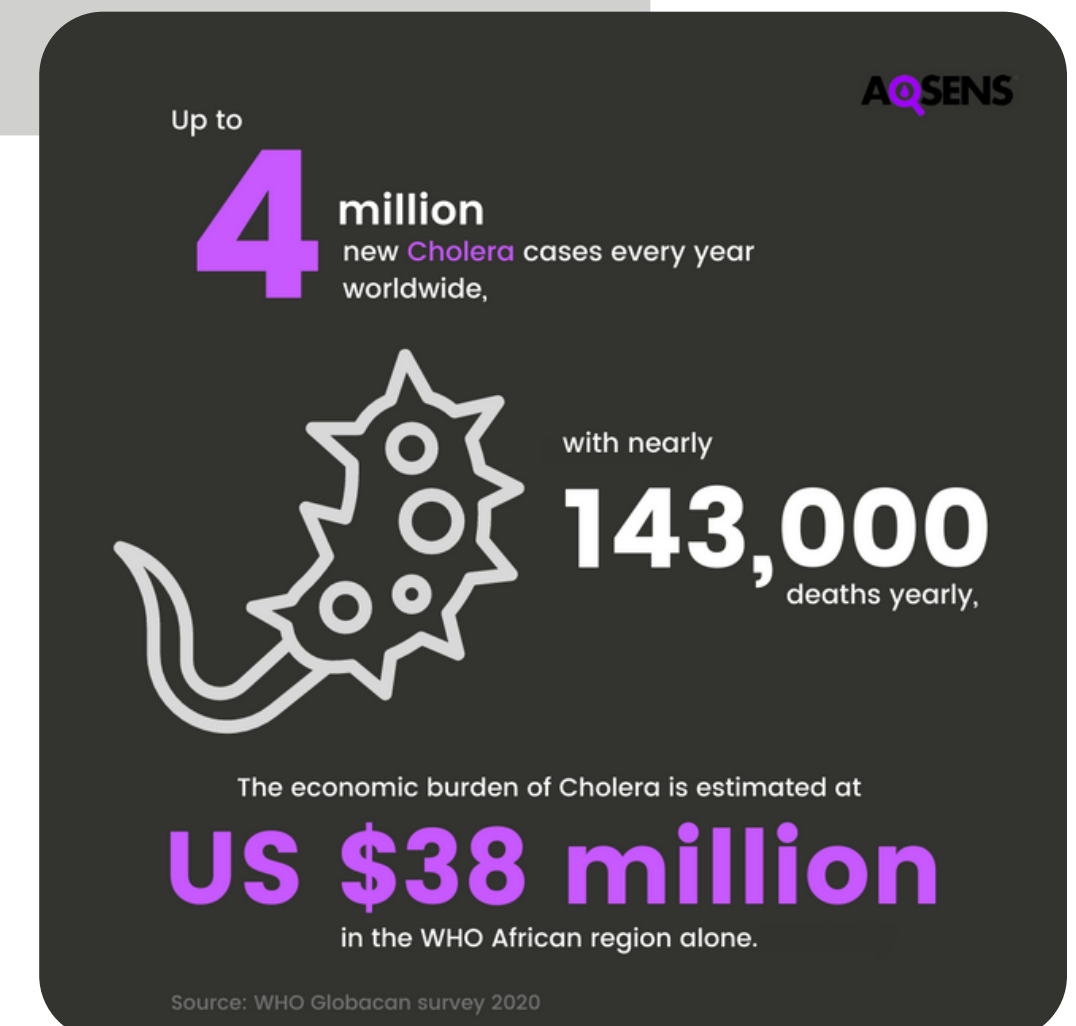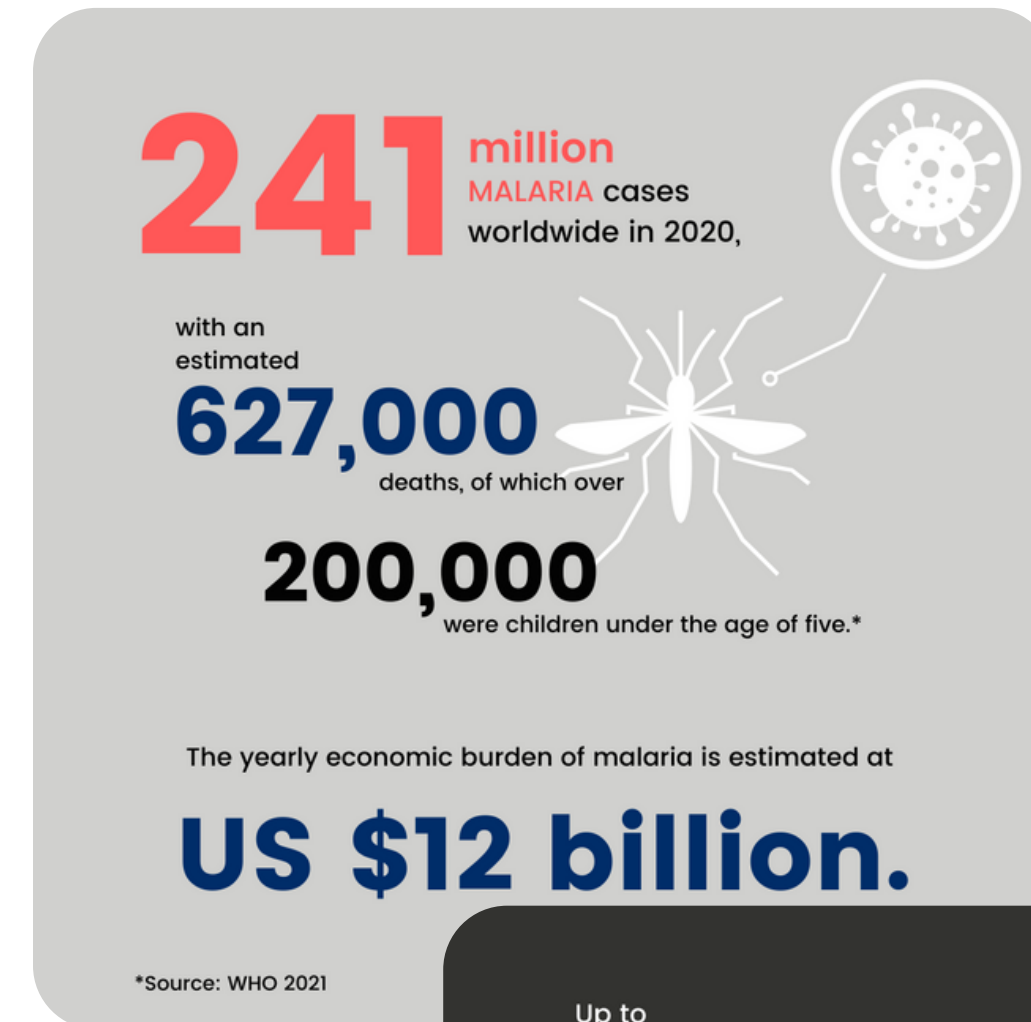**Focus: Malaria and tropical infectious disease**

Ongoing preclinical and clinical trial

- Detection of malaria from saliva samples, and the development of a mobile phage-based detection platform (AQ Mobi).

- Proof-of-concept studies agreed for tuberculosis and cholera in 1H 2023.

- **Collaborating parties:** Aqsens Health Ltd. and the Noguchi Memorial Institute for Medical Research (NMIMR), in Ghana.

The aims of the project are:

1. To assess the sensitivity and specificity of E-TRF and biosensors to detect malaria from saliva.
2. To perform a pre-clinical and clinical trial for biosensor assisted detection and screening of malaria.
3. To make market-entry with the AQ Malaria test, and then move on to the validation process of tuberculosis and cholera.

241 million MALARIA cases worldwide in 2020,

with an estimated **627,000** deaths, of which over

200,000 were children under the age of five.*

The yearly economic burden of malaria is estimated at

US $12 billion.

*Source: WHO 2021

Up to **4** million new Cholera cases every year worldwide,

with nearly **143,000** deaths yearly,

The economic burden of Cholera is estimated at

US $38 million

in the WHO African region alone.

Source: WHO Globacan survey 2020

BIOSALIVA

Project timeline: 2023 – 12 / 2025
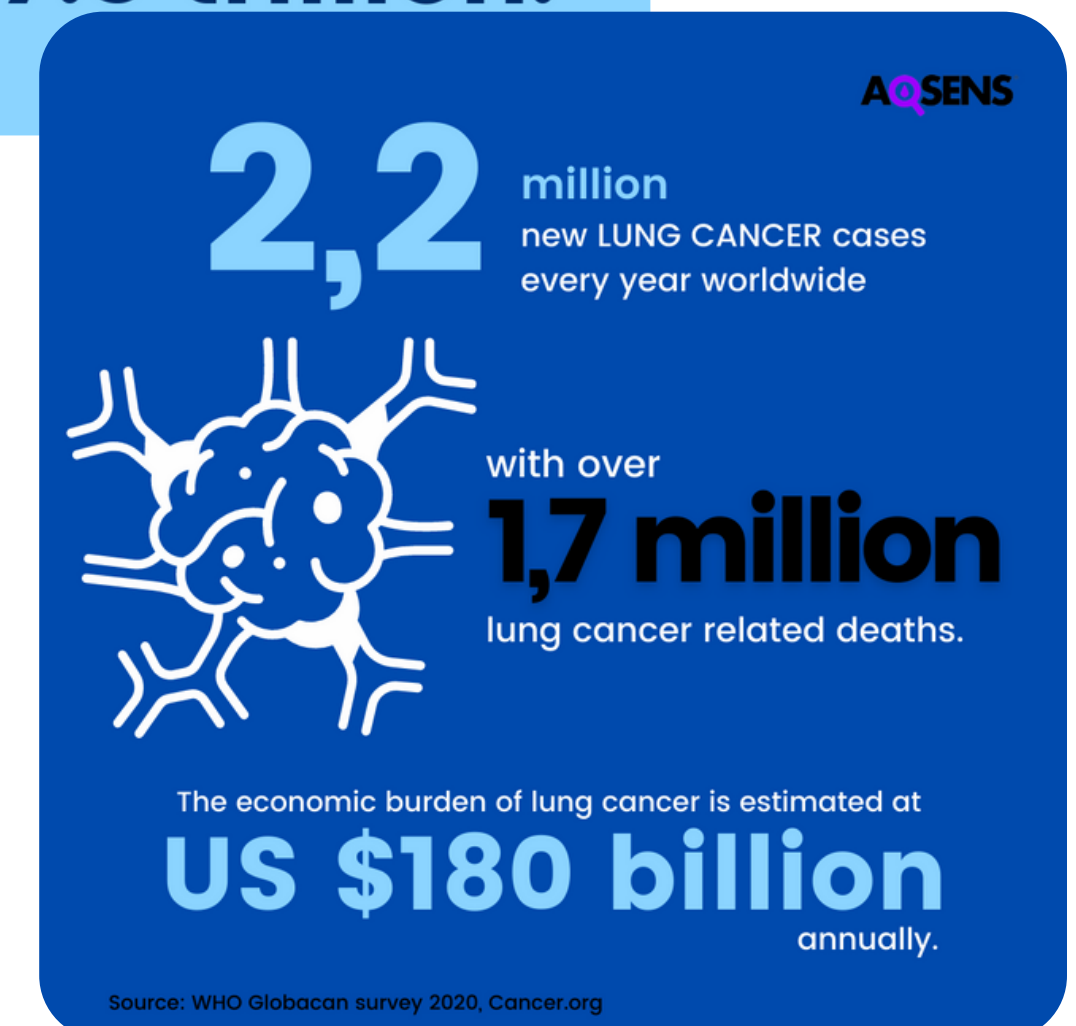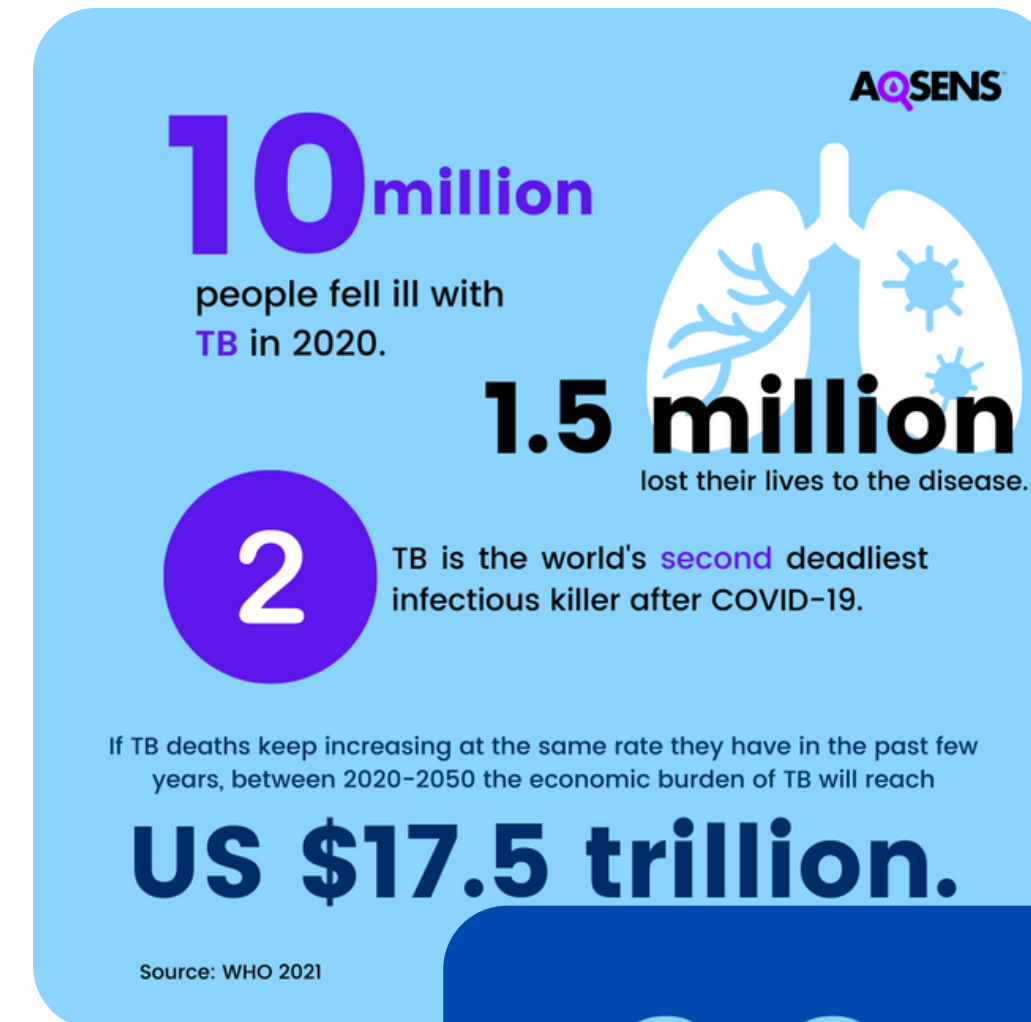**Focus: Lung cancer and Tuberculosis**

✓ Agreed / submitted

- Detection of saliva biomarkers for lung cancer and tuberculosis using phage-based biosensor technology.

- The mortality of lung cancer is very high and is still increasing in China, representing 37% of the cases and 39% of deaths globally.

- **Collaborating parties:** Aqsens Health Ltd. and Shanghai Jiao Tong University and Shanghai Public Health Clinical Center.

The aims of **BIOSALIVA** project are:

- To assess the sensitivity and specificity of the E-TRF and biosensor to detect two major pulmonary diseases: i) lung cancer and ii) tuberculosis.
- To perform a proof-of-concept and pre-clinical trial for biosensor assisted detection and screening of lung cancer and tuberculosis.

10 million people fell ill with TB in 2020.

1.5 million lost their lives to the disease.

2 TB is the world's second deadliest infectious killer after COVID-19.

If TB deaths keep increasing at the same rate they have in the past few years, between 2020-2050 the economic burden of TB will reach **US $17.5 trillion.**

Source: WHO 2021

2,2 million new LUNG CANCER cases every year worldwide

with over **1,7 million** lung cancer related deaths.

The economic burden of lung cancer is estimated at **US $180 billion** annually.

Source: WHO Globacan survey 2020, Cancer.org

Summary

1 Use of non-invasive samples and sampling processes will **significantly increase the efficiency of any health** diagnosis service in the world.

2 Aqsens Health and its E-TRF and biosensors are well positioned to **diagnose diseases from non-invasive samples like urine, saliva or stool .**

3 Aqsens Health is looking for **partnership models for clinical research and go-to market**.

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Thank You

Thank you for your attention, and please feel free to contact us with any questions.

@aqsens

📍 **PharmaCity**

Itäinen Pitkäkatu 4B 20520 Turku, Finland

✉ **Email**

contact@aqsens.com

🌐 **Website**

www.aqsens.com