

## A public health tool for monitoring aluminium levels in environmental and biological samples

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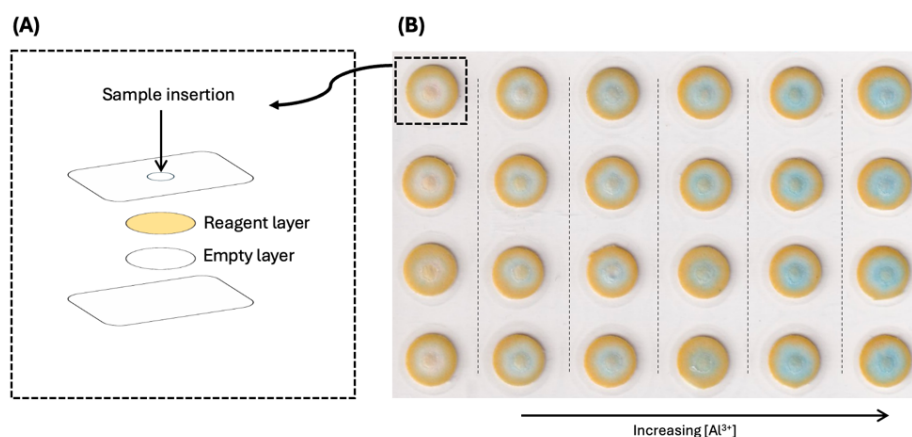
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Aluminium is an element with potential toxic effects, particularly when exposure exceeds safe limits. Drinking water is a key matrix for assessing environmental contamination and human exposure, since long-term intake of high aluminium concentrations has been associated with several health issues, including Alzheimer's disease. Additionally, monitoring aluminium in urine provides an important measure of cumulative exposure.

In this work, we report the development of a microfluidic paper-based analytical device ( $\mu$ PAD) for the determination of aluminium in both water and urine samples. The device relies on colorimetric detection using Chrome Azurol S (CAS), which forms a blue complex with aluminium ions. The intensity of the blue colour increases proportionally with the aluminium concentration, as illustrated in Fig. 1. Several physical and chemical parameters were optimized to achieve the best analytical performance, including the type and porosity of the filter paper, reagent volumes and concentrations, and sample volume. The final design consists of two paper layers: the top layer contains the CAS solution and acetate buffer solution, while the bottom layer is used as a reservoir to allow a higher sample volume. Aluminium determination in drinking water was successfully achieved, and the  $\mu$ PAD was further adapted for urine analysis, with ongoing studies addressing potential interferences.

This paper-based platform provides a simple, low-cost, and rapid analytical tool that does not require sophisticated instrumentation and shows strong potential for environmental monitoring and human biomonitoring.



**Fig.1.** Schematic representation (A) and a real image (B) of the developed  $\mu$ PAD for aluminium quantification.

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