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## Book of Abstract

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## P22

### Development of a Voltammetric Screening Method for Pharmaceutical Pollution in Waters

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Pharmaceutical pollution is a growing concern all over the world. It is estimated that over 100,000 tonnes of active pharmaceutical ingredients (APIs) are consumed globally every year [1]. Medicinal products can enter the environment through manufacturing processes, consumption, improper disposal and lack of wastewater treatment plants designed to remove or degrade pharmaceuticals [2]. Although various APIs have been detected in all the environmental compartments, at concentrations in the range of sub-ng/l to more than the mg/l [2; 3], there is still insufficient knowledge about the ecotoxicological impact on exposed species [4; 5]. Moreover, the monitoring of pharmaceuticals in the environment is limited by the heterogeneity of these substances and their metabolites, their low concentrations, which could make quantification difficult, and the high analysis costs [2]. For these reasons, the availability of analytical methods that can provide fast and simple monitoring has become crucial. Hence, the aim of this research is to develop a low-cost and easy method that can be exploitable for on site analysis of waters. For this purpose, voltammetric methods were chosen; all the measurements were carried out with a portable potentiostat, using carbon paste electrodes (CPEs) as working electrode differential pulse voltammetry (DPV). This study focused on two of the most used analgesics and antipyretics, namely acetaminophen (APAP) and diclofenac (DCF), though the final purpose is to obtain a fingerprint of different APIs. Firstly, the responses of both APAP and DCF were tested at pH values ranging from 2 to 10, to observe the effects of pH on redox behaviour, sensitivity and repeatability. Furthermore, stability was explored through UV-VIS analysis and electro-degradation. Subsequent scans of DCF solutions lead to the detection of a second peak (pH range 5-10), plus a third one (pH range 2-4). The best analytical conditions, the use of the developed method to analyse pharmaceuticals trapped by polar organic chemical integrative samplers (POCIS) was investigated. HLB (Hydrophilic Lipophilic Balance) sorbent solid phase extraction (SPE) cartridges were used to reproduce POCIS on a small. Aqueous solutions of APAP and/or DCF were analysed before and after flowing through the SPE cartridge. Next, the compounds retained by HLB were eluted with methanol and the eluate was collected in a Petri dish and mixed with graphite and paraffin oil, a carbon paste incorporating the compounds extracted from the HLB solid phase was obtained and a CPE was then prepared. Voltammograms reporting the redox signals of APAP and/or DCF were recorded. Being the analytes in solid phase, the method appears to gain in sensibility, but their quantification is not possible. The method is applicable as qualitative screening, to reveal the presence of pharmaceuticals trapped on passive samplers. The next steps of the research will be to study the electrochemical behaviour of other APIs and then apply the method to real water samples, to obtain a fingerprint revealing the presence, or the absence, of pharmaceuticals.

The proposed method is fast, easy and cheap and enables to decrease the number of samples that need to be analysed with more sophisticated and expensive techniques.

#### References

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**To Whom It May Concern**

Dear Madam or Sir,

We confirm that **Dr. Paolo Inaudi** participated at Recent Developments in Pharmaceutical Analysis (RDPA 2021), 6-8 September 2021, Modena - Italy.

Dr. Paolo Inaudi is author/co-author of the following accepted contribution(s):

P22 - Development of a Voltammetric Screening Method for Pharmaceutical Pollution in Waters

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**Presenting Author:** Inaudi, Paolo

**Status:** Poster

**Session Details:** Poster 1-3, **Time:** Monday, 06/Sept/2021: 5:30pm - 6:30pm

With best regards,

Prof. Federica Pellati  
*RDAPA2021 Conference Chair*