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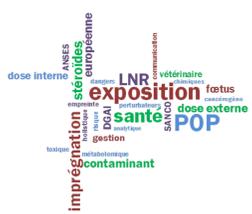
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# Non-volatile substances extractable from inner coatings of metallic cans from the French market and their occurrence in the canned vegetables

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## Introduction

Regulatory pressure against bisphenol A for food contact material (FCM) applications led **can coating** manufacturers to develop **polyester**-based alternatives. Besides intentionally added substances, the investigation of the presence of **non-intentionally added substances (NIAS)** has been raising the interest of the scientific community in response to manufacturers and consumers concerns. NIAS, generally of unknown structures, can be impurities from starting materials, degradation or decomposition products, contaminants from production process or oligomers principally formed during the synthesis of the coating. Such oligomers can be formed during resin synthesis or upon degradation over time. Although a wide range of reactions are possible (which poses an analytical challenge), these NIAS may be predicted since polyalcohols and carboxylic polyacids involved in the polycondensation reaction are generally known. In order to increase chemical food safety of packaging, it is now necessary to produce qualitative, quantitative and toxicological data.

This work aimed to contribute to the risk assessment of NIAS from polyester-based coatings by developing an **innovative analytical strategy** dedicated to their characterisation.

## Experimental

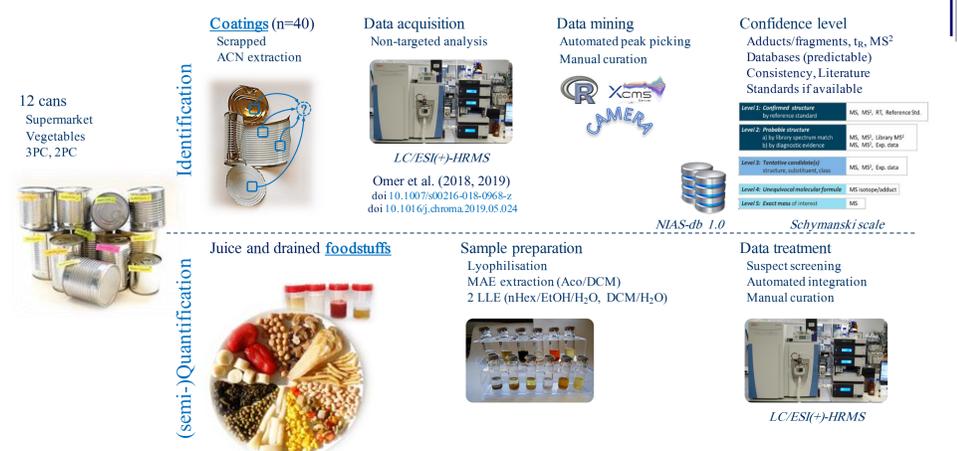


Figure 1: Study design.

## Results and Discussion

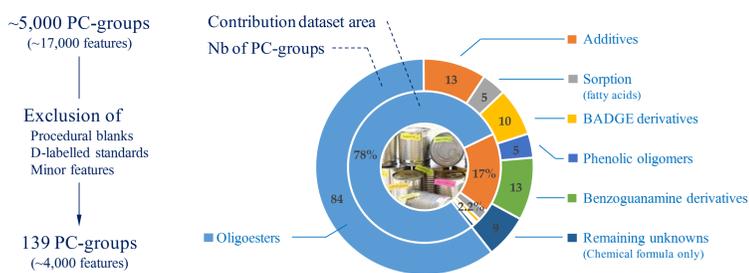


Figure 4: Data mining in 40 coatings from 12 vegetable cans.

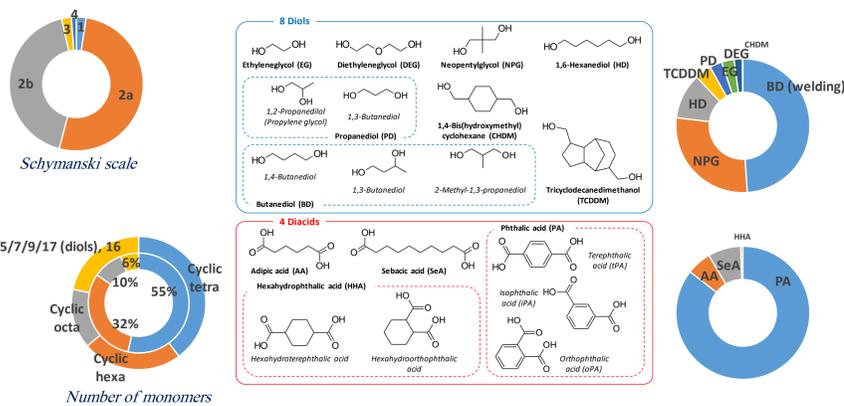


Figure 5: Oligoesters observed (84 monomer combinations; 38 out of the 40 coatings).

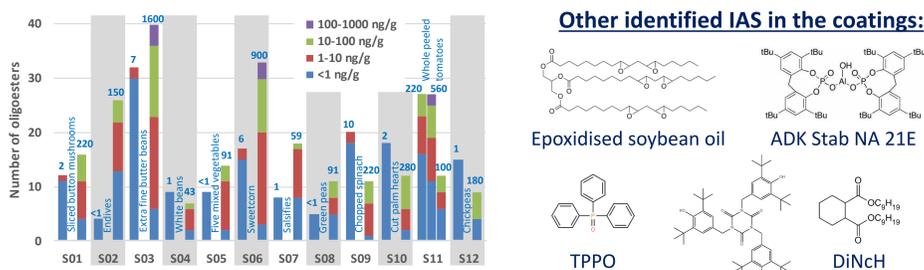


Figure 6: Oligoesters migrating in the vegetables. (68 combinations; Mean: 330 µg/kg; Range: 43–1600 µg/kg)

### Other identified NIAS in the coatings:

- Benzoguanamine derivatives (n=13)
- Phenolic oligomers (n=5)
- BADGE derivatives (n=10; incl. 6 migrating into vegetables)

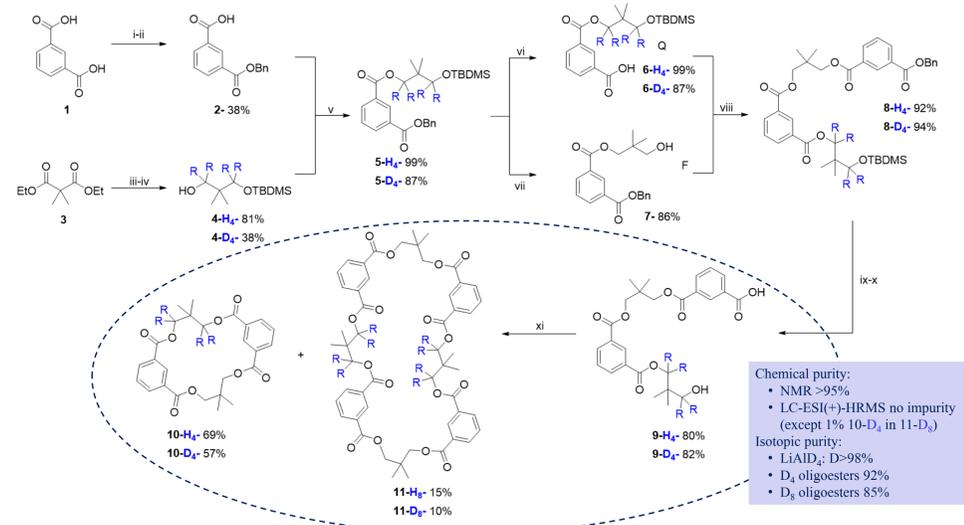


Figure 2: Stepwise synthesis of native and D-labelled combinations of NPG and iPA.

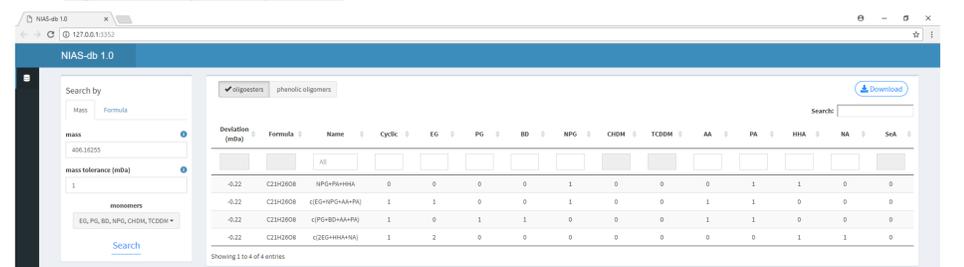


Figure 3: Screen captures of NIAS-db software. Open-source database of predictable combinations of 17 polyols with 15 polyacids (oligoesters) and phenol-formaldehyde oligomers. (Freely available at DOI 10.15454/HHY222)

## Conclusion

Using a non-targeted **LC/ESI(+)-HRMS** approach, dozens of small molecules in inner coatings of vegetable metallic cans have been identified. **Oligoesters**, a diverse family of unwanted compounds arising from the synthesis of polyesters, **prevailed** in the data set. This study sheds light on the need to fulfil a proper risk assessment on this NIAS family (exposure and hazard characterisation, including genotoxicity and endocrine disruption).

Detailed information in DOI 10.1016/j.jhazmat.2022.129026.