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An updated status about the color developers currently used in thermal papers and available on the French market

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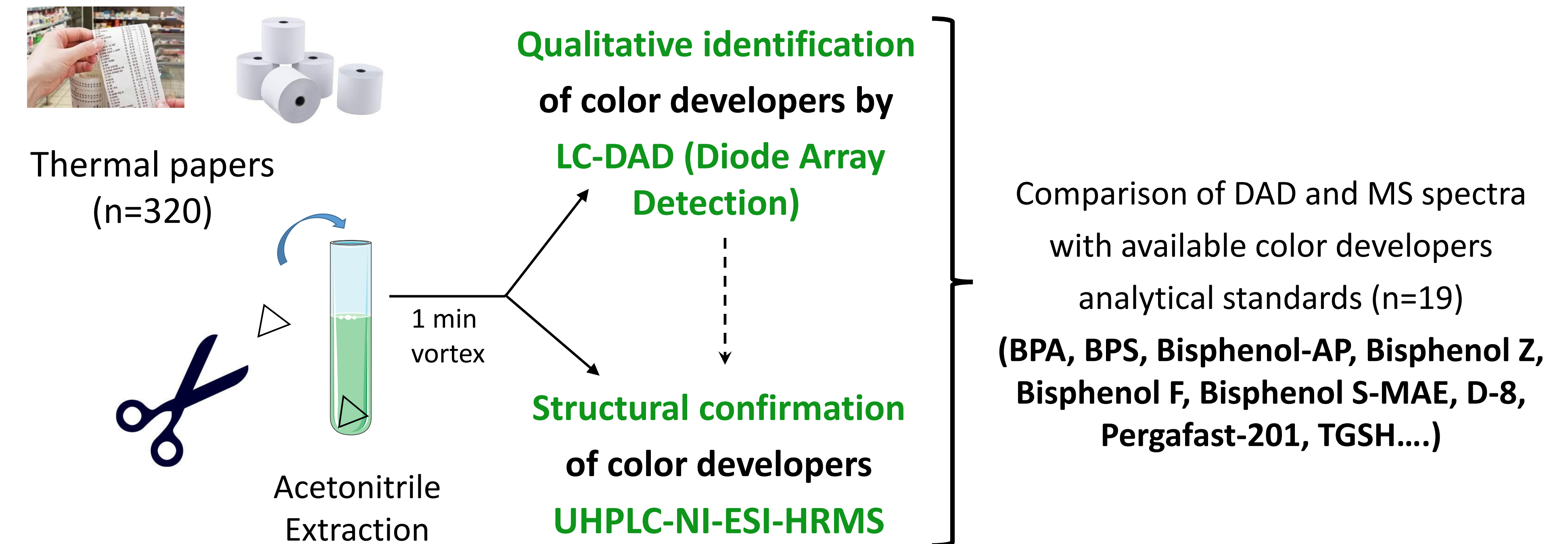
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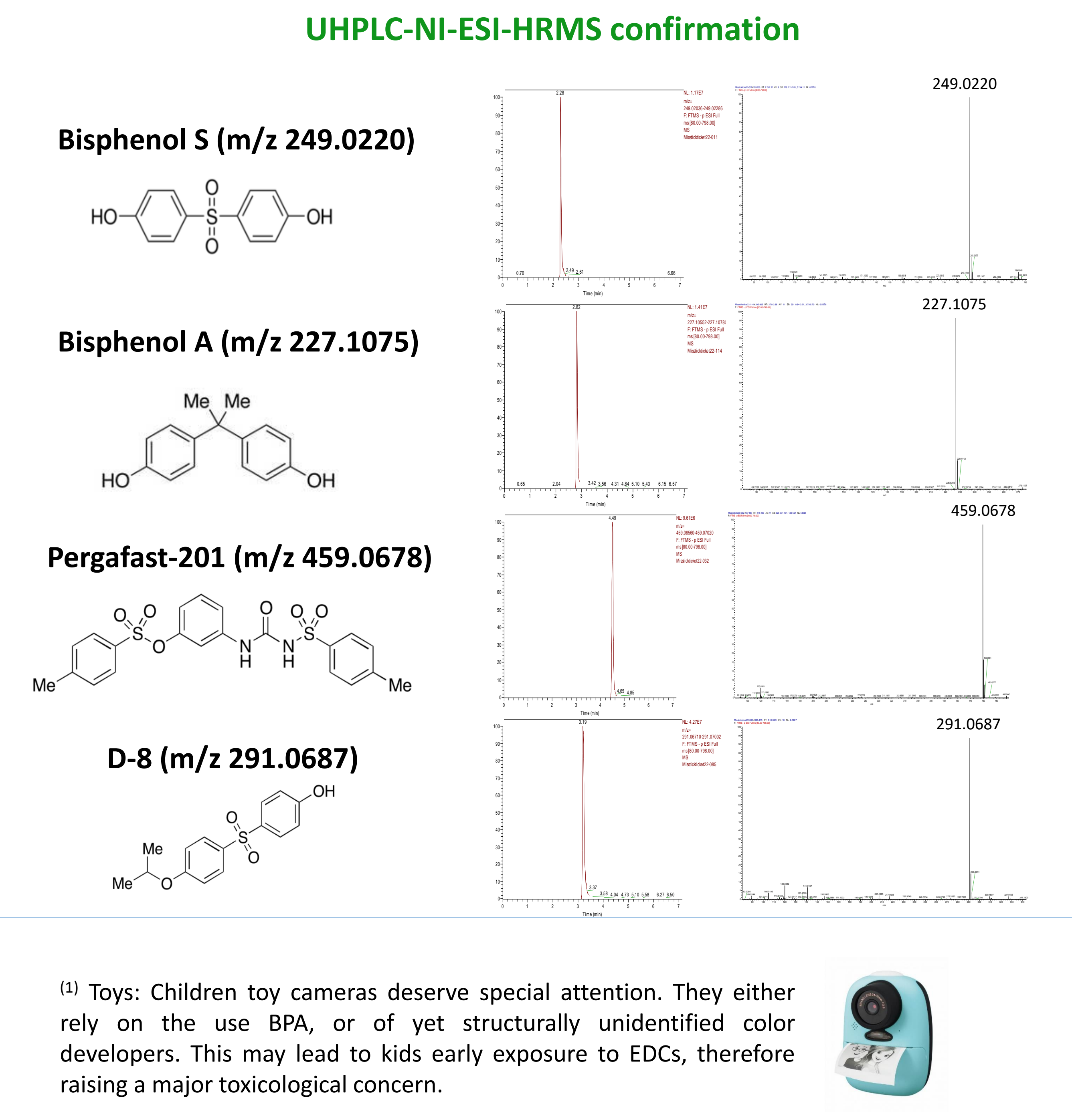
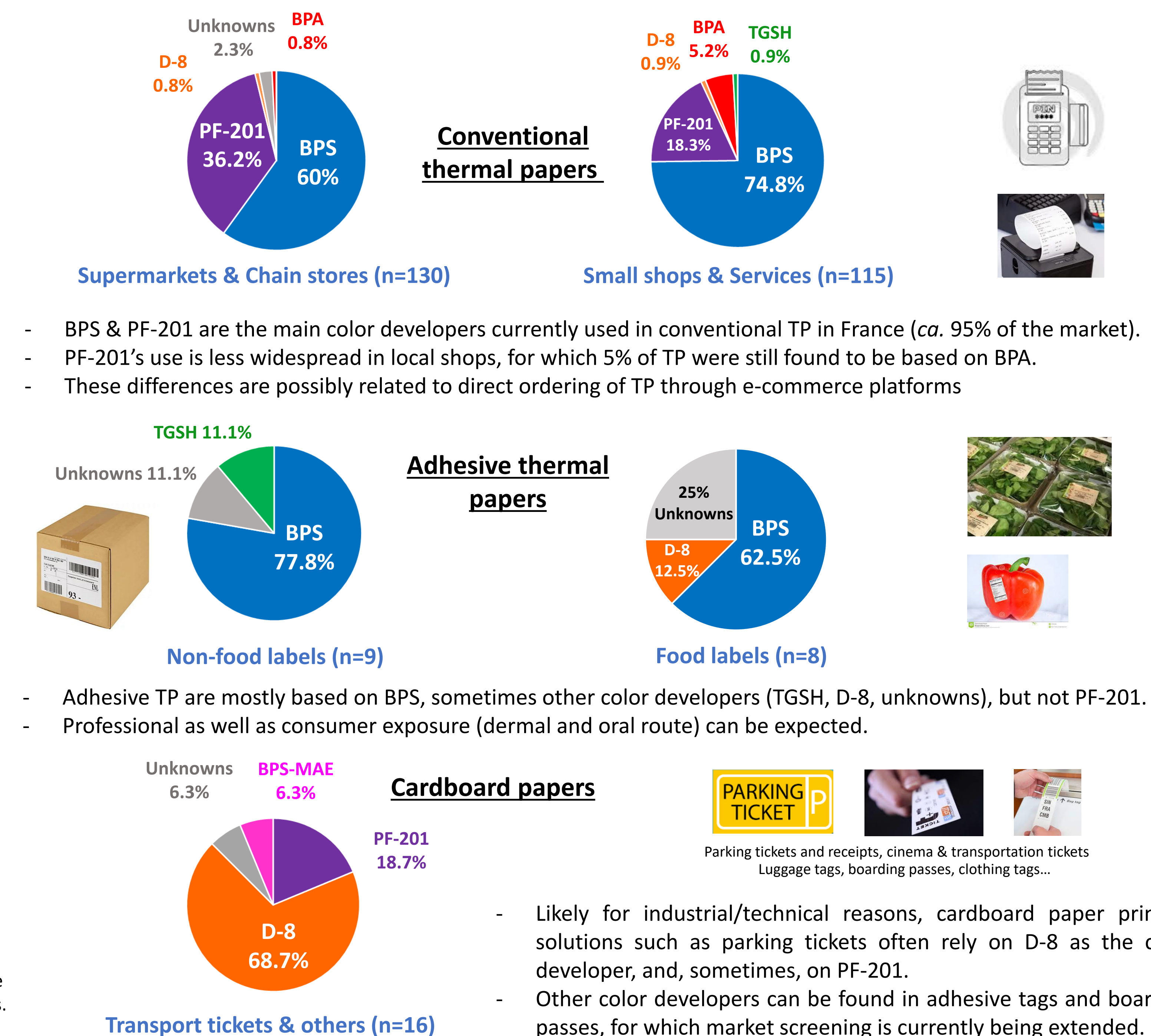
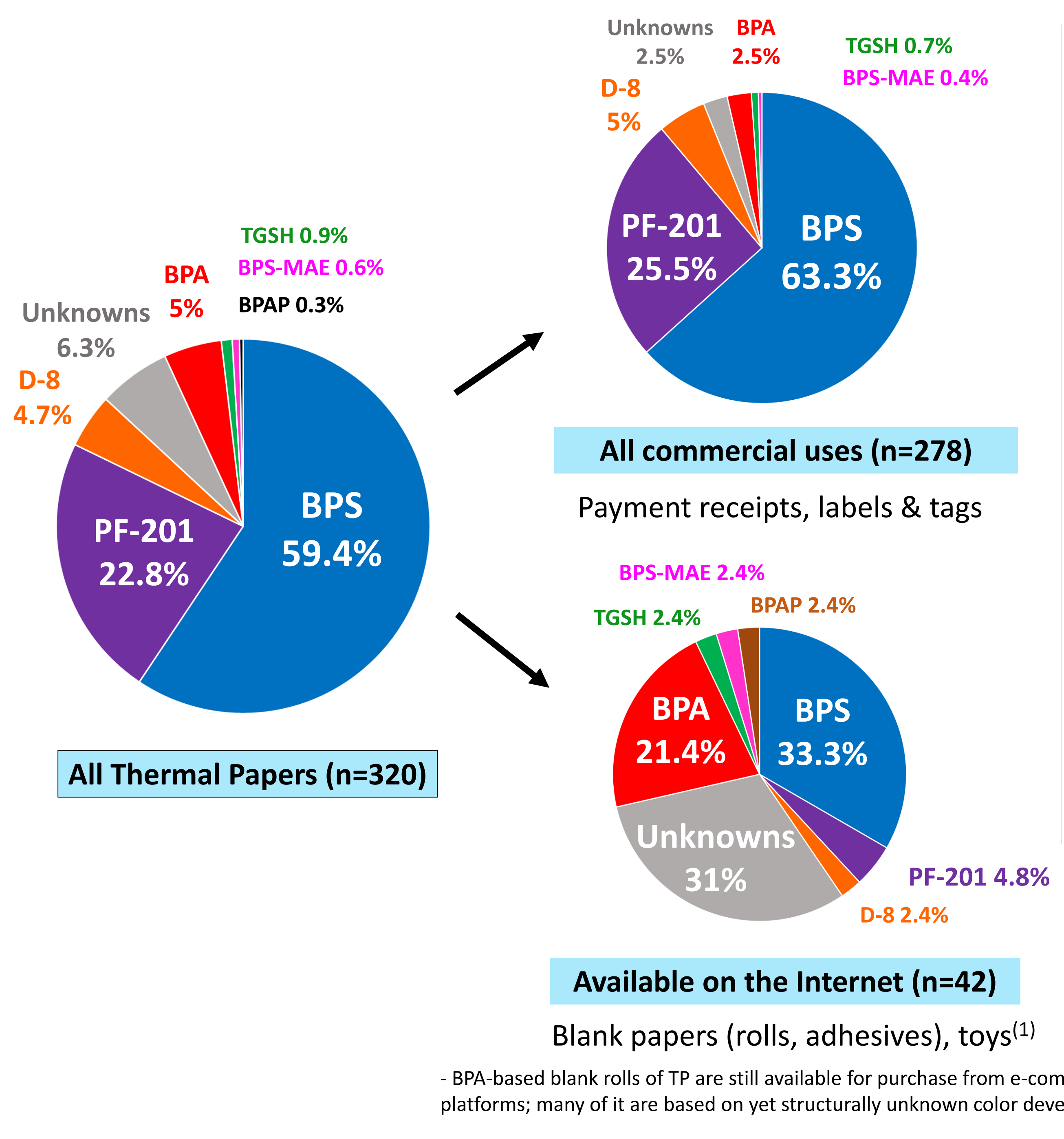
Context of the study

- Thermal printing (TP) solutions are increasingly used, with a worldwide market of TP papers estimated over 4 billion \$ in 2021, and expected to exceed 6 billion \$ by 2028.
- Due to their capability to act as proton donors, bisphenols such as Bisphenol A (BPA) are commonly used as color developers in TP, including point-of sale solutions, but also self-adhesive labels (parcels, foods) and several other types of TP solutions.
- BPA is a xeno-estrogen. Following demonstration that dermal exposure to this endocrine disrupting substance (EDC) can occur as a result of TP handling, the EU drastically limited the use of BPA in TP by January 2020 (<0.02% w/w). Alternative substances used for similar purposes are not regulated. These include BPA analogues such as Bisphenol S (BPS, a suspected EDC), but also D-8 and other color developers such as Pergafast-201 (PF-201), which toxicity and potential to penetrate skin are barely documented so far.
- We collected over 300 TP papers between April 2020 and May 2022 in France, from supermarkets, small stores, but also internet sellers. These included receipts, adhesive tags, self-service food scale stickers and even children toys. The objective was to reach a comprehensive overview of the substances in use, before proceeding to the examination of their fate, related hazards and potential to cross the human skin barrier.

Methodology



Results



Conclusions

- Our results show that ca. 60% of the French market of thermal papers nowadays consists of BPS. PF-201's use (ca. 23%) is on the rise, as in many other countries.
- Despite current EU regulations, 5% of thermal papers were found to contain BPA, mainly as a result of the availability of BPA-based TP solutions from e-commerce platforms (>20%).
- Other color developers such as D-8, TGSH, BPS-MAE and Bisphenol AP were occasionally identified. Unknown color developers were observed in 6.3% of analyzed thermal papers.
- D-8 was mostly detected in parking and public transport receipts. It appears to be the most common color developer used in cardboard papers.
- Quantification of major color developers, investigation of related hazards and of expected trans-dermal human exposure to these substances are further being explored in this project.