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BOOK OF ABSTRACTS

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MICROFLUIDIC PAPER-BASED ANALYTICAL DEVICE (μPAD) FOR SALIVARY AMMONIA/AMMONIUM

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A microfluidic paper-based analytical device (μPAD) was developed as a low cost, easy-to-use, disposable sensor for potential quantitative analysis of ammonia in saliva samples. The principle for the determination is based on the colour change of the bromothymol blue (BTB) indicator, produced by a change in pH; it shows a clear colour change from yellow to blue in the transition range of pH 6.0 - 7.6. The colour change was measured by using a desktop scanner and ImageJ software to analyze the recorded image.

Preliminary experiments were carried out using direct deployment of ammonia standards in the μPAD. The μPADs size was 75 x 105 mm and contained twenty circular hydrophilic sample zone and detection zone. The effect of indicator concentration was studied in the range from 0.13 – 0.65 mM. A 0.65 mM BTB concentration provided the highest sensitivity of ammonia detection in the linear range of 0 – 150 mg/L: $A = (0.10 \times 10^{-3} \pm 0.03 \times 10^{-3})$ x mg/L NH_3 – $(3.2\times 10^{-3} \pm 2.2 \times 10^{-3})$ ($r^2 = 0.996$). To apply this method to saliva samples, studies are now focused on isolating ammonia from the matrix, using gas-diffusion. Therefore, we are designing a μPADs with 3 layers, consisting of sample zone as the first layer, impregnated with the sodium hydroxide for conversion ammonium to ammonia. The second layer is a polytetrafluoroethylene (PTFE) hydrophobic membrane. It will allow the produced ammonia from sample zone to diffuse and react with BTB reagent at detection zone, which is the third layer. The developed μPADs approach could be useful for making point-of-care device to quantify the level of salivary ammonia/ammonium associated with some oral disease.

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