Electronic Supplementary Material (ESI) for RSC Sustainability.

Supporting Information

How Impurities Responsible for Recalls Emerge in Hand Sanitizers

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Table S1. The detection and quantification limits for each analyte, alongside their respective retention times for analysis by GC-MS.

Impurities in samples	Retention time (mins)	LOD (mg/mL)	LOQ (mg/mL)
Ethyl acetate	4.42	0.004	0.01
Ethanal	2.68	0.004	0.01
Acetal	4.57	0.005	0.02

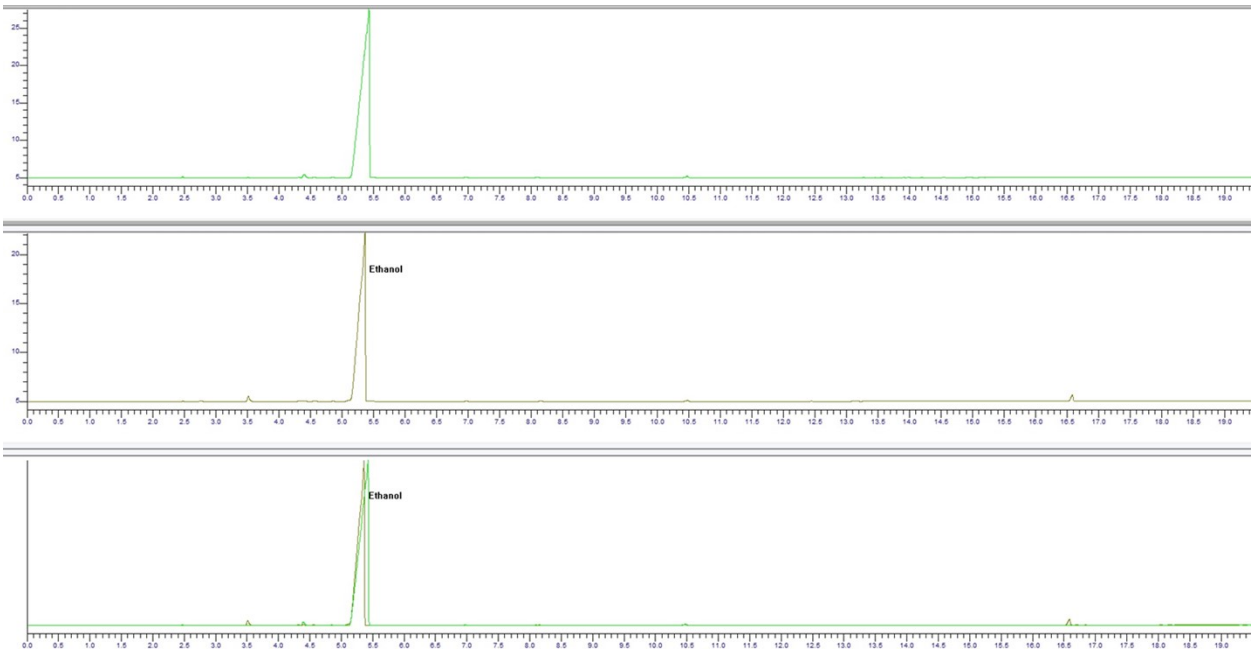

Figure S1. The proportion of ethanol in two different samples analyzed at different times in the study.

Fig. S2

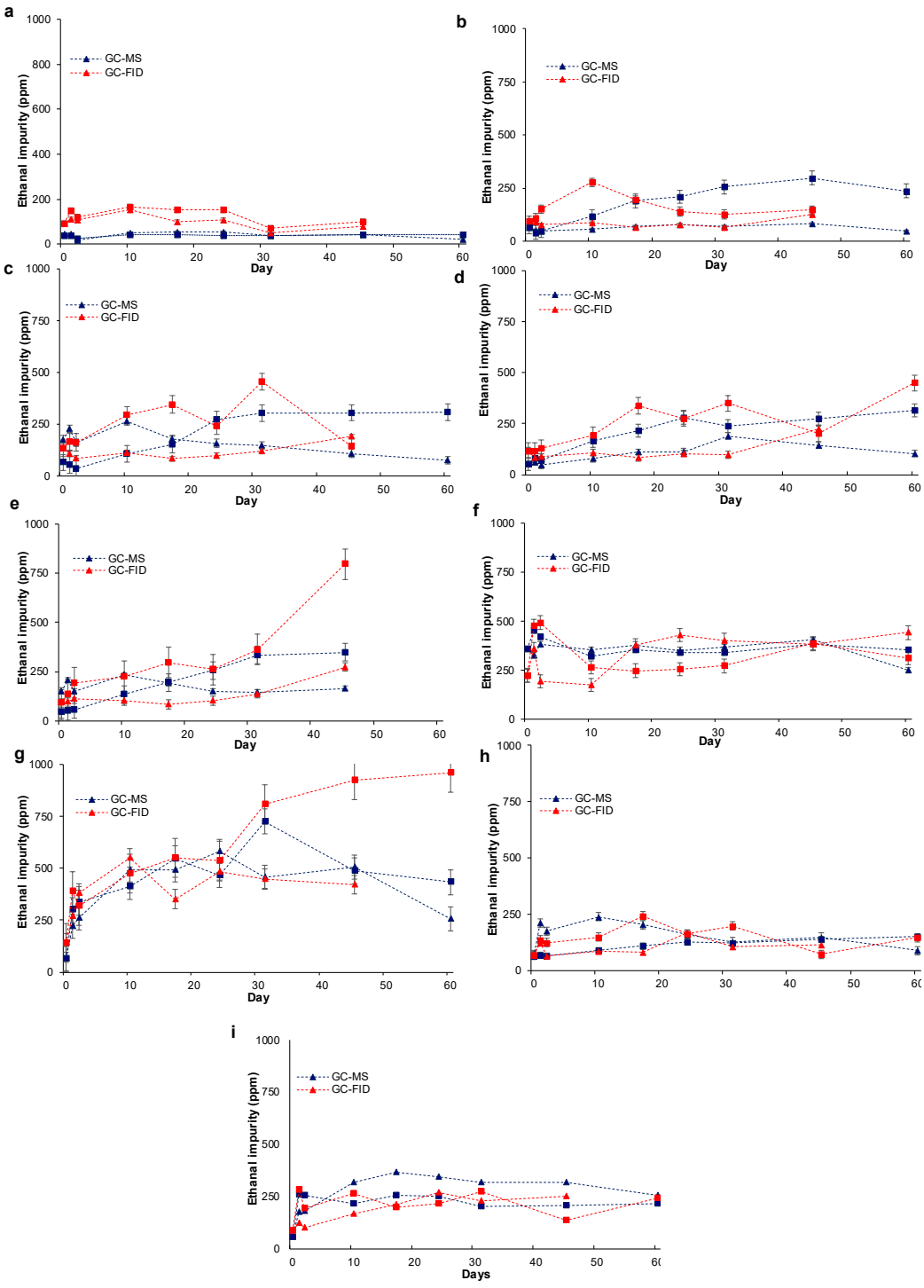

Figure S2. Analysis of ethanal concentration in ABHS. Analysis by GC-MS and GC-FID was shown by dark blue and red colors, respectively. Analysis in RT was shown by (▲) and in 45˚C was shown by (■). **a** F-0; **b** F-1; **c** F-2; **d** F-3; **e** F-4; **f** F-51; **g** F-52; **h** F-6; **i** F-7.

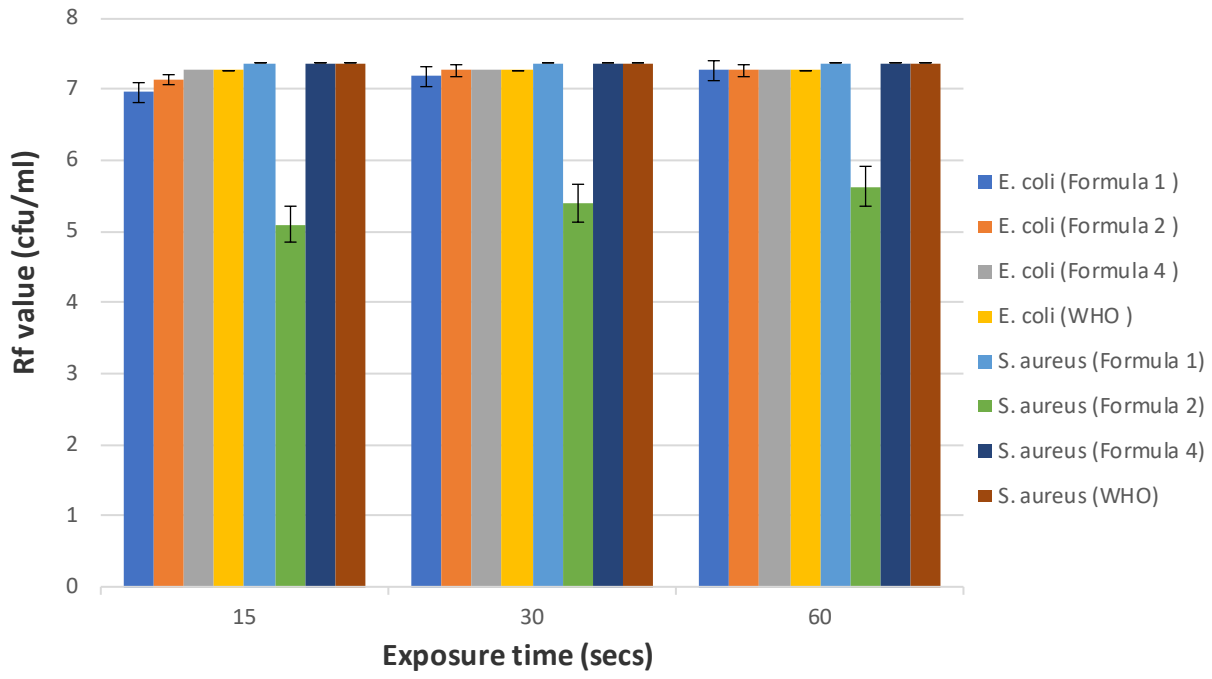

Figure S3. Summary of the efficacy of the hand sanitizer to the challenge organisms in simulated dirty conditions. The y-axis represent the logarithmic reduction of colonies present after treatment of the inoculum compared to the control inoculum. The error bars represent the standard deviation of three independent trials against three different batches of inoculum.

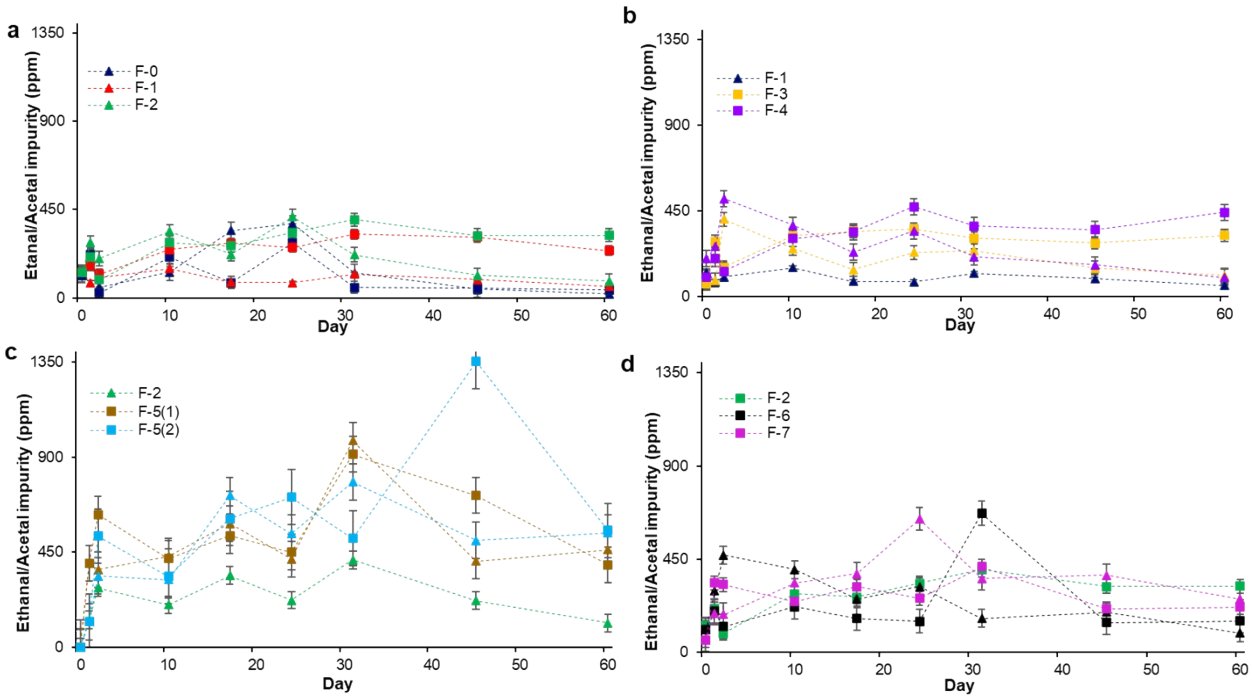

Figure S4. Analysis of combined ethanal and acetal concentration in ABHS. Comparison between **a) F-0**, **F-1** and **F-2**; **b) F-1**, **F-3** and **F-4**; **c) F-2**, **F-5(1)** and **F-5(2)** and **d)** Comparison of **F-2**, **F-6** and **F-7** formulations. Analysis in RT was shown by (▲) and in 45˚C was shown by (■).

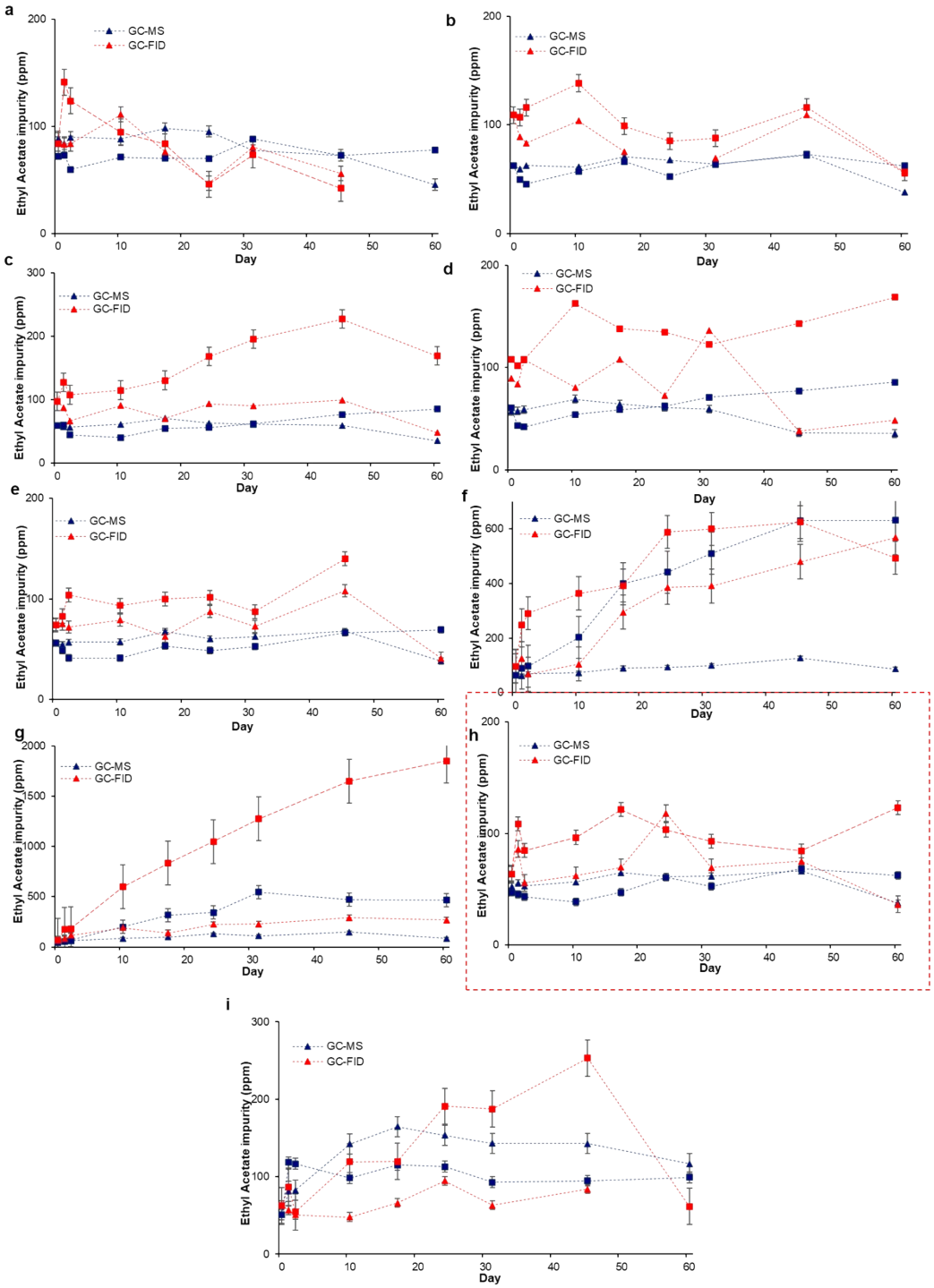

Figure S5. Analysis of ethyl acetate concentration in ABHS. Analysis by GC-MS and GC-FID was shown by dark blue and red colors, respectively. Analysis in RT was shown by (▲) and in 45˚C was shown by (■). **a** F-0; **b** F-1; **c** F-2; **d** F-3; **e** F-4; **f** F-51; **g** F-52; **h** F-6; **i** F-7.

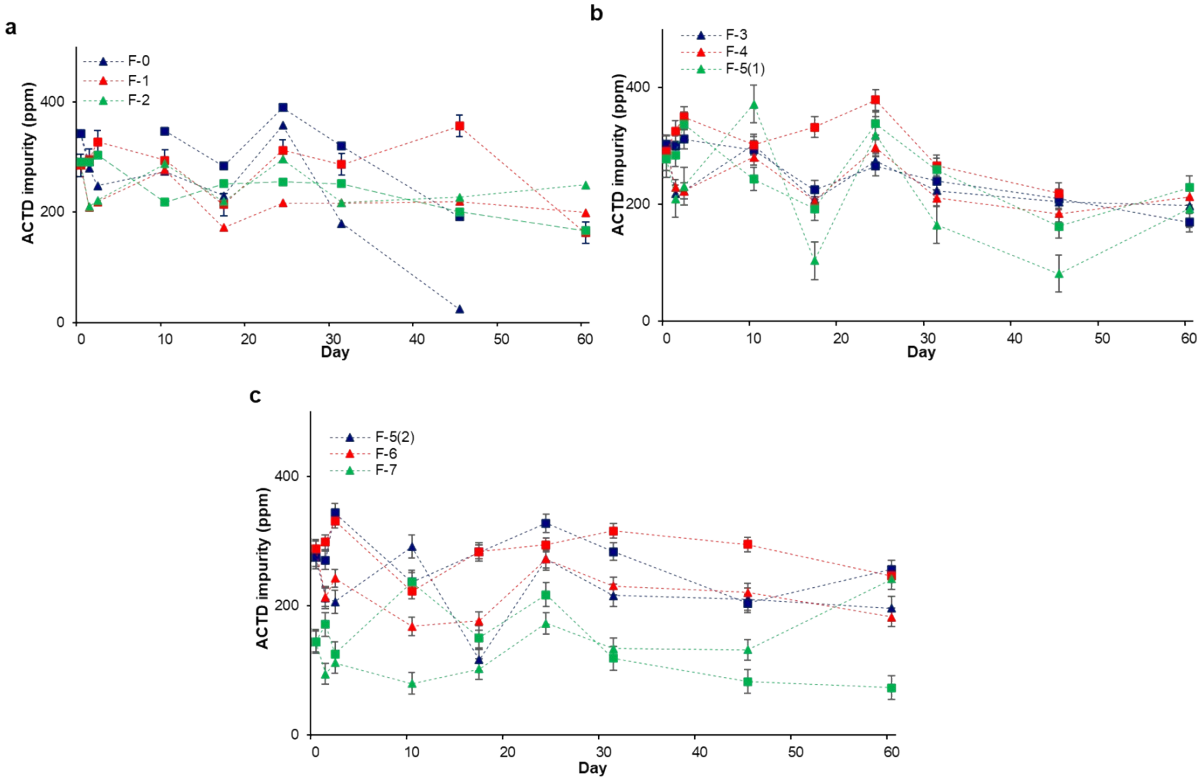

Figure S6. Analysis of ACTD concentration in ABHS. Comparison between **a) F-0**, **F-1** and **F-2**; **b) F-3**, **F-4** and **F-5(1)** and **c) F-5(2)**, **F-6** and **F-7** formulations. Analysis in RT was shown by (▲) and in 45˚C was shown by (■).

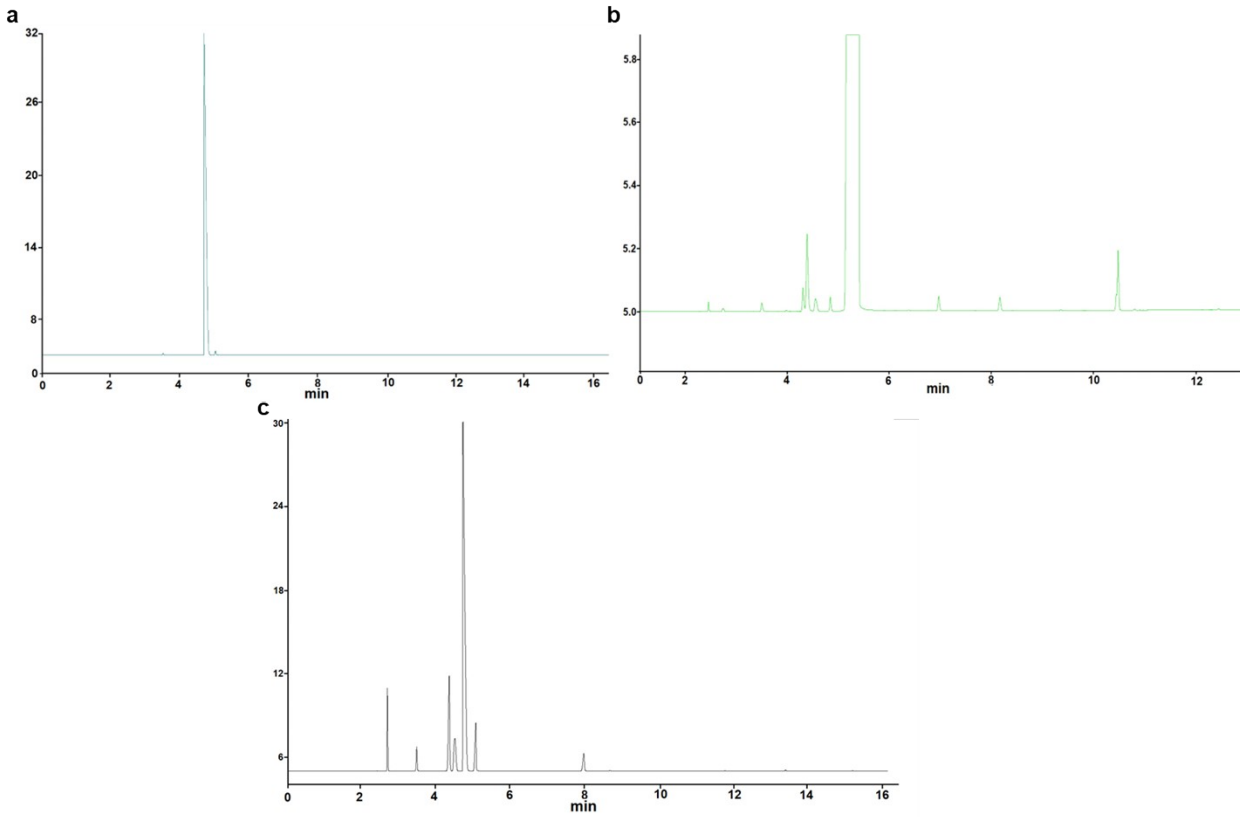

Figure S7. Chromatograms of a) blank, b) sample and c) standards to determine specificity of the method for detecting target analytes.