Supplementary Information

Fluorescent Carrier Ampholytes Assay for Portable, Label-Free Detection of Chemical Toxins in Tap Water

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We here present further details on the geometry of the custom-made chip we used in the detection of 2-nitrophenol and 2,4,6-trichlorophenol on our hand-held device (Figure 6 in the main paper), and provide the injection protocol we used. In Figure S3 we present an example where the fluorescent carrier ampholytes assay is used for detection of analytes in cationic isotachophoresis.

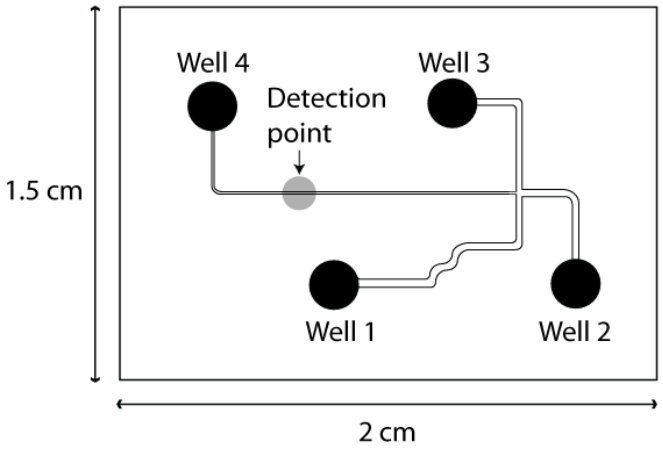

Figure S1: Schematic of the custom fabricated microfluidic chip used with the hand-held device. A uniform 10μm wide mask was used for all the channels. The wide/deep and the narrow/shallow sections were isotropically etched to depths of 25 μm and 5 μm respectively (resulting in respective widths of 60 μm and 20 μm). The channels between reservoirs 2 and 3 and the intersection were not directly used for this assay. The total path lengths from reservoir 4 to the intersection and from the intersection to reservoir 1 are 17 mm and 11 mm respectively.

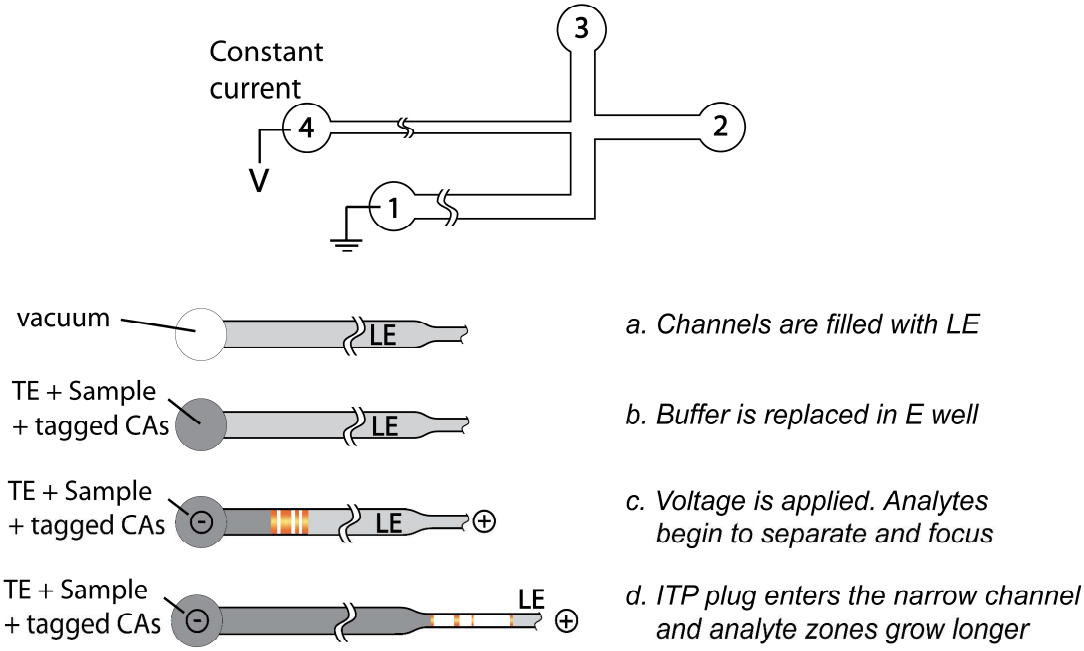

Figure S2. Schematic of the isotachophoresis (ITP) injection protocol on the microfluidic chip described in Figure 1S. (a) We filled reservoirs 2,3 and 4 with leading electrolyte (LE) and applied vacuum to reservoir 1 until all channels are filled, then (b) rinsed reservoir 1 several times with distilled water and filled it with the mixture of trailing electrolyte (TE), analyte and labeled carrier ampholytes. (c) After placing the electrodes in reservoirs 1 and 4, we applied constant voltage, and (d) detected the fluorescent signal at the narrow part of the channel, where the ITP zones are longer and the SNR of analyte detection is higher.

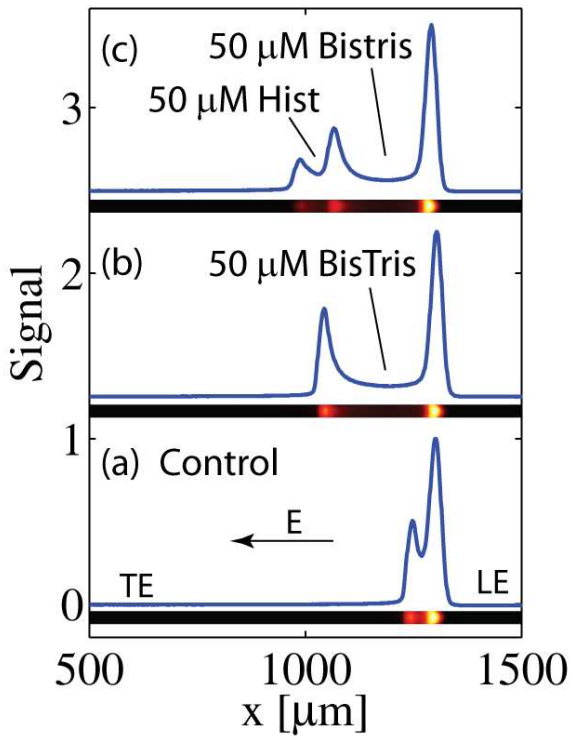

Figure S3: Demonstration of the FCA assay for detection of bis-tris and histidine in cationic ITP. As in the case of anionic ITP, groups of fluorescent carrier ampholytes are displaced by the analyte zone creating a gap in the signal. Experiments performed on an epifluorescent microscope. Raw inverted-intensity images of the fluorescent peaks are presented under each signal. Here, we labeled carrier ampholyte mixture with a pI range of 3-10 with carboxyrhodamine 6G. The LE is 10 mM sodium, TE is 10 mM pyridine and counterion is 20 mM HEPES. We preforemd the experiments on the Caliper N95 chip at a constant voltage of 1100 V, and with a 2 ms exposure time.