

# NON-TARGET SCREENING A NEW TOOL TO IMPROVE OUR UNDERSTANDING OF CHEMICAL POLLUTION BOLEANDE

As chemicals circulate in products, waste streams, food chains and human populations, chemical exposure has become a cross-cutting challenge for environmental protection, human health, and food safety. The EU and Member State authorities are missing enough chemicals' data in these sectors as ongoing monitoring captures only a small fraction of these.

Given the large number of existing chemicals, it is not realistic to develop analytical methods to monitor all of them, and current targeted methods can only support Early Warning Systems under the Zero Pollution Action Plan to a limited extent. PARC aims to address the challenges posed by chemical exposure and its impact on human health and the environment.

Moreover, the health impacts of chemical exposure are often the result of aggregated exposure to multiple contaminants from various sources. This type of exposure cannot be captured using only traditional targeted monitoring methods focused on a limited number of contaminants.<sup>1</sup>

NTS is an advanced analytical approach used to detect and identify a wide range of chemicals, including known and unknown pollutants, and their metabolites (excretion products) and is now sufficiently developed for policy uptake.

The development of NTS was historically more developed in the environmental field. The NORMAN network, a network that enhances the exchange of information on emerging environmental substances, uses NTS to detect a wide range of potentially harmful substances in water bodies, including those often missed by traditional methods. This supports the prioritisation of possible hazardous compounds for the WFD's Watch List and for the development of a groundwater Watch List.<sup>5</sup>

The EFSA's work on the SCREENER project<sup>3</sup> focusses on NTS to detect halogenated compounds in various food items. From these results, some chemicals were prioritised and quantified using targeted techniques.

The European Human Biomonitoring Initiative (HBM4EU) and PARC show the potential application of NTS to human samples. It allowed for instance the identification of real-life pesticide exposure patterns across the EU<sup>4</sup> and new tentative biomarkers of exposure in the population.<sup>5</sup> This will support both human and environment health-relevant early warning system.

To unlock policy value, the EU together with the Member States would benefit from coordinated laboratory network, standardised interpretation frameworks, and capacity building.

## KEY MESSAGES

- 1 Non-Targeted Screening (NTS) can be used to identify chemicals in the environment, food, drinking water, and in human bodies that we typically would not find with the monitoring methods that are used today. Thus, providing a more complete picture of chemical exposure and its impacts.<sup>1</sup>
- 2 Implementing NTS methods complements targeted analysis and strengthens EU and national ambitions under chemical-related policy ambitions such as the Zero-Pollution Action Plan and the "One Substance, One Assessment" (OSOA) with the Early-Warning Systems (EWS) by identifying emerging substances before risks escalates.<sup>1</sup>
- 3 Policymakers can use NTS outputs to support prioritisation such as the Water Framework Directive (WFD) Watch List updates, the European Food Safety Authority (EFSA) early warning, and European Chemicals Agency (ECHA) substance evaluation.
- 4 The Partnership for the Assessment of Risks in Chemicals (PARC) has demonstrated that NTS methods, associated to fit for purpose harmonisation, generate a new type of useful information to be integrated into EU and national assessment and exposure workflows.<sup>1</sup>
- 5 To best support policy impact, the EU and Member States will benefit from Reference laboratories as follow-up of the laboratory network established in PARC. This will ensure harmonised quality assurance and quality control as well as capacity building.

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# MAIN FINDINGS

PARC's activities have made significant progress to make NTS operational and harmonised across environmental, food and human biomonitoring matrices, in support of next-generation risk assessment, early warning systems and prioritisation.

## HARMONISATION AND QUALITY ASSURANCE

- Organisation of inter-laboratory comparison assays for both environmental, food and human matrices.
- Development and testing of a common mixture of QA/QC markers for individual method performance assessment to be made available commercially in the future.
- A common template to report results for transparent and comparable data sharing.
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## DEMONSTRATION IN MONITORING

Several hundreds of real sample analyses have been performed across different contexts:

- Environment: Wastewater-based epidemiology, sentinel animals.
- Food: Honey, baby food.
- Humans: General population biomonitoring within the PARC aligned studies human biomonitoring (HBM survey analysis) or specific occupational or perinatal sub-populations.

These methodologies integrate analytical instruments with sound data processing tools. These approaches have been applied in various research and real case studies, demonstrating their suitability to achieve a more comprehensive and integrated assessment of chemical exposure. The resulting data on chemicals that are not (yet) included in regular monitoring are of relevance to regulatory authorities, as well as environmental and public health institutions supporting an early warning system and faster regulatory uptake.

# CONTRIBUTION TO POLICY AND REGULATORY PROCESSES

The timeframe within which the PARC main results will benefit the policy process is appropriate for immediate implementation.<sup>1</sup> Results can be used in ongoing revisions of chemical legislation, procedures for assessing substances by regulatory agencies, and decisions on substances to be investigated in new national and EU-wide studies.<sup>1</sup> For example, it could be used in the EU-wide HBM study under OSOA, to complement targeted analysis.

## NTS OUTPUTS CAN DIRECTLY CONTRIBUTE TO:

- Prioritisation of chemicals e.g. WFD Watch List updates.
- EWS under the OSOA.
- Summarising, NTS is a valuable new tool to be used in comprehensive environmental surveillance, food safety assessment and for improved monitoring of occupational health and safety.
- EU-wide HBM survey under OSOA and national HBM programmes.
- Rapid identification of substances needing targeted risk assessment.

## REFERENCES

1. [Concept note: Scientific support to policy positioning of suspect and non-target screening \(SS/NTS\) approaches](#)
2. [PARC AD4.6 Concept paper regarding common definitions and short to medium term support to policy objectives of innovative \(self-\) sampling, suspect screening and NTS/EDA approaches](#)
3. [Screening for emerging chemical risks in the food chain \(SCREENER\)](#)
4. [A large-scale multi-laboratory suspect screening of pesticide metabolites in human biomonitoring: From tentative annotations to verified occurrences](#)
5. [Suspect and non-targeted screening-based human biomonitoring identified 74 biomarkers of exposure in urine of Slovenian children](#)
6. [Beyond target chemicals: updating the NORMAN prioritisation scheme to support the EU chemicals strategy with semi-quantitative suspect/non-target screening data](#)

# CONCLUSIONS AND RECOMMENDATIONS

PARC has successfully tested and contributed to enhance the applicability of innovative methodologies for characterising chemical exposure.<sup>2</sup> It is crucial to implement NTS approaches for achieving a more comprehensive understanding of chemical exposure, supporting science-based policy decisions and strengthening an EU wide early warning system.

1

Establish a coordinated EU-wide NTS lab network, to facilitate the collection, curation and evaluation of comprehensive datasets generated by NTS approaches across environmental, food and human matrices.<sup>1</sup>

2

Environmental, food and public health institutions should integrate NTS methodologies into their monitoring programs to support a coordinated EU approach for better regulatory uptake and complement targeted monitoring e.g. WFD Watch List updates, EFSA early warning, New-Generation Risk Assessment, chemicals' Early-Warning System.<sup>1</sup>

3

For the advancement of NTS, chemical industry should contribute to its wider use by providing reference substances and mass spectra.

4

Support harmonised QA/QC and reporting templates ensuring comparability across Member States.

5

Trainings for non-analytical experts in the interpretation of NTS output should be developed to invest in capacity building.