

DEVELOPMENT OF A MICROFLUIDIC PAPER-BASED SENSOR FOR ALUMINIUM ASSESSMENT IN WATER FOR DOMESTIC CONSUMPTION

Juliana I. S. Aguiar*, António O. S. S. Rangel, Raquel B. R. Mesquita

Universidade Católica Portuguesa, CBQF – Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005, Porto, Portugal

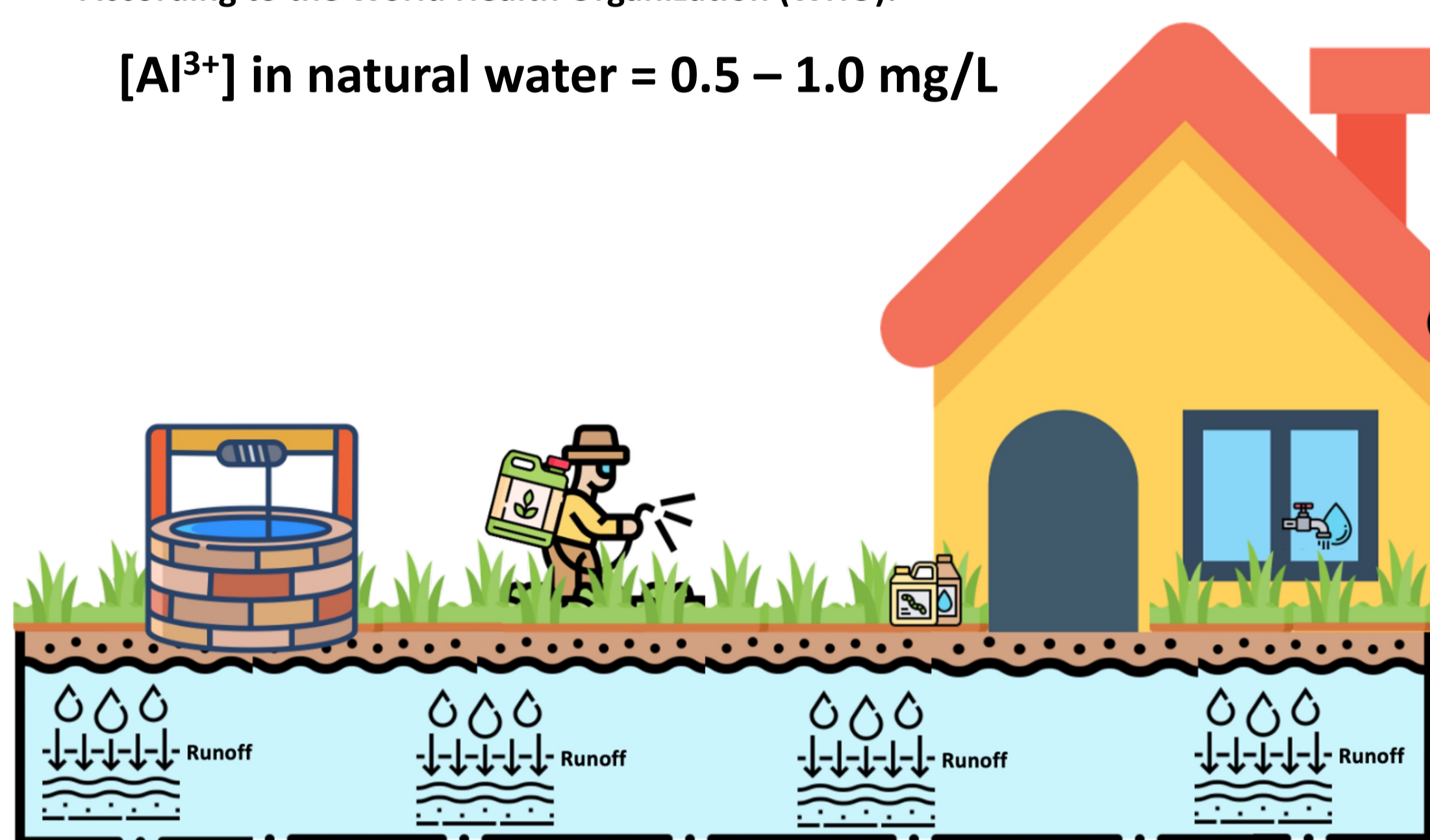
*E-mail: s-jisaguiar@ucp.pt

Introduction & Objective

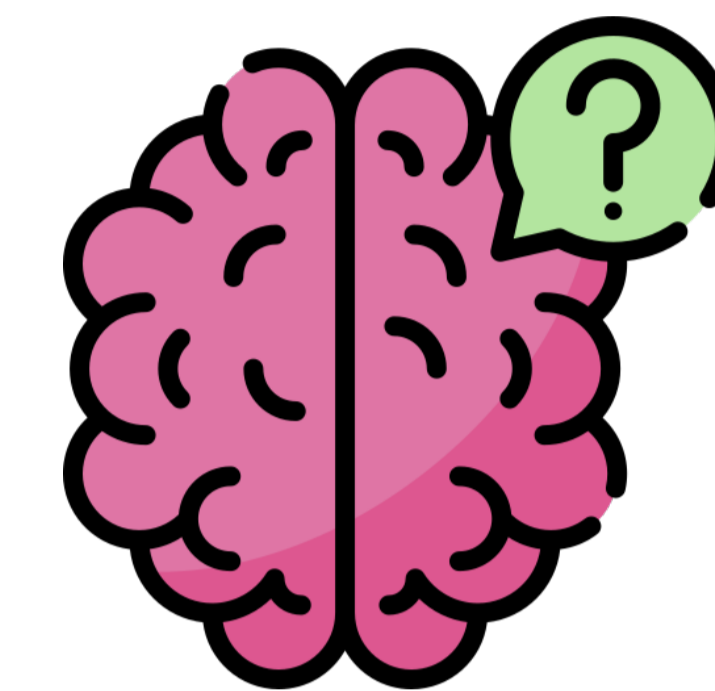
Why is so important to assess the water quality in private wells?

According to the World Health Organization (WHO):

$[Al^{3+}]$ in natural water = 0.5 – 1.0 mg/L



Aluminium exposure can lead to several health conditions and diseases



Alzheimer's disease



Parkinson's disease



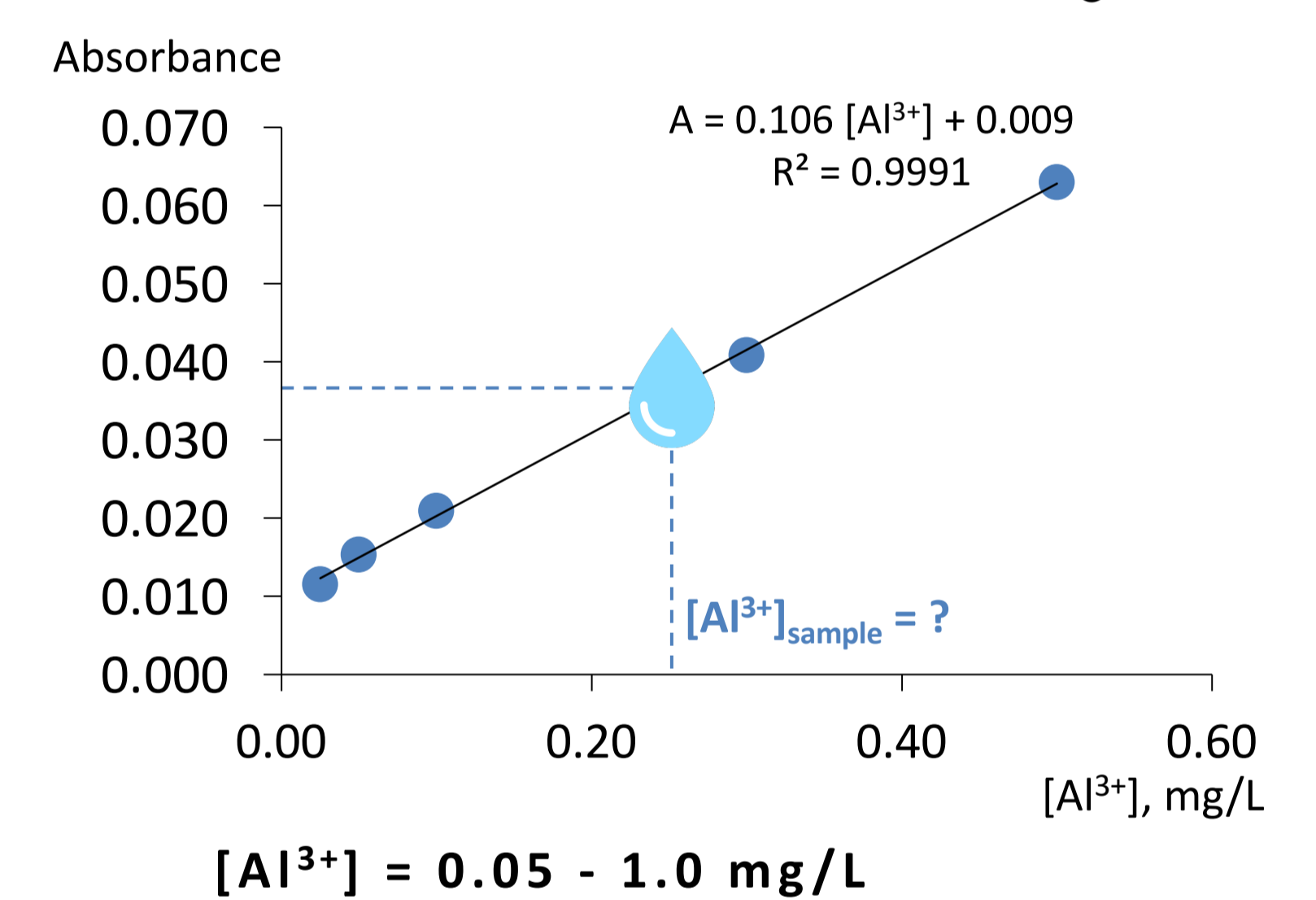
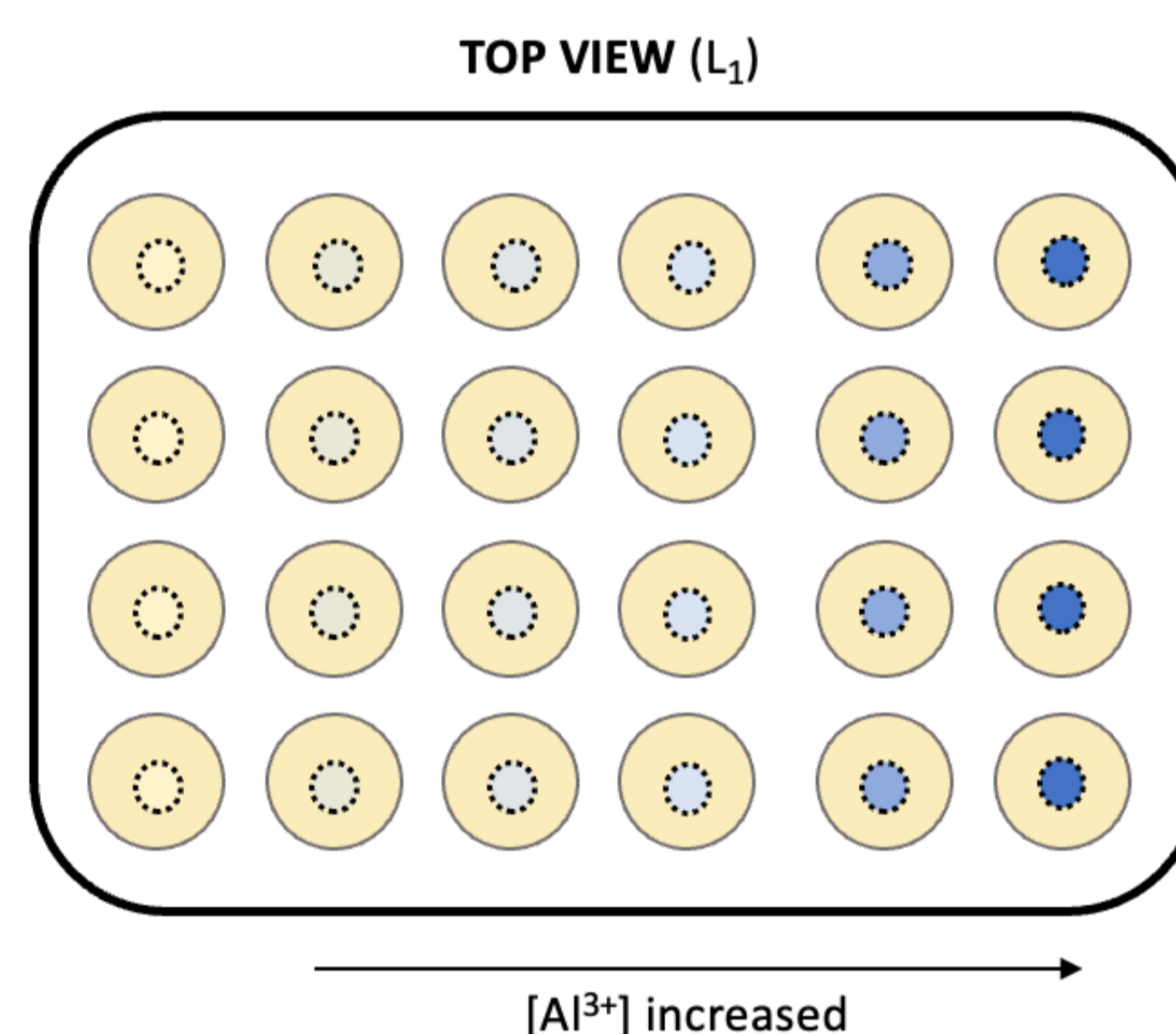
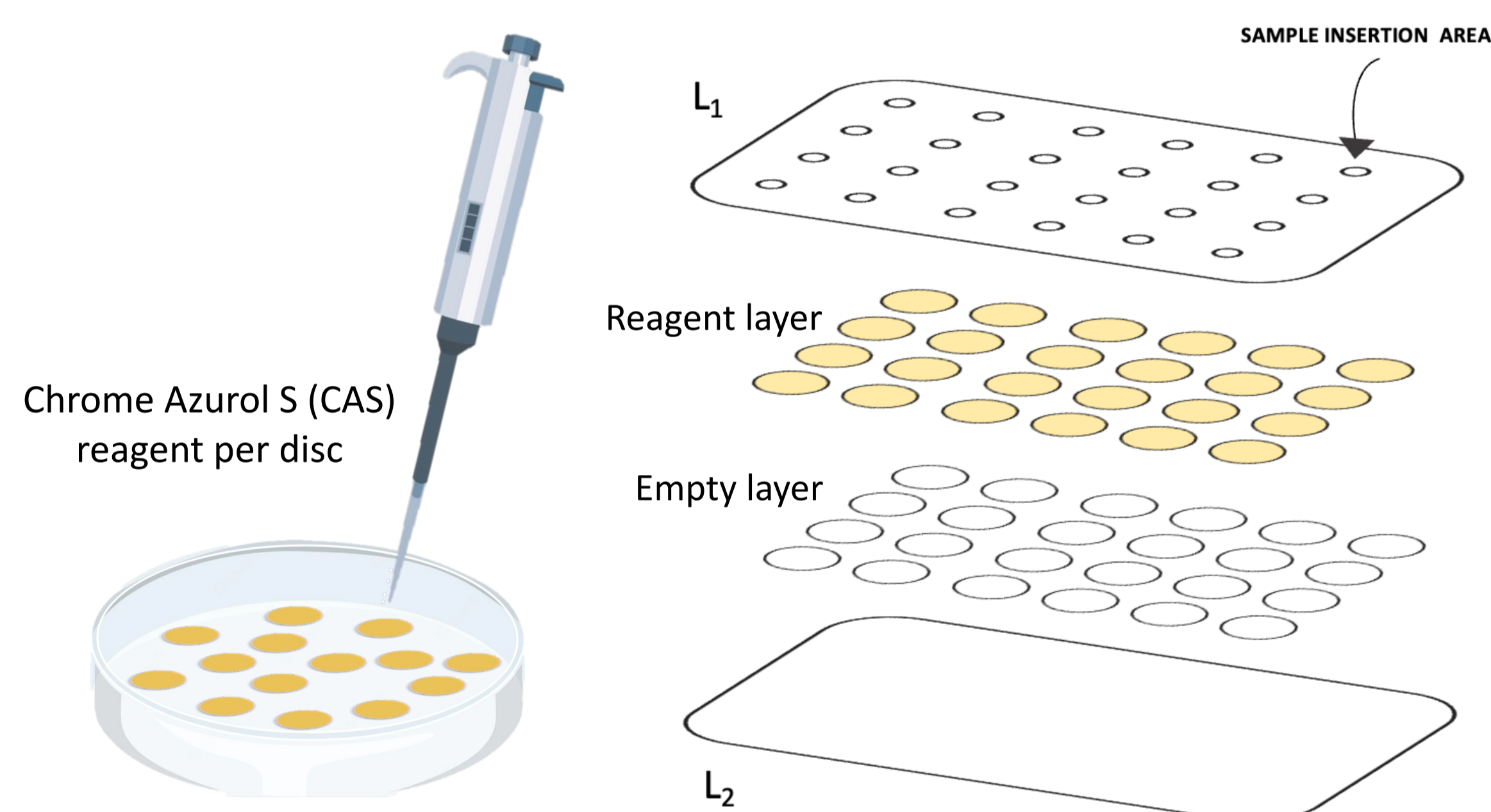
Multiple sclerosis



Autism

Methods

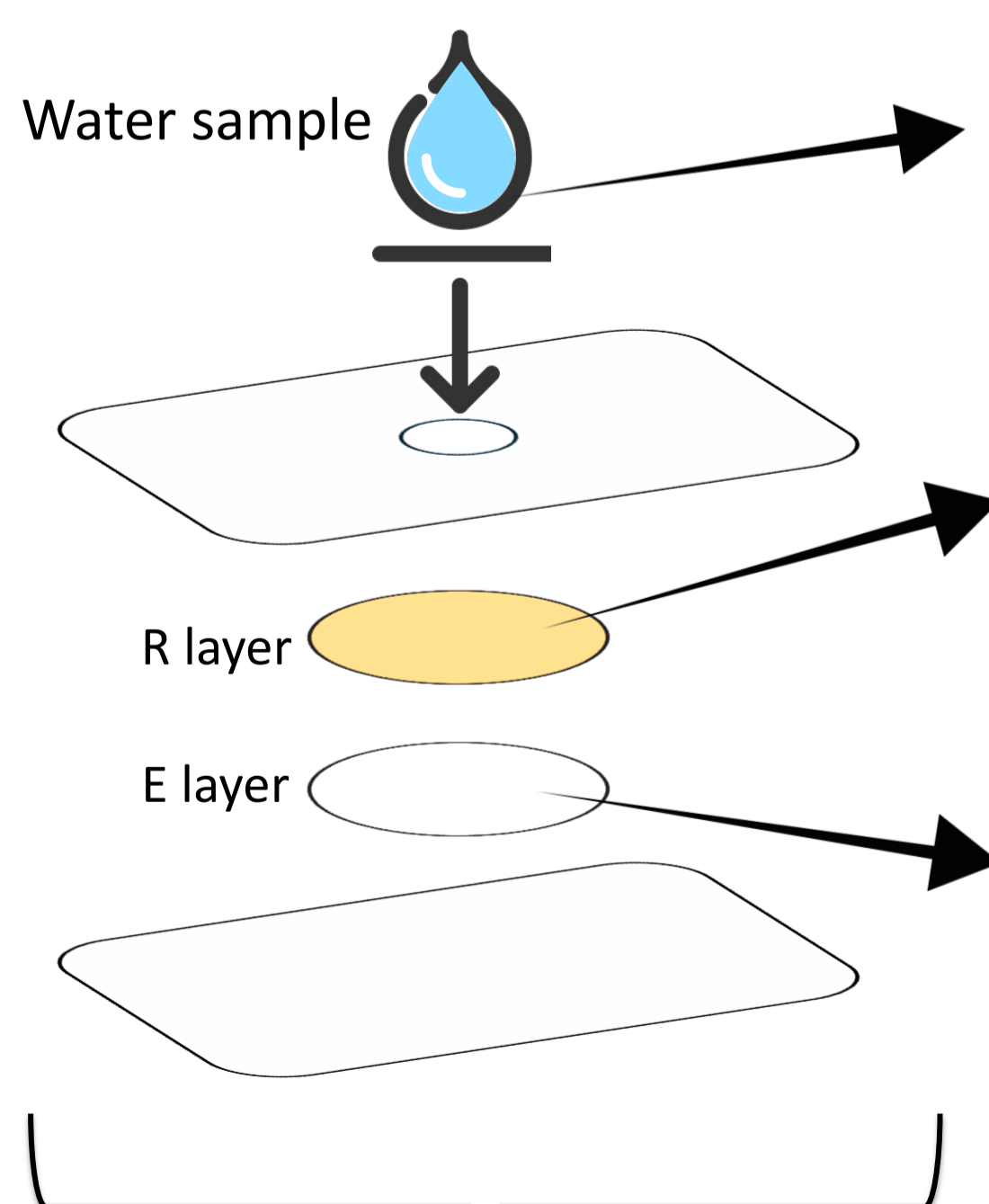
Development of a **microfluidic paper-based device** to contribute to an **in-the-moment assessment** of water sources for human consumption



Results

μPAD Optimization studies:

WORK ON GOING...



Sample volume: 10 - 40 μ L (**20 μ L**);

Reagent layer optimization:

- Colour reagents: ERC and CAS (**CAS**);
- Type of the filter paper: qualitative, ashless quantitative, hardened low ash and hardened ashless (**qualitative**);
- Paper porosity: 2.5 - 25 μ m (**11 μ m**);
- CAS concentration: 0.2 - 1.0 g/L (**1.0 g/L**);

Empty layer optimization:

- Paper porosity: 2.5 - 25 μ m (**11 μ m**);
- Paper thickness: 180 and 390 μ m (**390 μ m**);
- Diameter of the paper disc: 9.5 and 12.7 mm (**9.5 mm**);

μPAD design optimization:

- Number of layers: 1, 2 and 3 layers (**2 layers**);
- Reagent layer: first or second layer (**in the first layer**);

Conclusions & Future work

Low cost and rapid analysis
real-time monitoring of water quality



Early diagnostic tool for potential health risks associated with aluminium exposure



User-friendly operation: accessible to a wide range of users, including homeowners with private wells



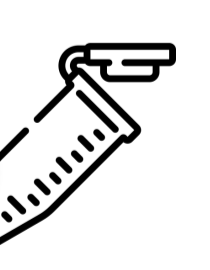
μPAD designed according to the World Health Organization (WHO) guidelines



Disposable and environmentally friendly



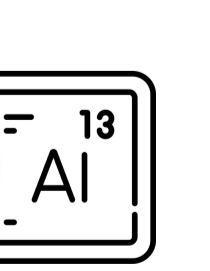
Small sample volume



Portability: easily transportable to remote locations



Aluminium determination in water for domestic consumption



Acknowledgements

Juliana I. S. Aguiar thanks FCT – Fundação para a Ciência e a Tecnologia for the grant 2023.00790.BD. This work was also supported by National Funds from FCT through project UIDB/50016/2020.