TOXICITY OF (MICRO)PLASTICS

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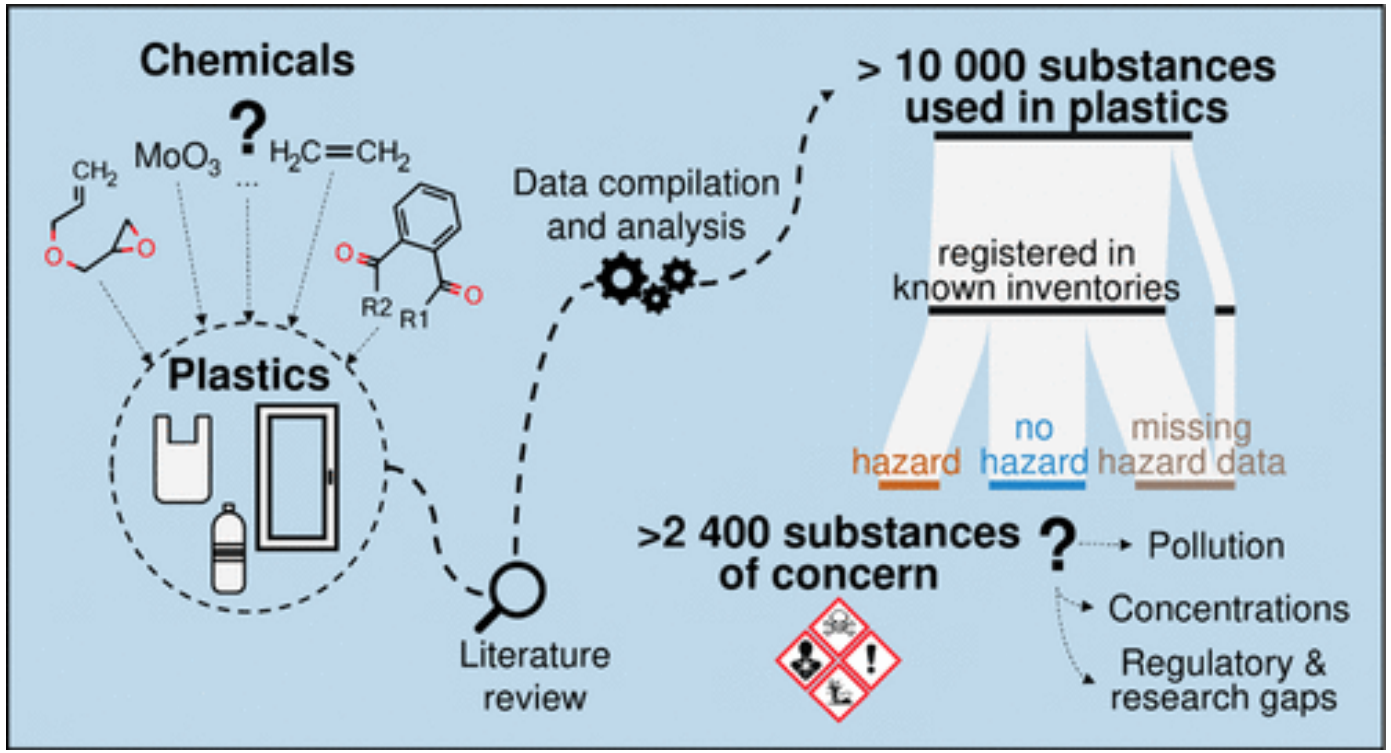
01
PET
02
PE-HD
03
PVC
04
PE-LD
05
PP
06
PS
07
O

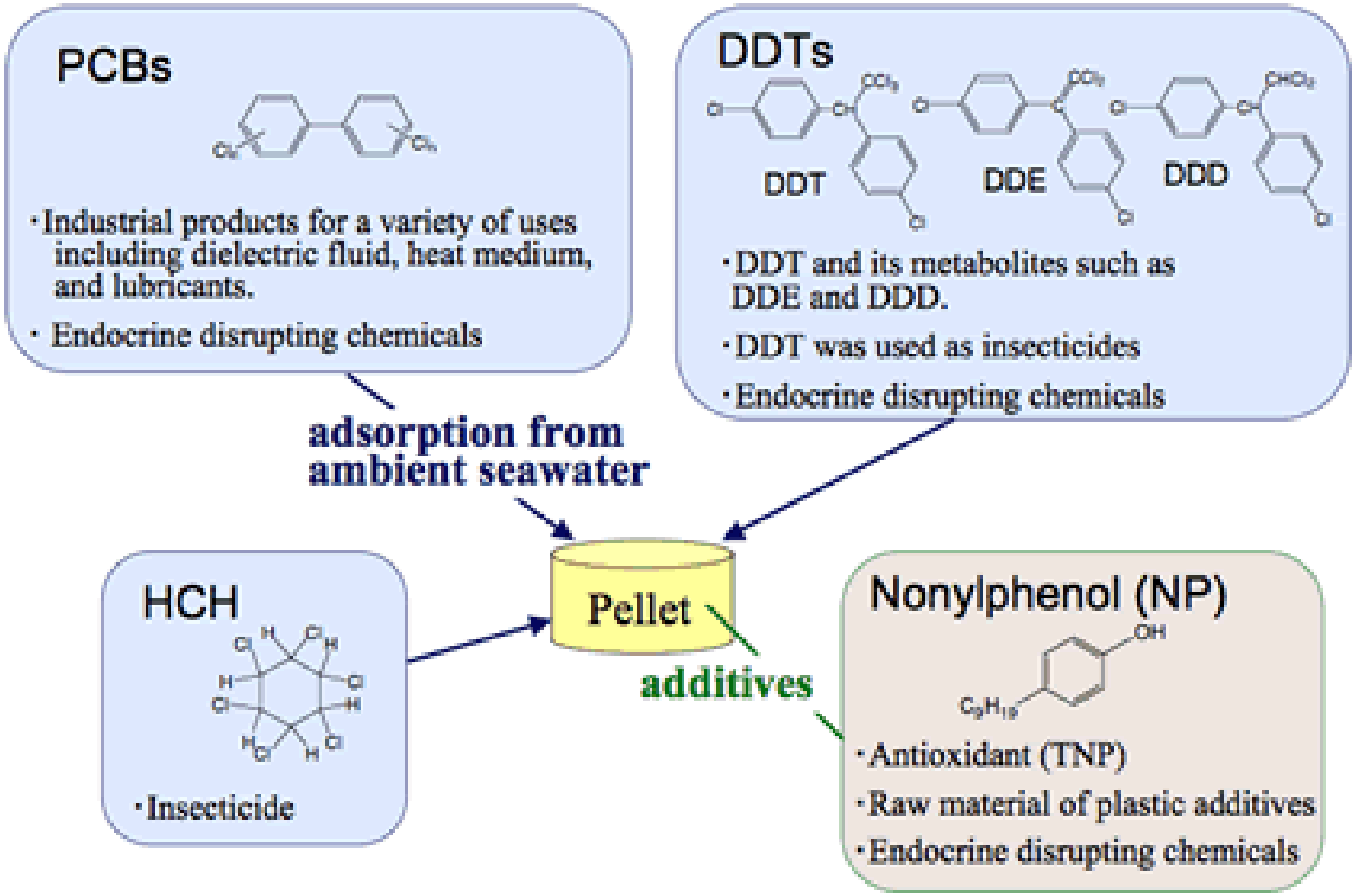
Chemicals in plastic

- 10 000 substances used in plastics (Wang et al 2021)
- 350 000 chemicals and mixtures on the global market (Wang et al, 2020)



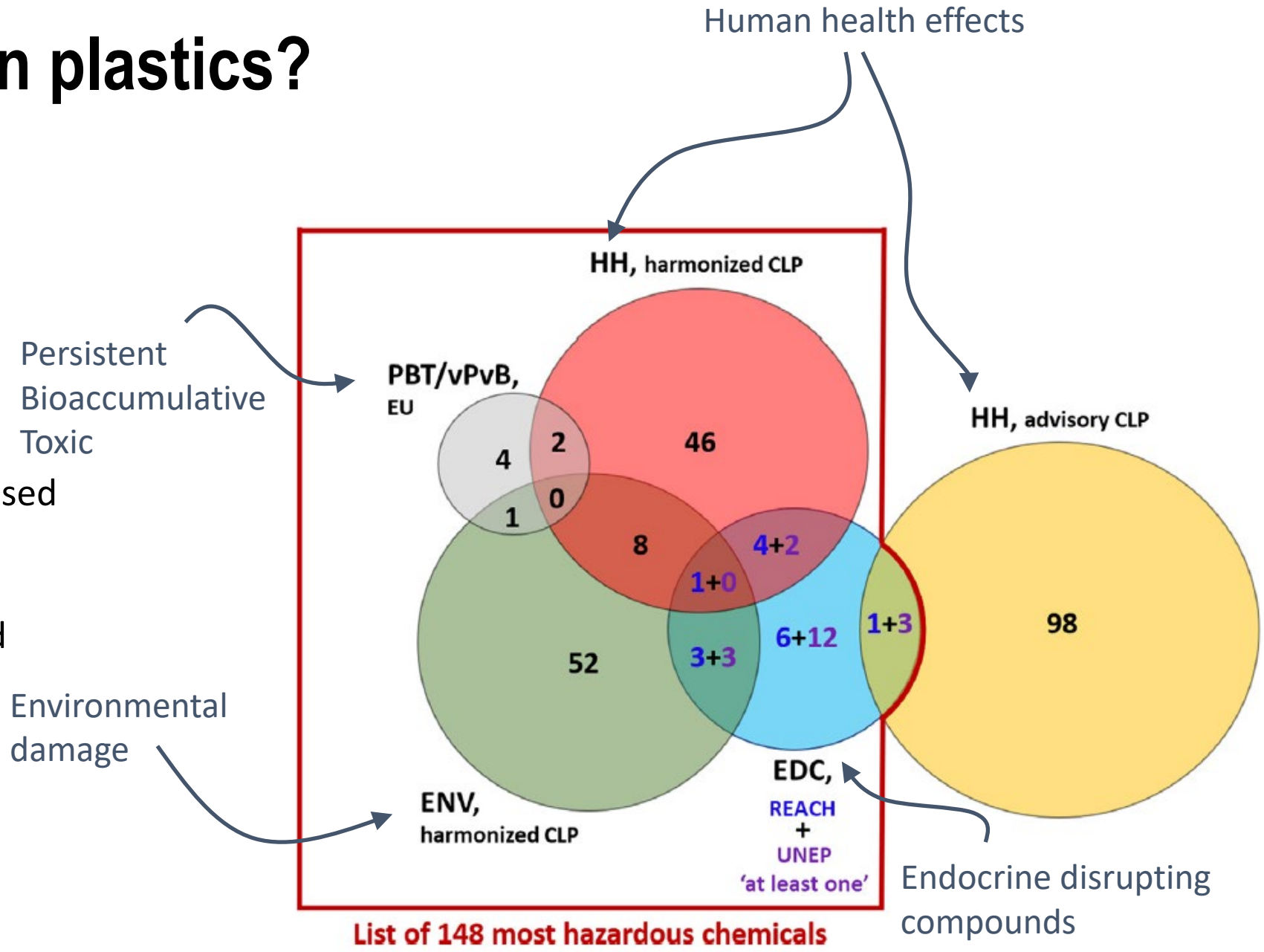
Chemicals in plastic

- Pellets as vectors for chemicals
- Pellet Watch



Toxic chemicals in plastics?

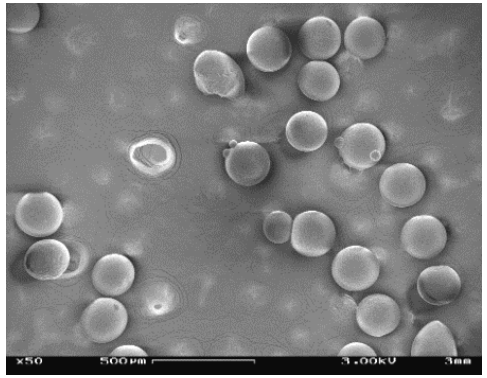
- 3377 substances that can be used in plastic packaging
- 906 chemicals were confirmed
- **148 known toxicants**

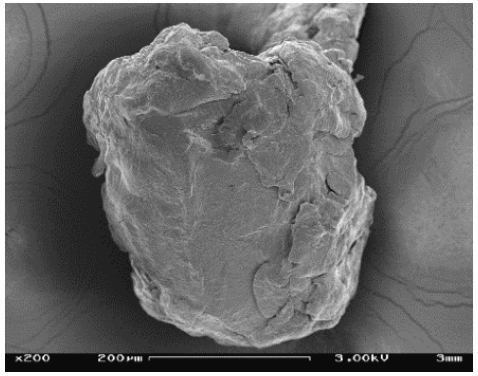


Groh et al (2019)

Effects of microplastics?

- Chemical effects
- Polymer effects
- Particle effects





Images: Giedre Asmonaite

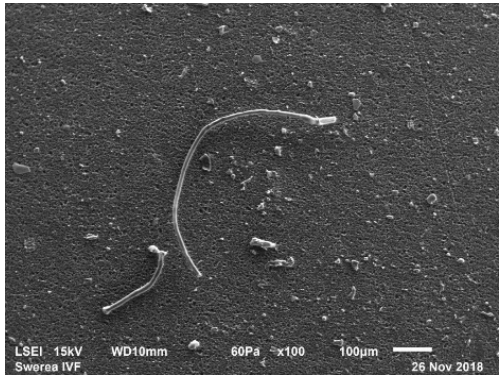
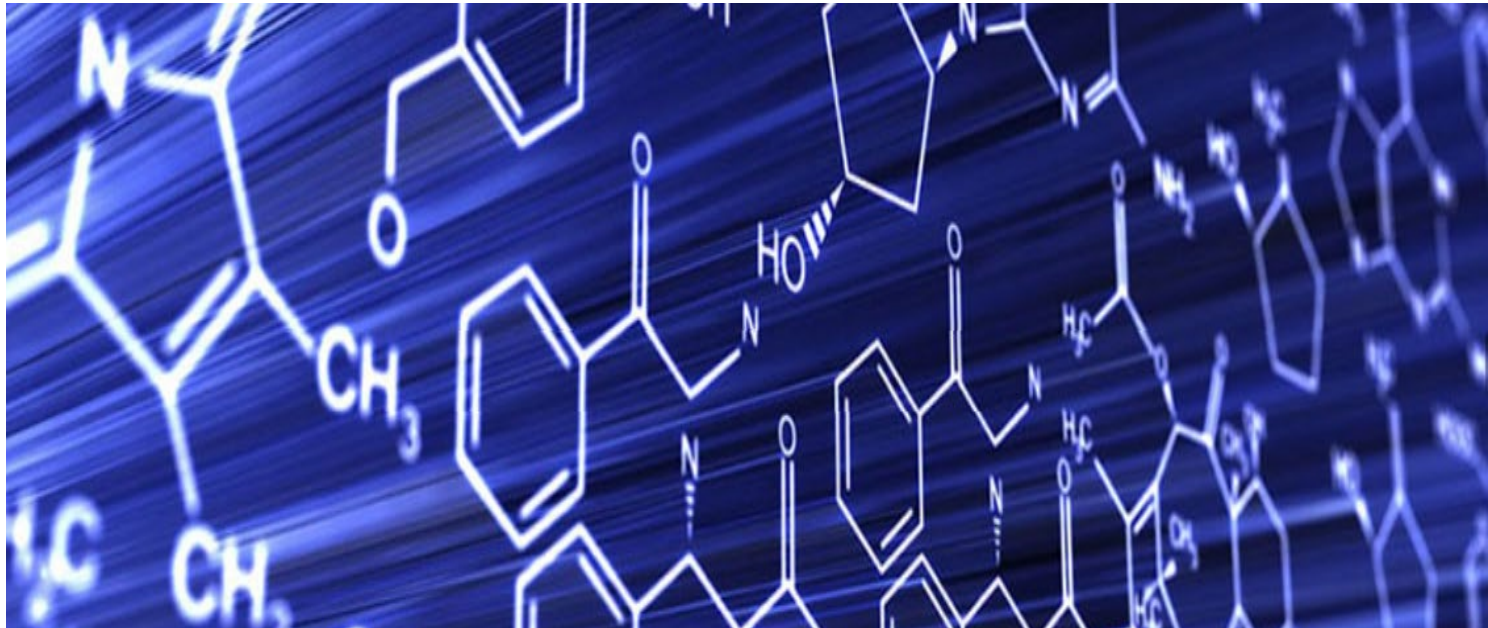
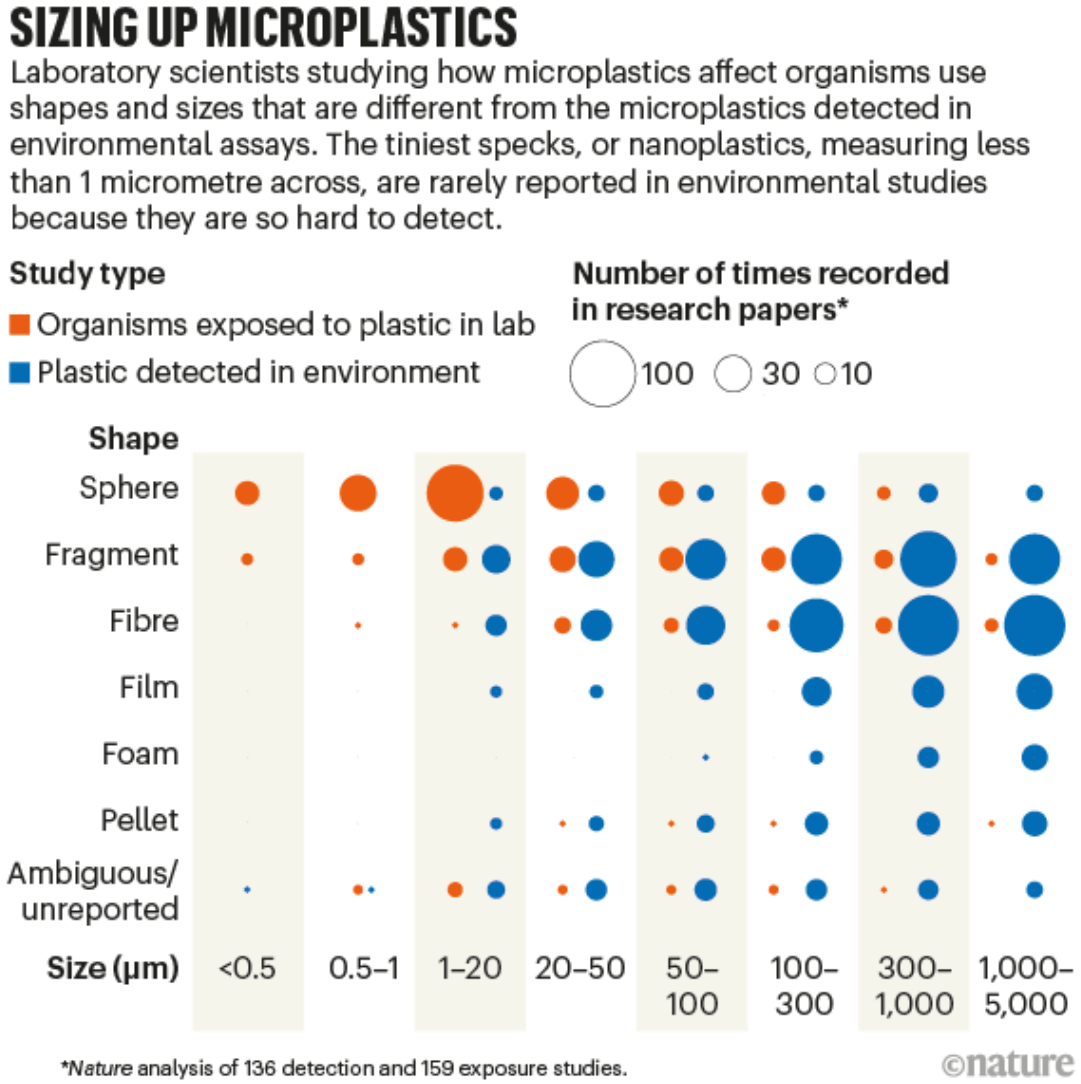
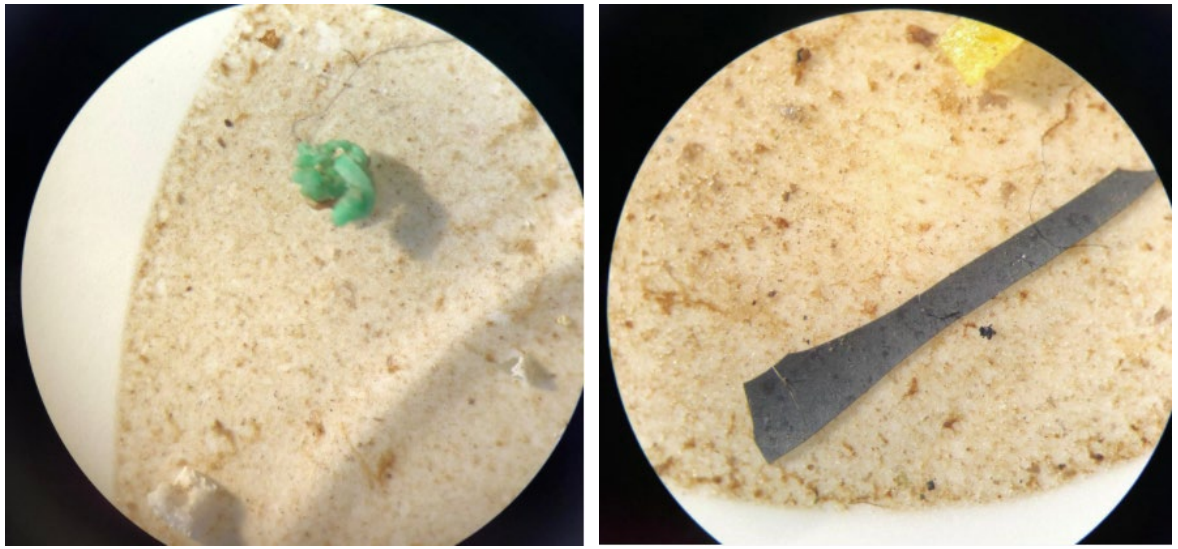


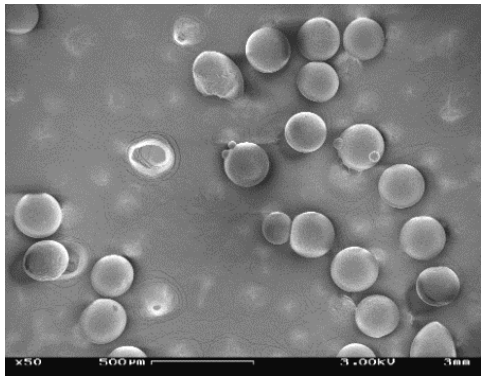
Image: Anne-Charlotte Hanning



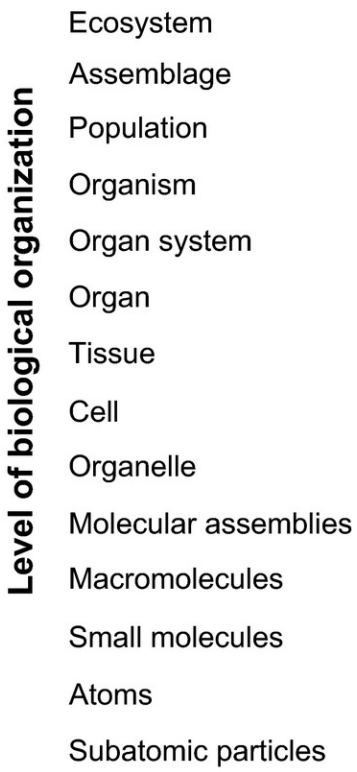
MPs in the environment vs MPs in the lab…







What is known and unknown about the effects of plastic pollution: A meta-analysis and systematic review



Bucci et al (2020)

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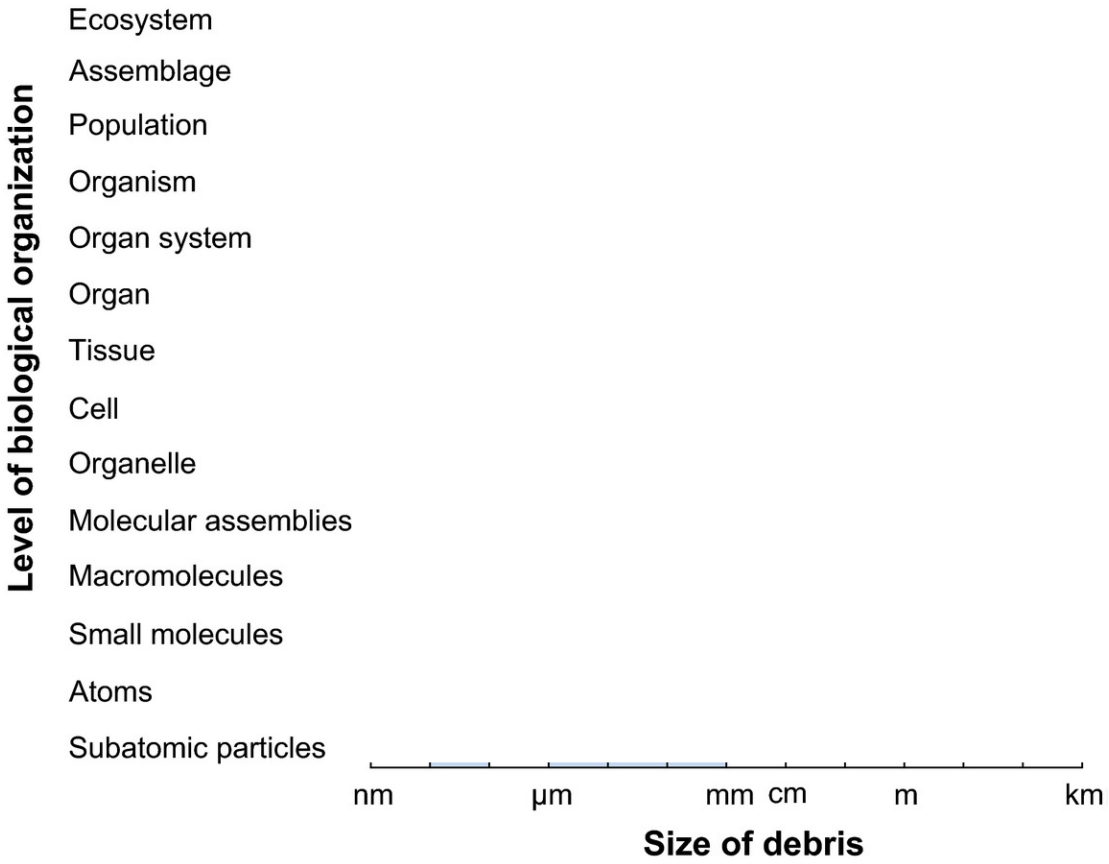

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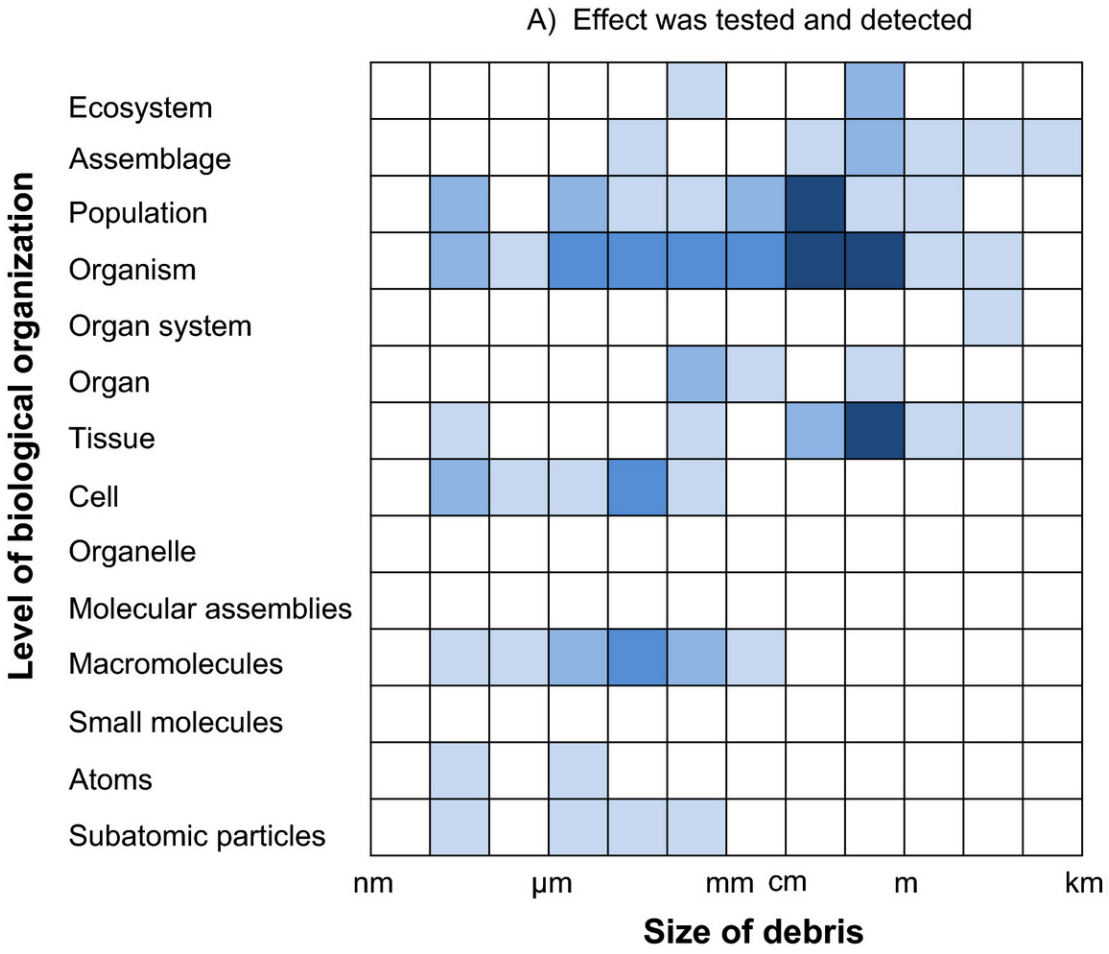

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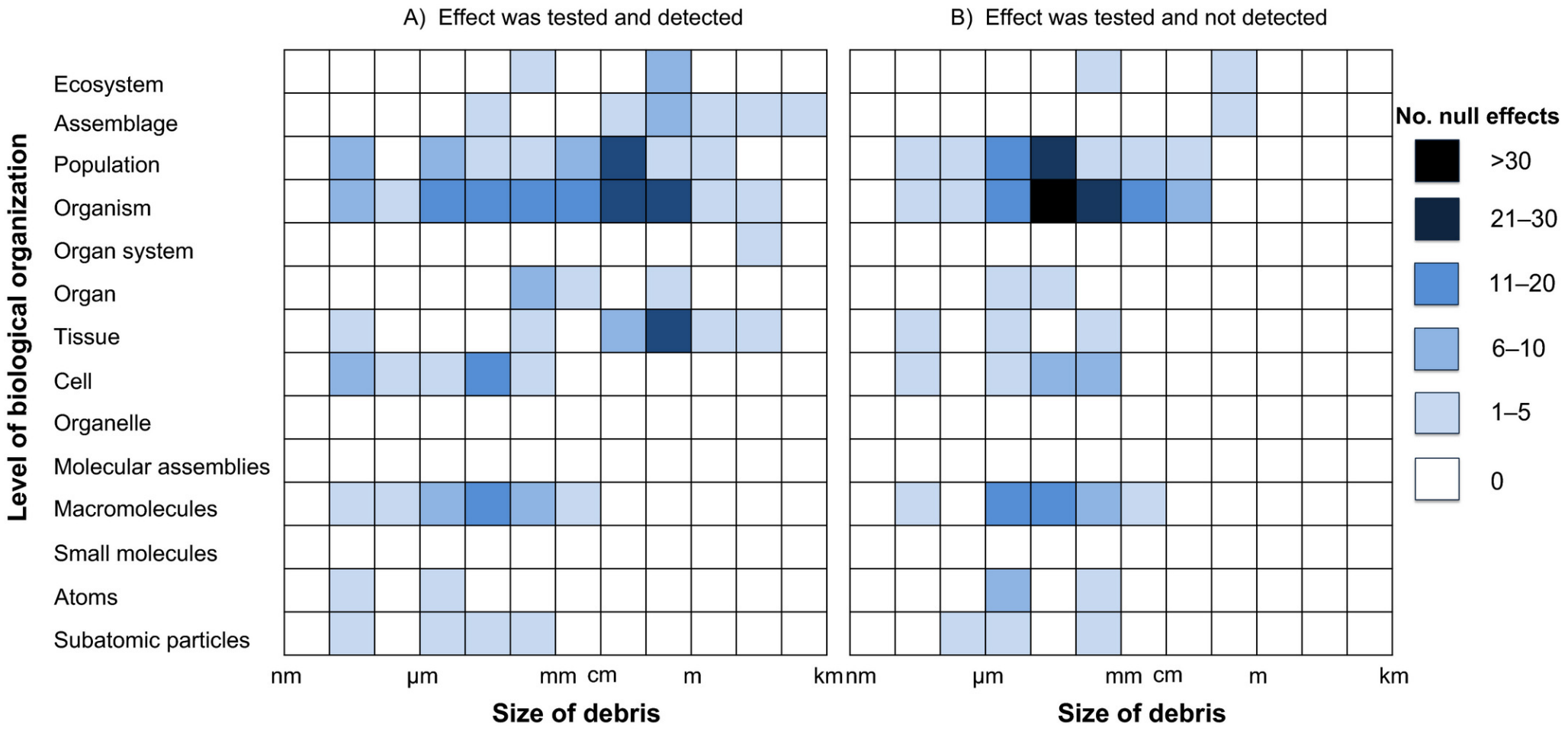


Bucci et al (2020)

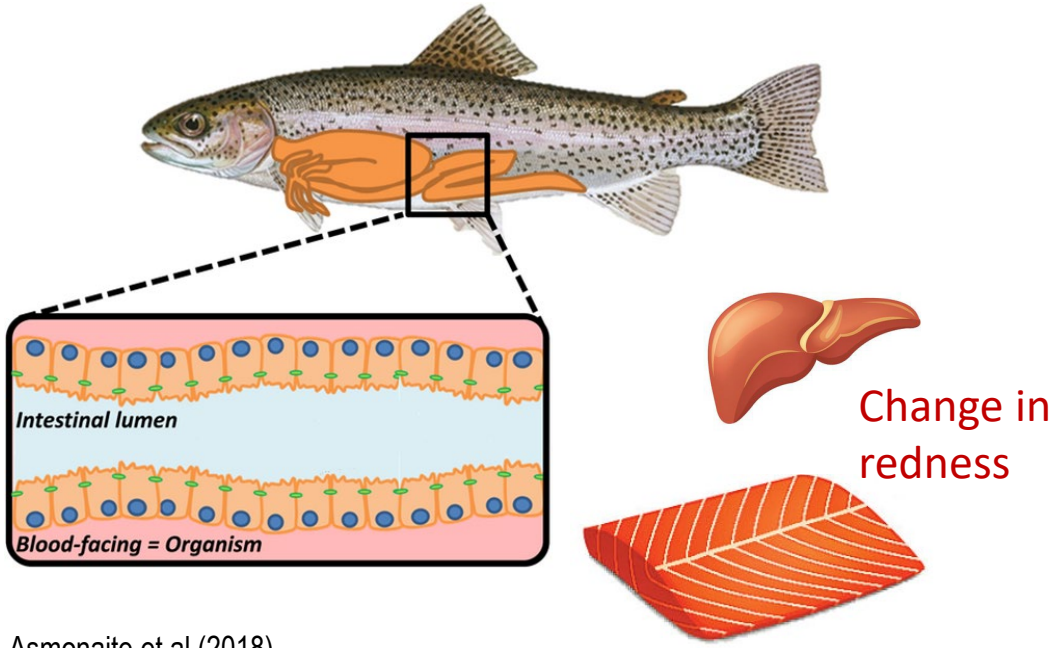
Size matters…

MPs sizes reported in field samples

Fed rainbow trout 250-400µm PS MPs (2000 /day)

- Uptake of chemicals
- Metabolism, detoxification
- Organ, tissue damage
- Gut function

Sewage and Harbor contaminated

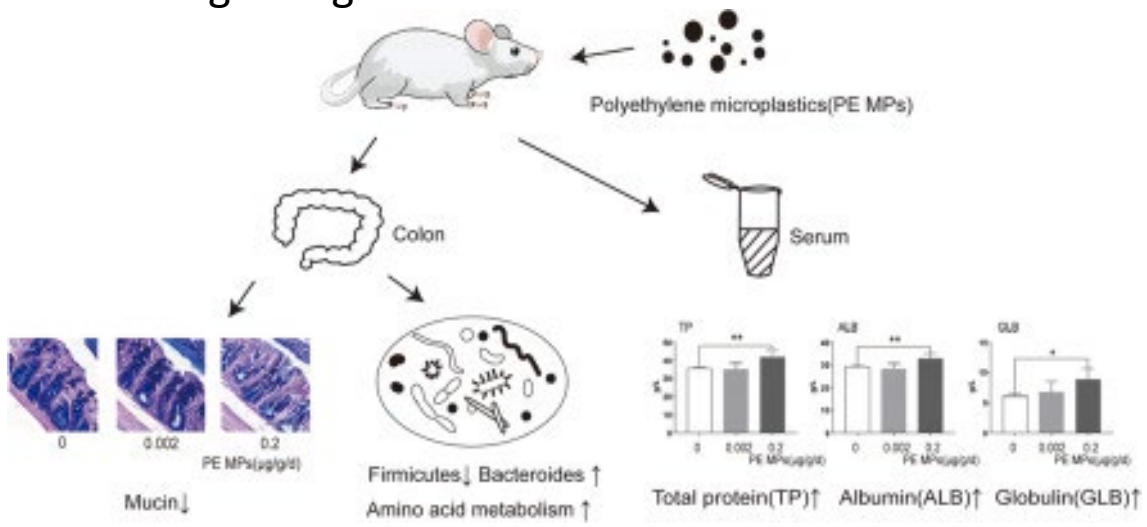


Asmonaite et al (2018)

Sun et al (2021)

Fed mice 1-4µm PE MPs (0.2µg/g/day)

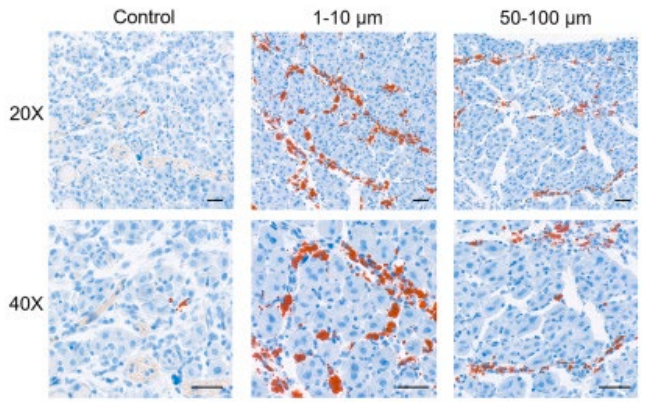
- Decrease in mucin production
- Increased amino acid metabolism
- Changes in gut microbiome



Wang et al (2021)

Fed mice 1-10 OR 50-100 µm PS MPs (0.2µg/g/day)

- Oxidative stress, ROS
- Myoblasts -> adipocytes
- Smaller particles more toxic

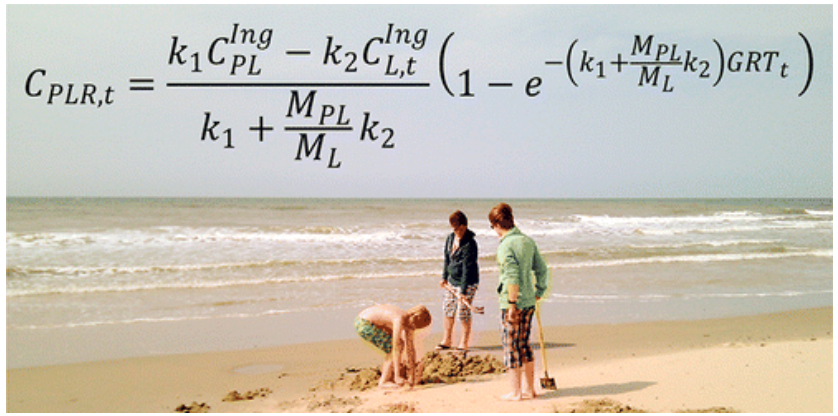


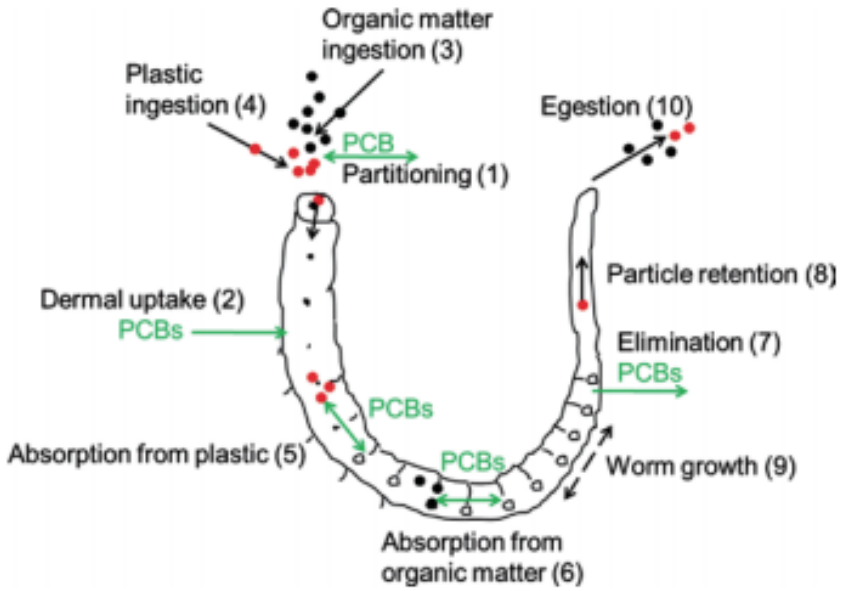
Chemicals…

Negligible transfer of chemicals from MPs

Koelmans et al (2013)

$$C_{PLR,t} = \frac{k_1 C_{PL}^{Ing} - k_2 C_{L,t}^{Ing}}{k_1 + \frac{M_{PL}}{M_L} k_2} \left(1 - e^{-\left(k_1 + \frac{M_{PL}}{M_L} k_2\right) GRT_t}\right)$$





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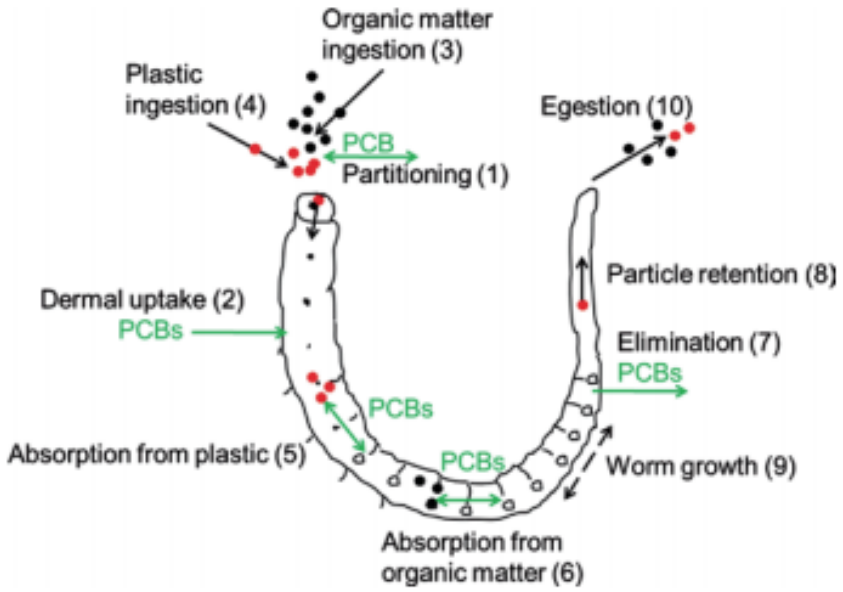
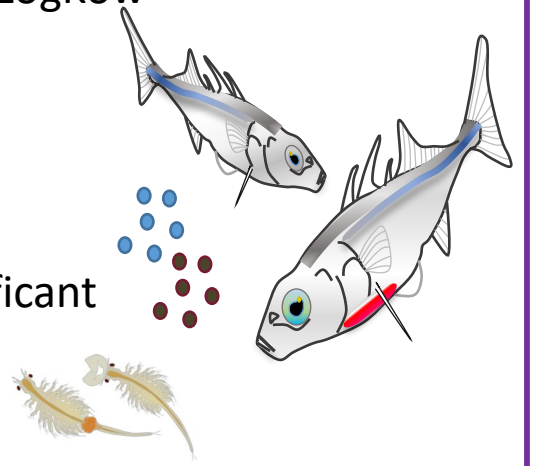


Low transfer of chemicals from MPs

Fed stickleback 3 different particles (PS, PE, silica) and 3 different chemicals with different MOA, LogKow

- Uptake of chemicals
- Metabolism, detoxification
- Biomarker effects

- Exposure via food chain is more significant



Asmonaite et al (2020) Bpur et al (2020)

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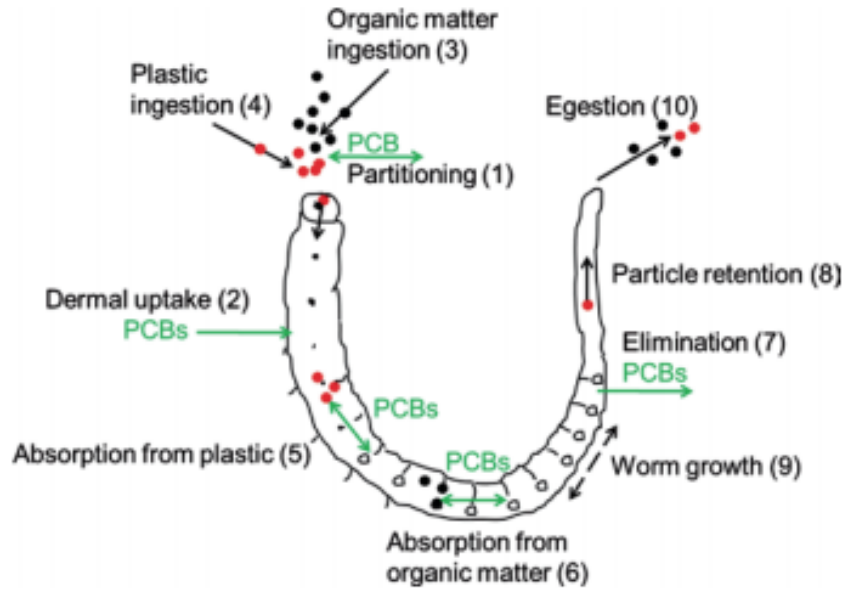

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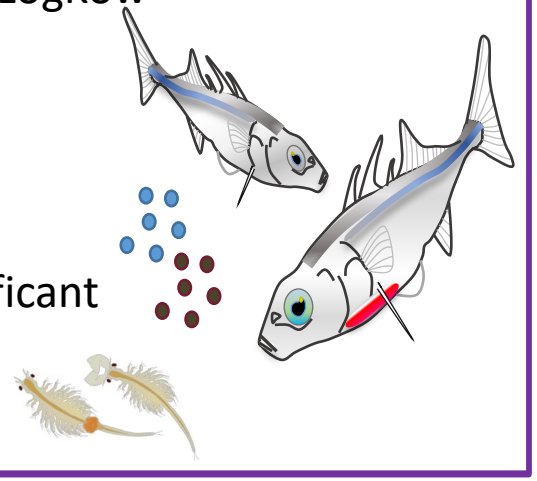
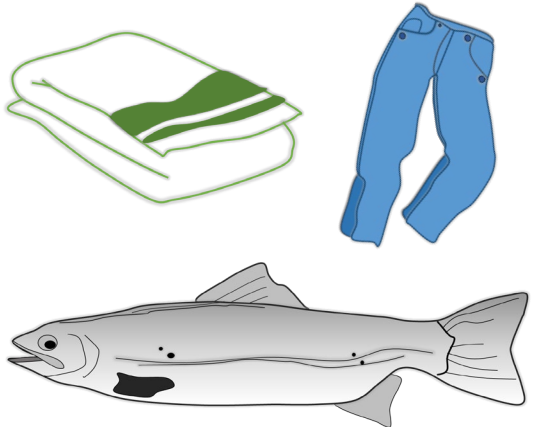


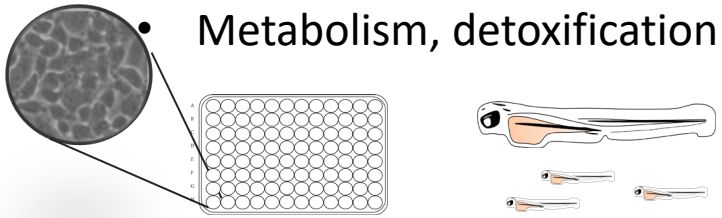
Asmonaite et al (2020) Bour et al (2020)

Leaching of toxic chemicals from textiles

Exposed trout and zebrafish

- Toxic effects in *in vitro* tests
- Biomarker effects in trout
- Metabolism, detoxification





Carney Almroth et al (2021)

Thank you!

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Foto: Annelie Pompe