

Which are the ecotoxicological properties of a conventional **plastic** object?

In order to answer this question on scientific grounds we need to divide the object in two parts with very different ecotoxicological properties

A: THE POLYMER

70% PVC

B: THE CHEMICAL ADDITIVES

30% DEHP, an endocrine disruptor



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97% LDPE



B: THE CHEMICAL ADDITIVES

3% Antioxidants (BHT, HALS), uv stabilizers (BP, Ni-quinchers), pigments (TiO₂, Cr...)

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% PolyL-Lactic Acid



B: THE CHEMICAL ADDITIVES

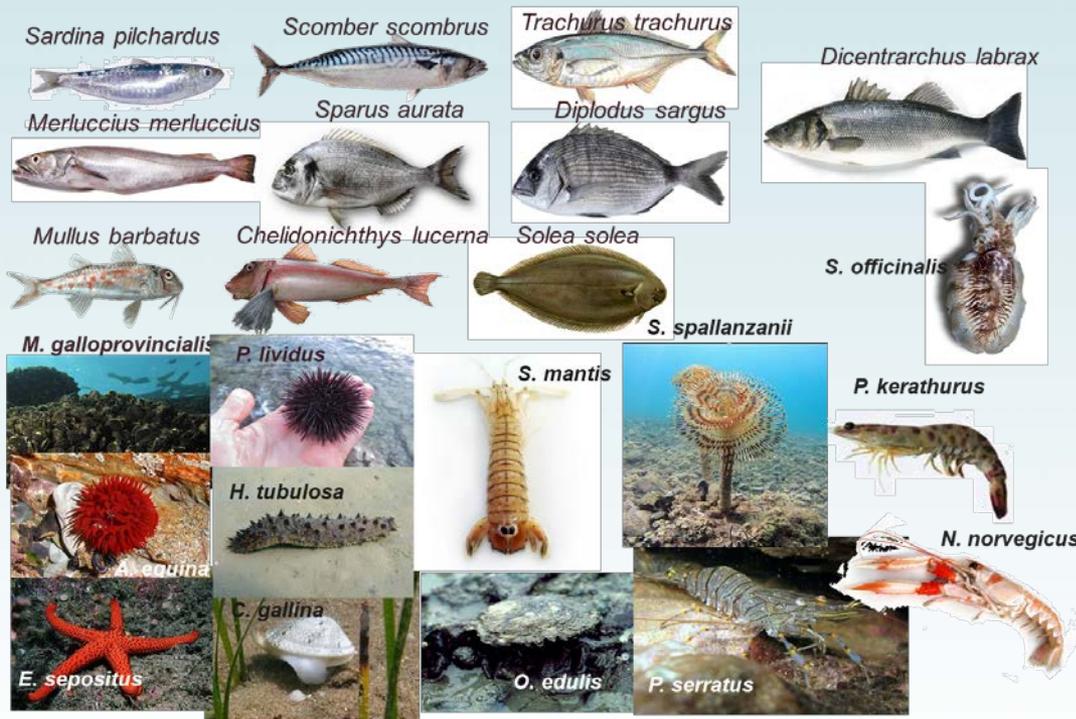
2% BHT (antioxidant),
antimicrobial agents

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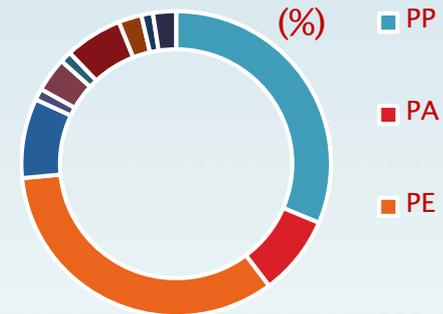
THE POLYMER The case of POLYETHYLENE

-PE microplastics are EVERYWHERE in the sea

26% of 320 analysed organisms were positive to microplastics ingestion, up to 70% of positive fish for some species



TYPOLOGY FREQUENCY (%)

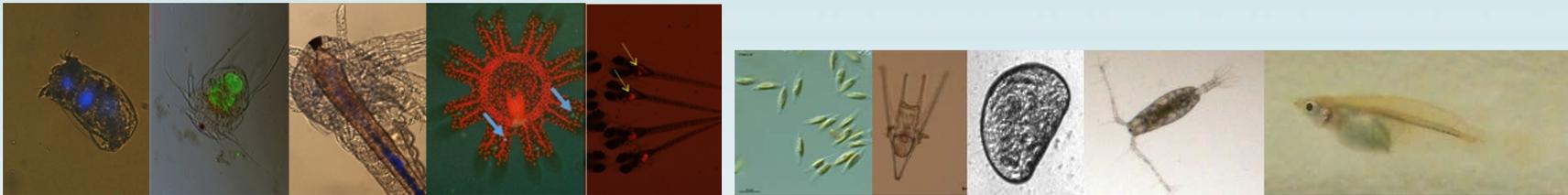


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THE POLYMER The case of POLYETHYLENE

-PE microplastics are **EVERYWHERE** in the sea

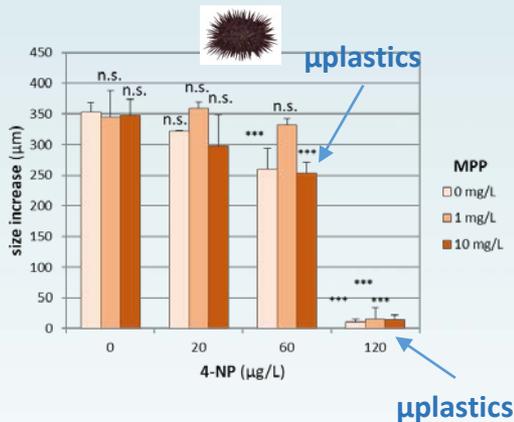
-PE microplastics **ARE INGESTED** by zooplankton, but they are **NON TOXIC**



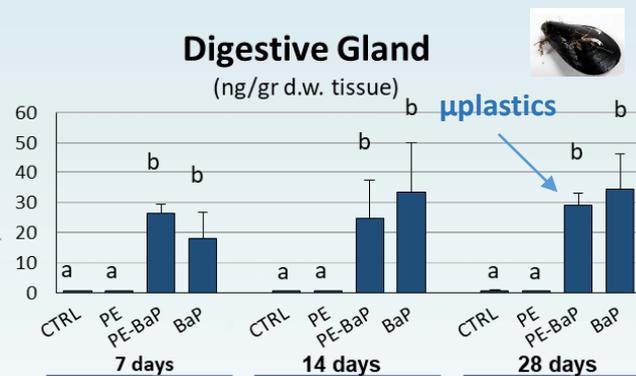
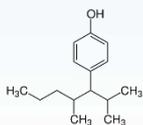
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THE POLYMER
The case of **POLYETHYLENE**

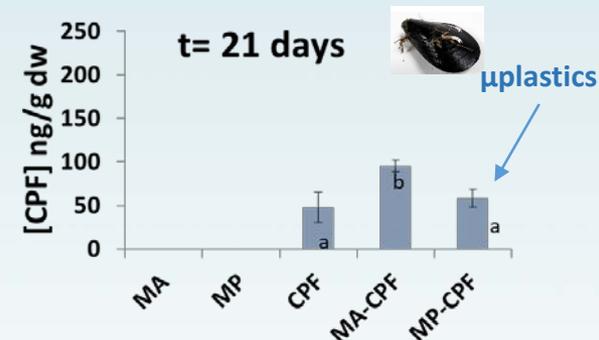
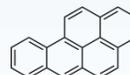
- PE microplastics are **EVERYWHERE** in the sea
- PE microplastics **ARE INGESTED** by zooplankton, but they are **NON TOXIC**
- PE microplastics does **NOT** act as **VECTORS** of HOPs increasing uptake with respect to waterborne or natural particles



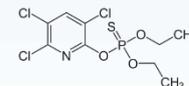
4-nonylphenol



benzo-a-pyrene



chlorpyrifos



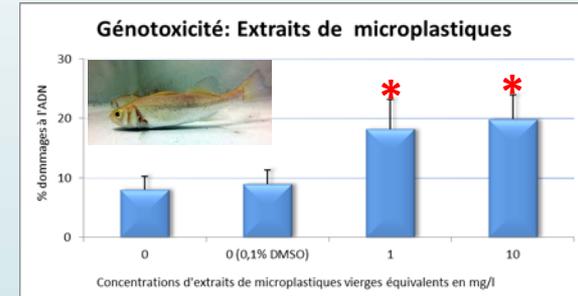
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THE ADDITIVES

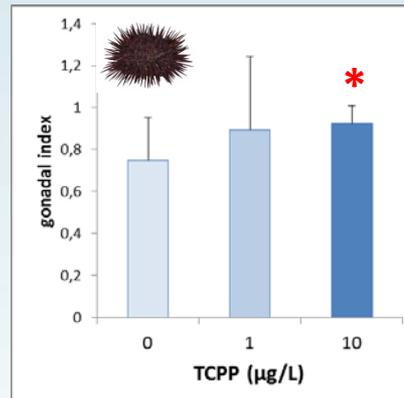
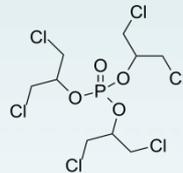
-PE organic extracts are **TOXIC**:

Dicentrarchus labrax brain cell lines DLB-1

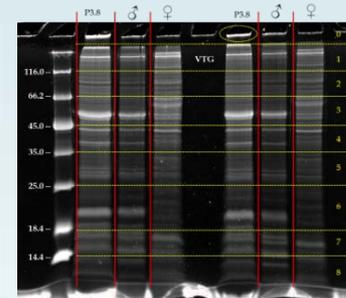
-Some chemical additives show lethal and sublethal toxicity:
endocrine disruption in sea-urchin



Tris(1,3-dichloro-2-propyl)phosphate (TCPP)



Increase in gonad index in females exposed to TCPP



Can we know the composition in additives of a plastic object?

No! only the polymer is indicated (PE, PP, PET...). The composition in chemical additives is not disclosed. This includes plastics in contact with food.

In fact, composition of a plastic object is controlled only in the following cases (according to EU legislation):

-Articles that can be placed in the mouth of children:

- ≤ 0.1% for ED phthalates (Dir. 2005/84/EC)
- ≤ 0.1 mg/L (migration limit) for BPA (Dir. 2014/81/EU)
- ≤ 5 mg/Kg TCEP, TCPP, TDCP (Dir. 2014/81/EU)

-Plastics in contact with food:

- migration limits for ca. 900 chemicals from 0.05 to 60 mg/Kg (Reg. 10/2011)

-Packaging:

- <100 ppm for the sum of Hg, Cd, Pb and CrVI (Dir. 94/62/EC)

Which are the ecotoxicological properties of a conventional **plastic** object?

In conclusion, ecotoxicological properties, risks and remediation measures are different for POLYMERS and ADDITIVES

A: THE POLYMER

-Inert: NON TOXIC

**-Persistent: bag ca. 50 years,
bottle ca. 400 years**

**-Produce secondary microplastics:
OXODEGRADABLES**

B: THE CHEMICAL ADDITIVES

**-Potentially TOXIC (ENDOCRINE
DISRUPTORS)**

**-a priori risk assessment to find **NON
TOXIC chemical additives****

