

Chemicals in plastics: Toxicity and composition

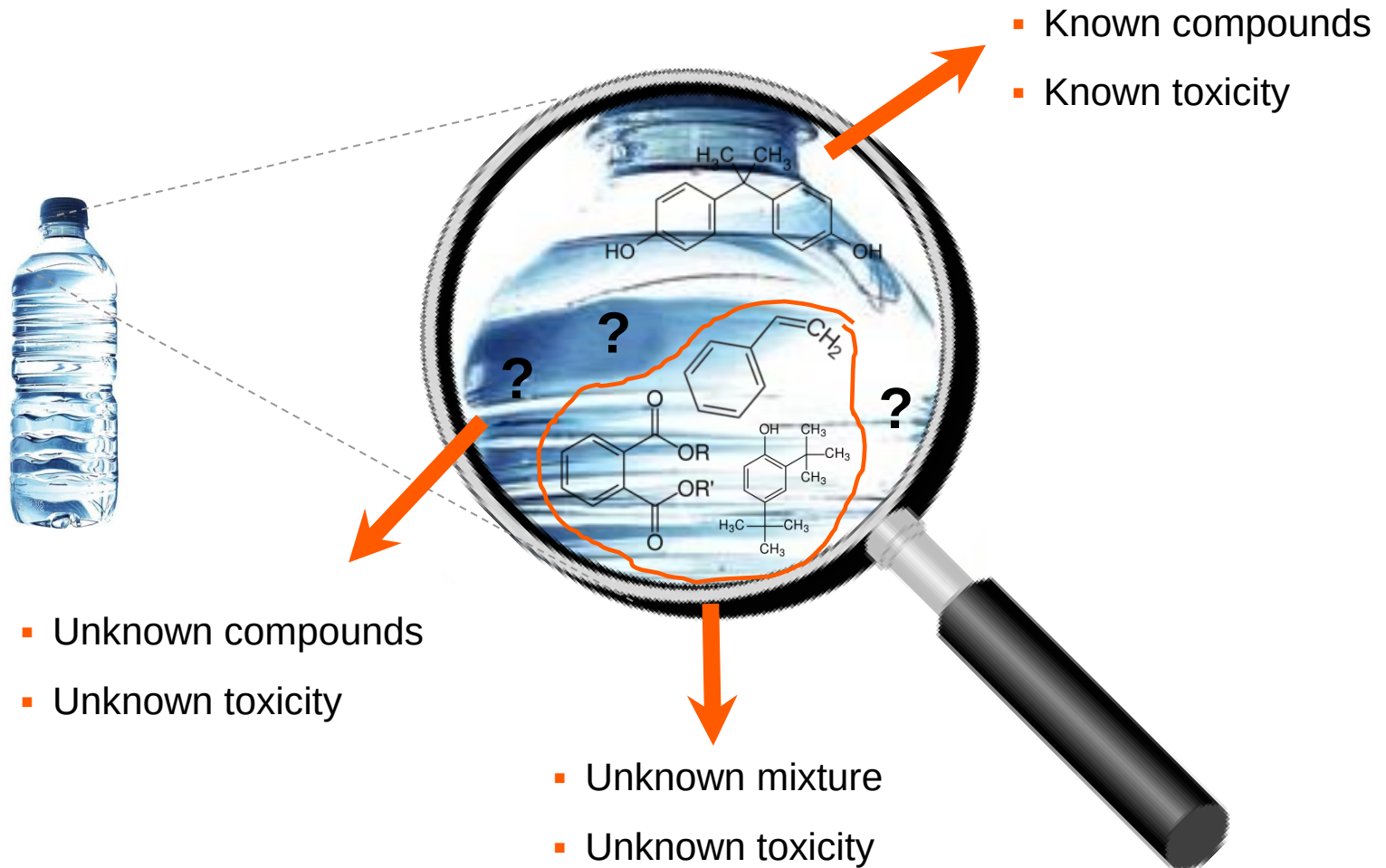
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1. Which substances do we find in plastics?
 - Type
 - Function

2. Do plastic products contain substances which cause toxic effects *in vitro*?

Are there difference between

- Plastic types
- Product types
- FCM vs. non-FCMs?

Plastic products



Products

Drink bottles	Yoghurt cups	Trays/Boxes	Foils/Bags	Shampoos	Others
					

Plastic types

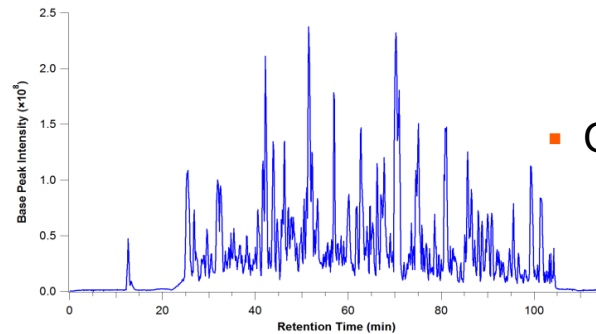
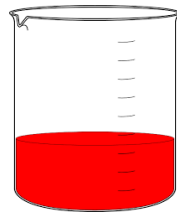
PET	HDPE	LDPE	PS	PP	PUR	PVC	PLA
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Petrol-based

Renewable

Additive amount

Study design



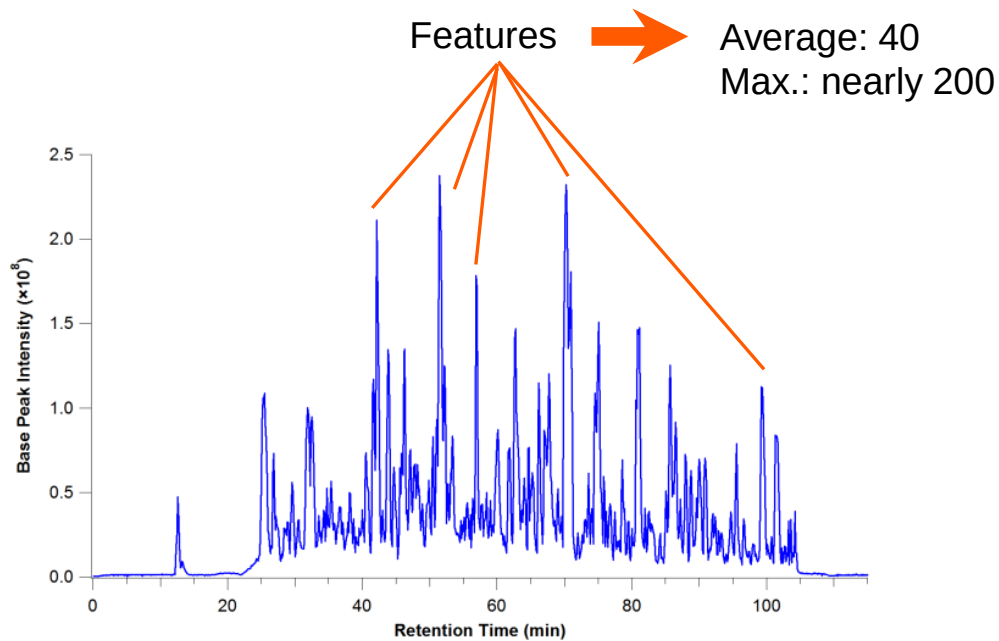
■ GC-QFOT-MS/MS



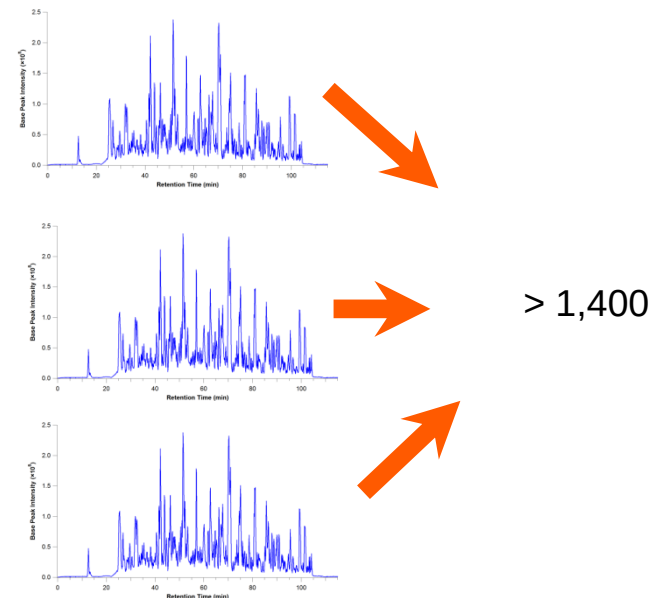
- Baseline toxicity
- Oxidative stress
- Endocrine activity

Amount of chemical features

One extract

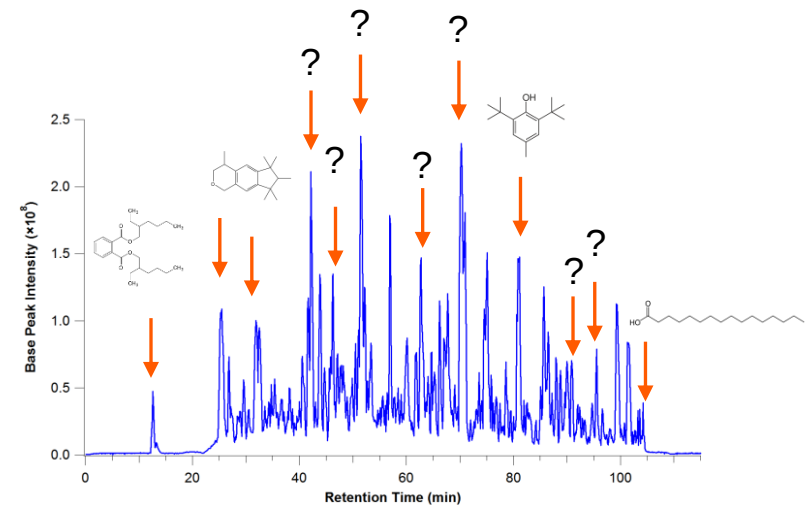
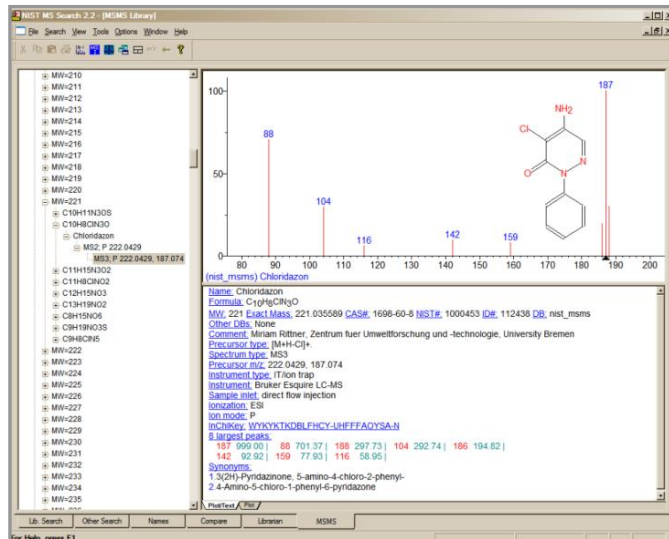


34 extracts



- PVC extracts: highest count
- PET extracts: lowest count

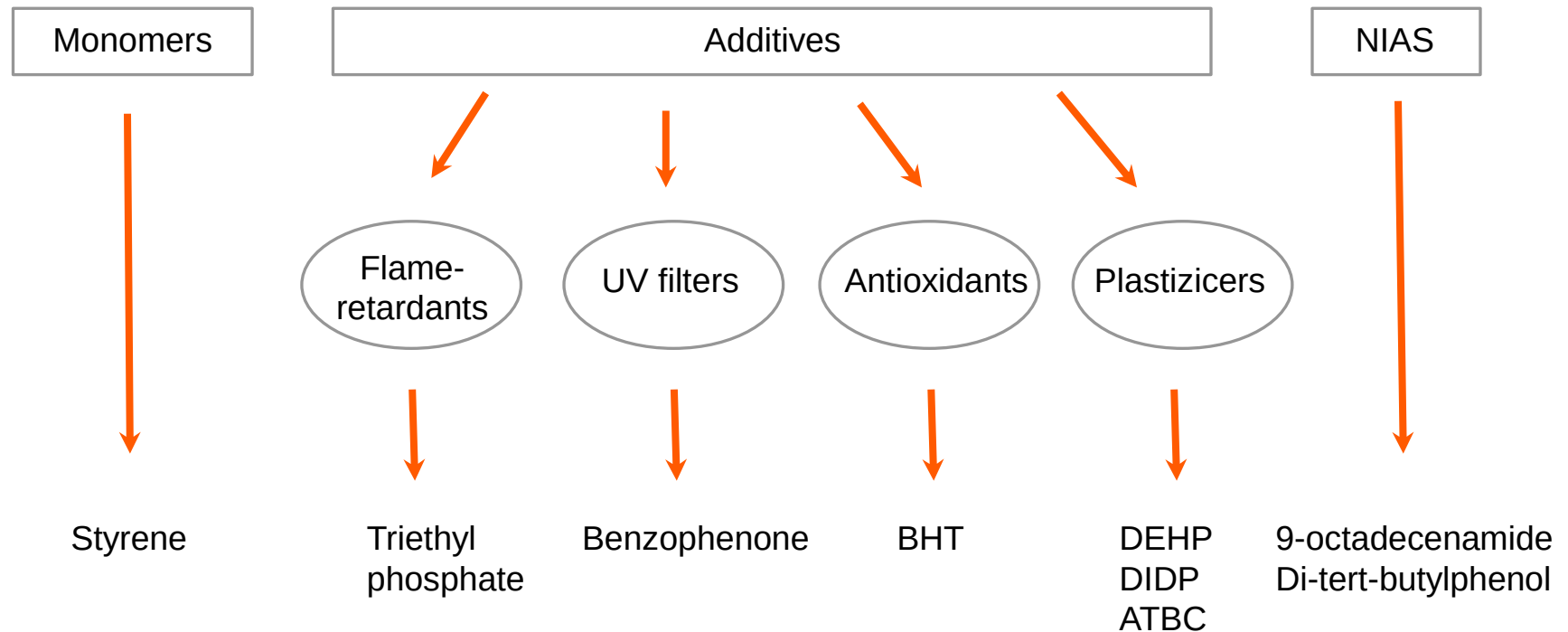
Compound identification



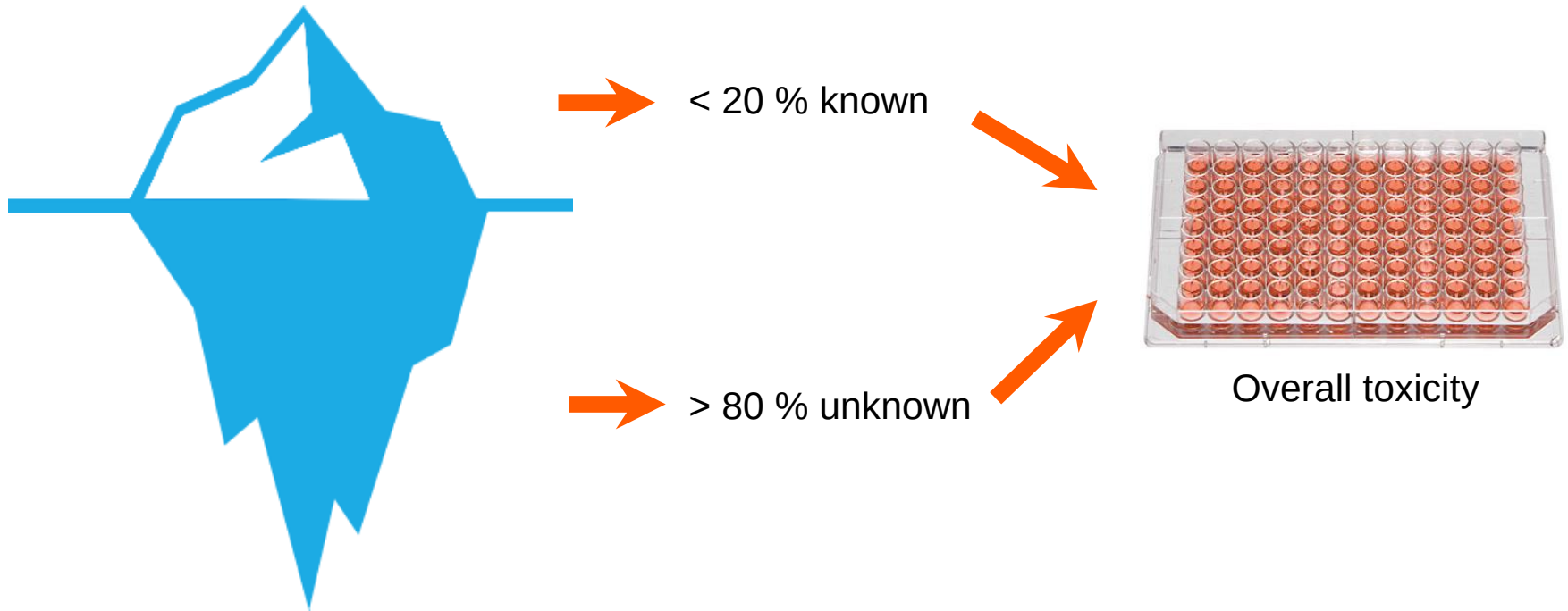
- Identification: 260 unique compounds
- > 80 % remain unknown

Compound function and name

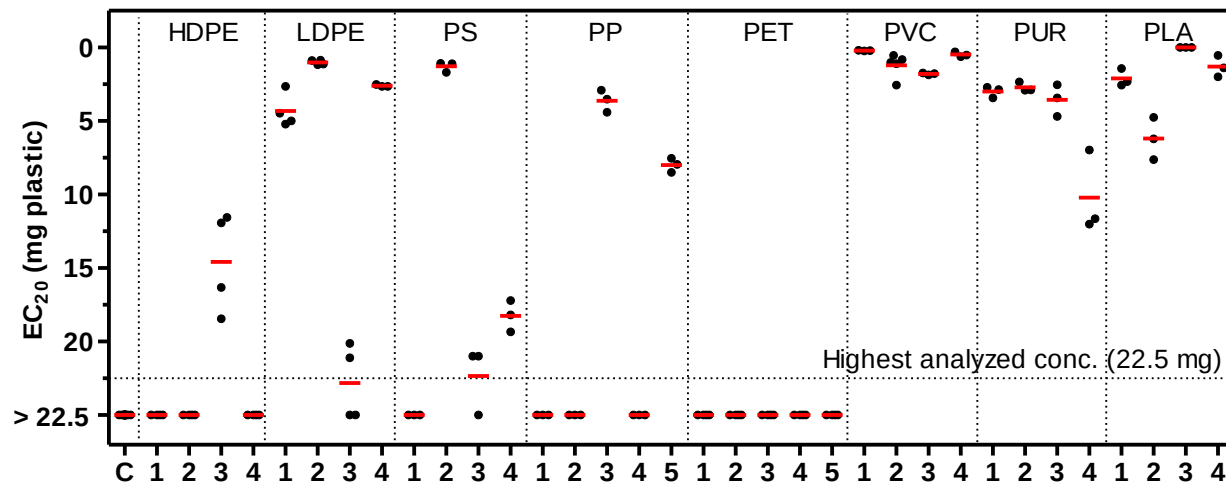
57 plastic-associated compounds



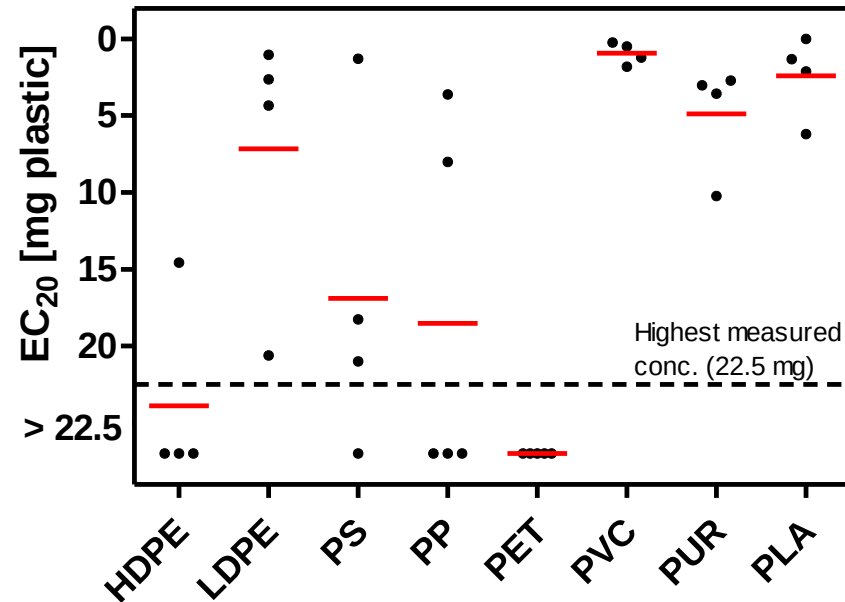
Toxicity of chemicals in plastics



Baseline toxicity

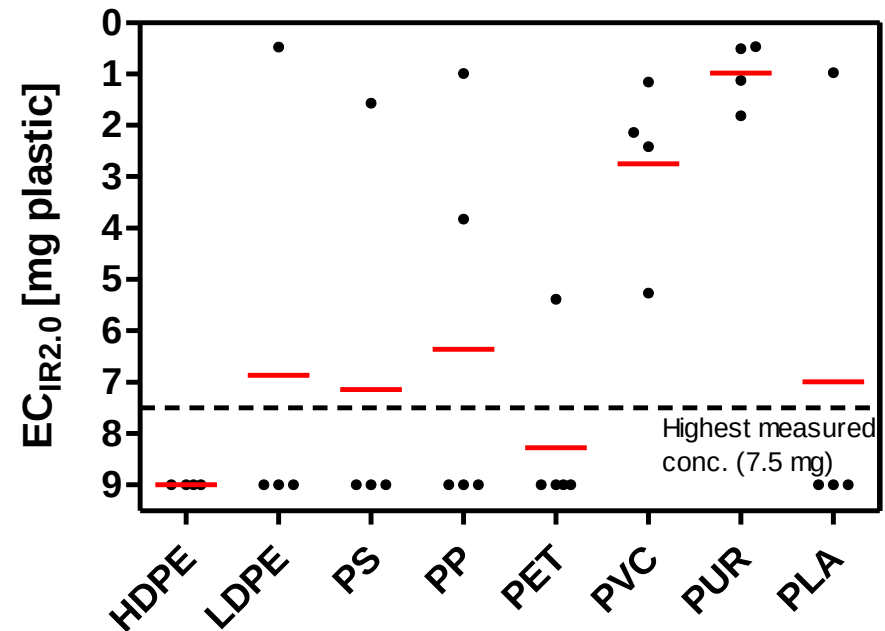
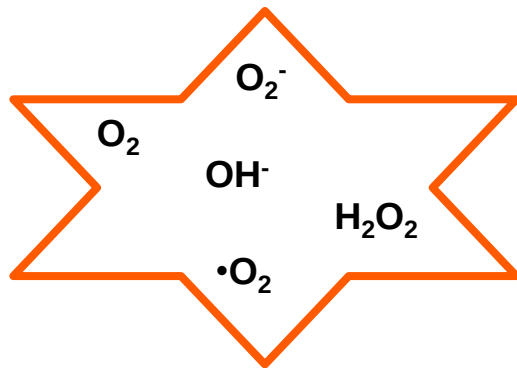


- 2/3 of the extracts: induction of baseline toxicity



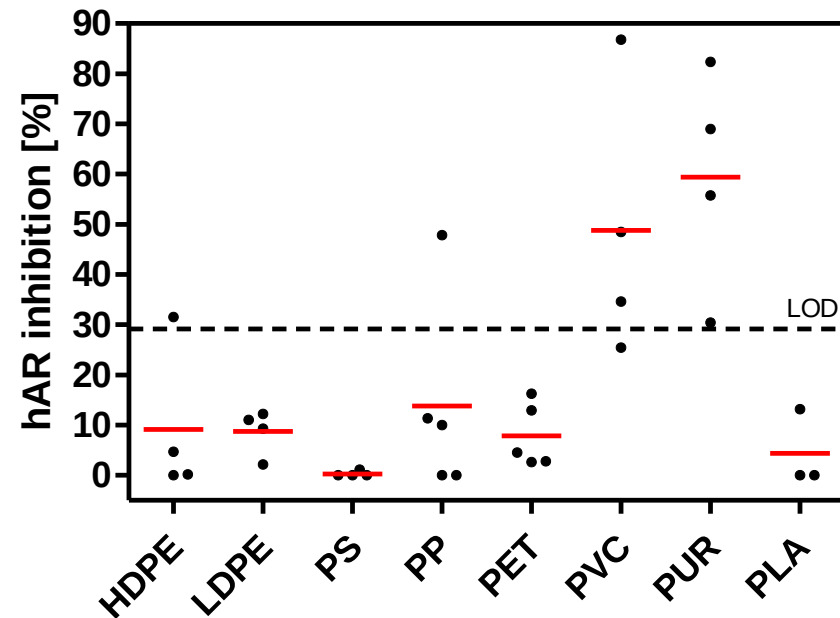
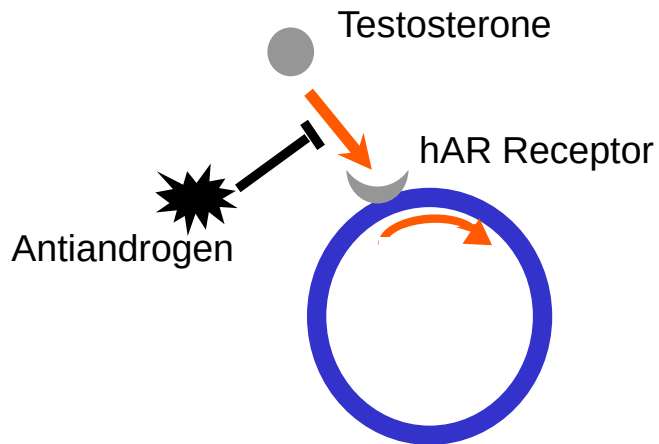
- PVC, PUR, PLA extracts: highest baseline toxicity
- PET extracts: no effect

Oxidative Stress



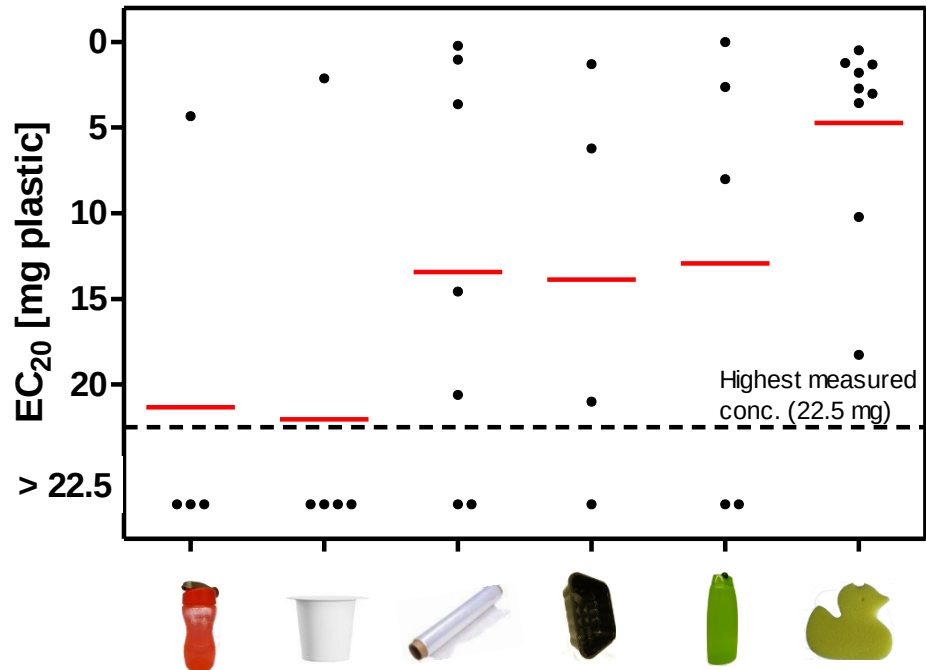
- All PUR and PVC extracts: induction of oxidative stress
- One LDPE extract: most potent inducer

Antiandrogenic activity



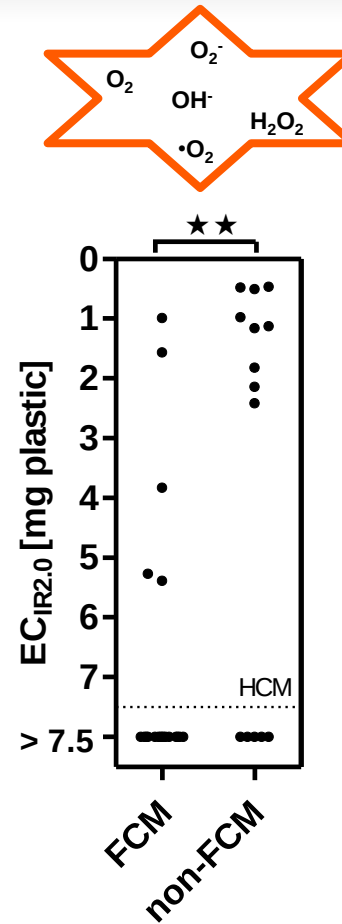
- 9 extracts: with antiandrogenic activity
- PUR, PVC extracts: particularly active

Product type



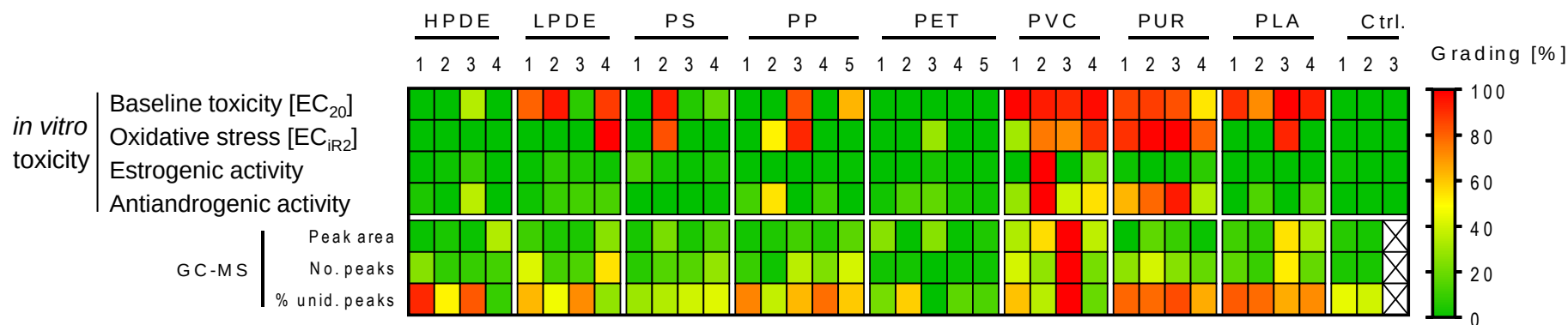
- Among all product types at least one with toxicity

Food contact vs. no food contact



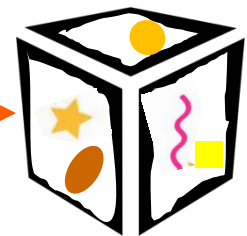
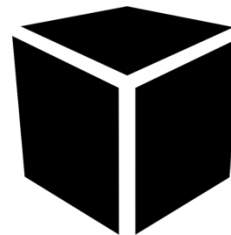
- Non-FCMs induced higher effects
- Some FCM equally toxic as non-FCMs

Summary



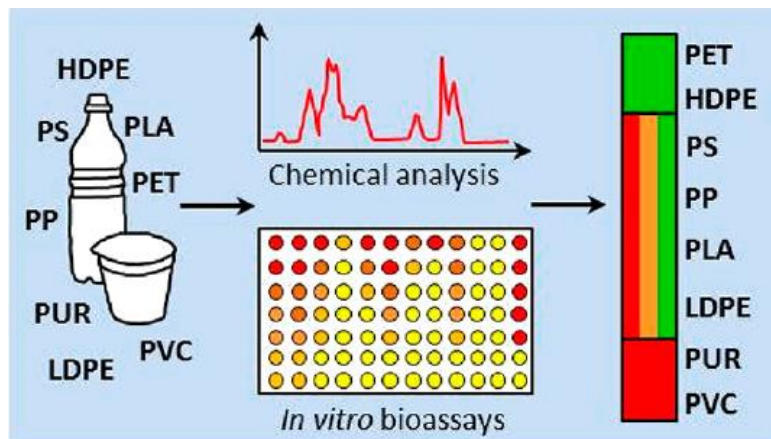
1. Chemicals used in plastics
 - many chemicals: up to 200/product
 - majority unknown: > 80%
2. 74% of consumer plastics contain toxic chemicals
3. Some plastic types are more toxic than others but hard to generalize

Conclusions



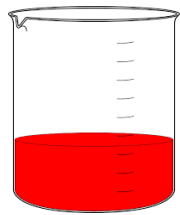
¹ Benchmarking the in Vitro Toxicity and Chemical Composition of ² Plastic Consumer Products

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⁴ and Martin Wagner^{†,||,ID}

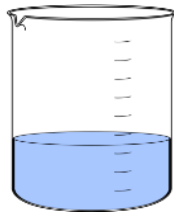


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Ongoing work



In plastics
Extracts



Out of plastics
Migrates



“Bioplastics”

Conventional
plastics

Thanks!

Questions? Suggestions?

plastX



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Cooperations:



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