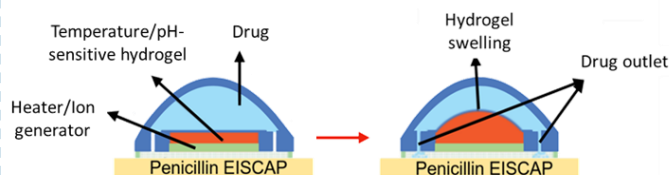## Future Steps

Further steps towards **drug-release systems:** Development of **pH and/or temperature-responsive hydrogels** as carriers;

- theoretical model of the drug-release process;
- proof-of-concept experiments on penicillin release as a model antibiotic and its detection with a digital EISCAP-based penicillin biosensor.

Temperature/pH-sensitive hydrogel
Drug
Hydrogel swelling
Drug outlet
Heater/Ion generator
Penicillin EISCAP
Penicillin EISCAP

EISCAP: electrolyte-insulator-semiconductor capacitor

About Us

Principal Investigators:

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National Academy of Sciences
A.B. Nalbandyan
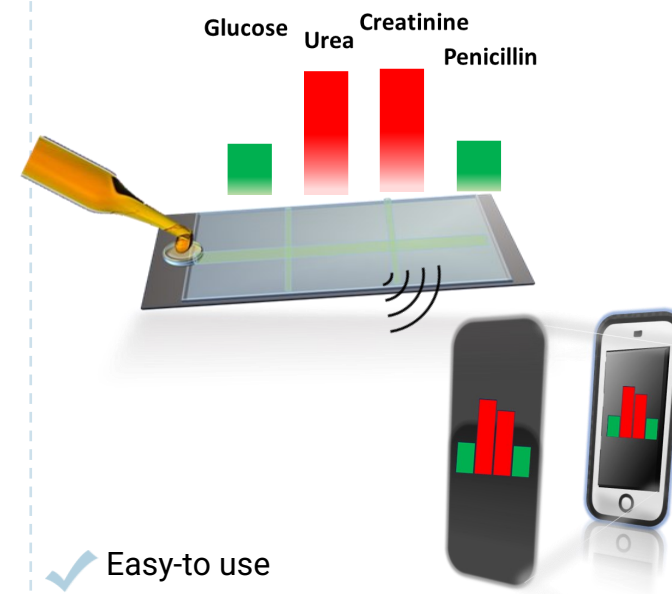Institute of Chemical Physics

You can find us here

Digital biosensors and actuators for urinalysis and sense/act/treat systems
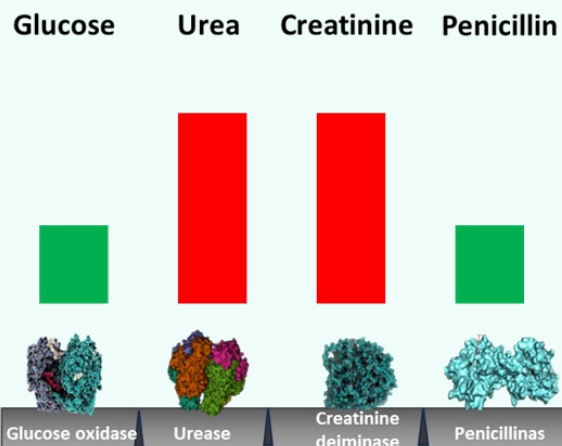
UroLogic*Chip*

Urinalysis point-of-care digital biosensor

Multi- analyte detection of several biomarkers in urine with enzyme-modified sensor, such as **glucose, urea, creatinine, penicillin**.

Glucose
Urea
Creatinine
Penicillin

- ✓ Easy-to use
- ✓ Homecare, in-field settings
- ✓ Non-invasive method
- ✓ Exchangable and combinable

Digital biosensors and actuators for urinalysis and sense/act/treat systems

Detection of multiple biomarkers in urine

Glucose   Urea   Creatinine   Penicillin

Glucose oxidase   Urease   Creatinine deiminase   Penicillinas

Multi-analyte detection of biomarkers from the urine sample including:

* **Glucose**
* **Urea**
* **Creatinine**
* **Penicillin**

with enzyme-modified sensor, via pH changes induced by the enzymatic reaction.

The main aim of the proposed project is the conception, modelling and development of an array of digital biosensors (so-called **UroLogicChip**) for the Point-of-care (POC) detection of various urinary biomarkers. The device can be used for rapid evaluation of the overall physical state.

Urine sample
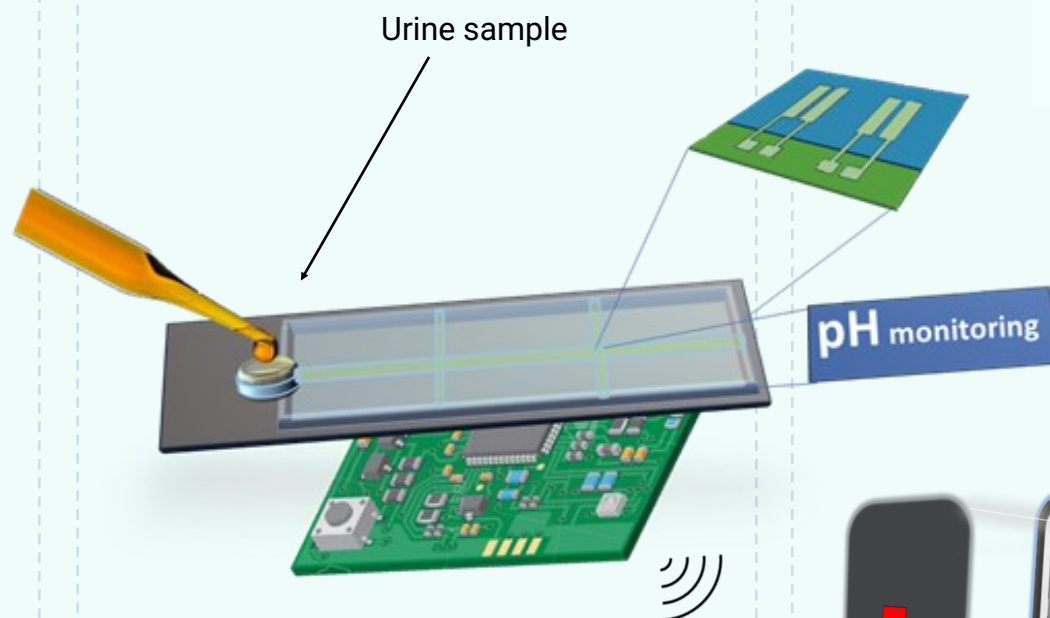
pH monitoring

Simultaneous measurement of several clinically relevant biomarkers used in diagnosis of e.g. renal dysfunction and diabetes mellitus

Parallel conductivity and pH monitoring with miniaturised capacitive coupled contactless conductivity and pH-sensitive sensors

pH sensitivity = 52 mV/pH
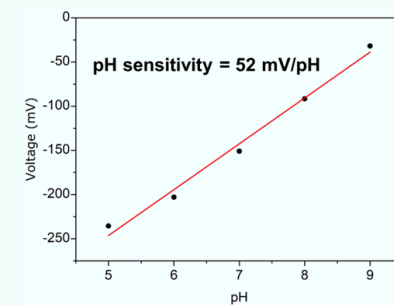
Near-Nernstian pH-sensitive Ta_2O_5 sensing membrane, is a perfect platform for recording the pH changes on the sensor surface.
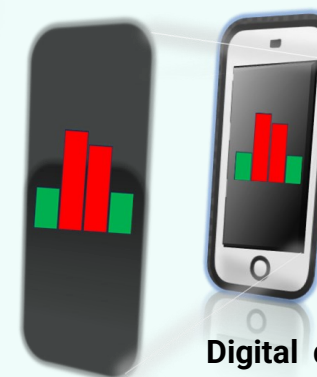
Digital display of the results in YES/NO format with cut off values for each biomarker