

Plastics and bioaccumulation assessment



Background

Orcas are under threat from water contamination. Polluted water can contain many different chemicals which pass directly from the water to the animal.

Orcas are apex (top) predators. As a result, chemicals can pass up the food chain accumulating in greater concentrations in these animals. This process is called bioaccumulation.

Polychlorinated biphenyls (PCBs) are industrial chemicals used to make lots of products. They are so dangerous to humans and the environment that they were banned in the in 1979 in the USA and 1981 in the UK. However, they persist in the oceans today.

Orcas with high levels of PCBs often become ill. The chemical can cause cancer, suppress immune system, and impair reproduction. One orca was in the news in 2018 as she was carrying a dead calf for 17 days. The calf died, in part, as it received PCBs from the mother's milk.

The study

Scientists have speared orcas in these locations, removing some of their blubber (fat). Their fat was tested for concentrations of PCBs.

1. Calculate the mean concentration (add all 3 values and divide by 3).
2. Remove anomalies (sample values which do not match others).
3. Using graph paper, draw a bar chart showing how the mean PCB concentration in orcas change with location.

STUDENT SHEET 5a

Table 1: PCB concentration in orcas

Location	Sample concentrations of PCB in blubber (mg/kg)			Mean of samples	Rank of mean concentration (1 - highest)
	1	2	3		
UK	101	103	300		
Portugal	110	111	112		
Slovenia	170	177	174		
Spain	230	241	235		
Gibraltar	320	360	344		

Summary Questions

1. What is bioaccumulation?

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2. A scientist called PCB chemicals a 'persistent organic pollutant (POP)'. Why do you think she called them persistent?

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3. Which areas are most polluted with PCBs?

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Jepson et al. (2016)
PCB pollution continues to impact populations of orcas and other dolphins in European waters.