Proposals for NORMAN Joint Programme of Activities 2023

Title	**Expanding and validating the chemical space of non-target screening workflows**
Type of activity	Research
Leader	Nikolaos S. Thomaidis (University of Athens)
Topic / activities	***Background / Justification for the proposed activity:*** In 2020, an activity to study the coverage of the chemical domain by the non-target screening workflows was launched. The objective of the activity was to develop models able to answer whether a compound is amendable to an analytical method by having individual predictions for sample extraction, chromatography and ionization source. The models allow the investigation of the expansion of the chemical space that is achieved by the employment of new analytical platforms e.g., hydrophilic interaction liquid chromatography (HILIC) and novel ionization techniques e.g., atmospheric pressure chemical ionization (APCI). The developed methods can provide critical information on the covered chemical space and the limitations introduced by the sample extraction methods and instrumental methods. Understanding these gaps can help the NTS community to design new analytical methods and NTS workflows. For example, the analysis of polar compounds requires specific sample preparation methods and chromatography, which if not applied properly create "blind spots" in the determination of suspect and unknown compounds. The models were used to predict the most appropriate instrumental analytical platform and the information is already available in the NORMAN SusDat. The activity allows better exploitation of the enormous capabilities of modern instrumental analysis for the detection of emerging pollutants (EPs) by non-target HRMS screening. Moreover, these efforts will be communicated to the researchers with a high-impact peer-reviewed scientific publication. ***Description of the proposed activity*** This activity aims to evaluate the models at the interlaboratory level, assess their predictions in improving the NTS workflows, and improve the models by the provided feedback. To achieve these objectives, we will provide NORMAN members end user application to make chemical space predictions. We will prepare and execute a carefully designed experiment to cover different extraction methods. We will then distribute the extracts to NORMAN members with the appropriate instrumental setups. The aim is to cover RPLC-ESI-HRMS, HILIC-ESI-HRMS, GC-EI-HRMS, GC-APCI-HRMS, where HRMS can be QTOF or Orbitrap instruments. Analysis will be conducted in positive and negative ionizations. Other novel analytical platforms (e.g., SFC chromatography, APPI ion source etc.) will be tested if appropriate instrumentation is available at the NORMAN laboratories. Complementary, we will attempt to reuse existing data from previous NORMAN trials. The laboratories will use the software to their generated data to evaluate - The overall accuracy of the models - The most appropriate chromatography (RP, HILIC, GC) - The most appropriate ionization type (ESI, EI, APCI) - The most appropriate ionization source (positive or negative ionization) We aim to create a scientific publication and to develop a guideline to address the analytical gaps for various chemical classes. We also believe that the data will be enough to provide guidance for the most favourable adduct formation. ***Expected outcomes:*** ▪ Improvement of NTS workflows ▪ Improvement of the screening capabilities of NORMAN Digital Sample Freezing Platform (DSFP) ▪ Development of a guideline to address the analytical gaps for various chemical classes ▪ Make the models available to the community for testing and evaluation ▪ High-impact scientific publication ***Added value / Link with other NORMAN activities and / or other projects*** ▪ Improvement of the NTS workflows and NORMAN Database System ▪ Enrichment of SusDat with additional information ▪ Improvement of DSFP ▪ Improvement of the WG1 prioritization workflow
Participants	UoA, UFZ, NILU, EAWAG, and **all members** with appropriate analytical instrumentation
Proposed in-kind contribution	Working hours for implementation the project.
Contribution needed from NORMAN Association[1]	Purchase of consumables for analysis, logistics and software: 12,000 €

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[1] Please, provide here a transparent justification of the requested resources and of the in-kind contribution, thereby distinguishing between the costs associated with "person-months" for the organisation, the "travelling costs" for invited speakers and the costs for the logistics (e.g. meals, room rental etc.)