

Congener specific accumulation of toxaphene in different Antarctic seal species

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1. Introduction

The concentrations of toxaphene in blubber of Weddell seals (*Leptonychotes weddelli*) from the Antarctic are high compared to other organochlorines like PCBs and DDT¹). Only few toxaphene congeners are responsible for the the high toxaphene content of seal samples. Two compounds could be identified as TOX8 (also called T2 or Parlar #26) and TOX9 (T12/Parlar #50)²⁻⁴).

Due to the quite different composition of the toxaphene pattern of seal blubber (two high abundant congeners) and technical toxaphene (at least several hundreds of compounds⁵), a proper quantitation of TOX8 and TOX9 is not possible without single standards compounds. Yet, Burhenne et al. have overcome this problem by preparation of these toxaphene compounds which now are commercially available⁶).

2. Results and Discussion

The concentrations of organochlorine compounds in the blubber of Weddell seals and crabeaters (*Lobodon carcinophagus*) are shown in Table 1.

Table 1: Residues of PCBs and DDT in the blubber of seal species from the Antarctic (ranges in $\mu\text{g}/\text{kg}$)

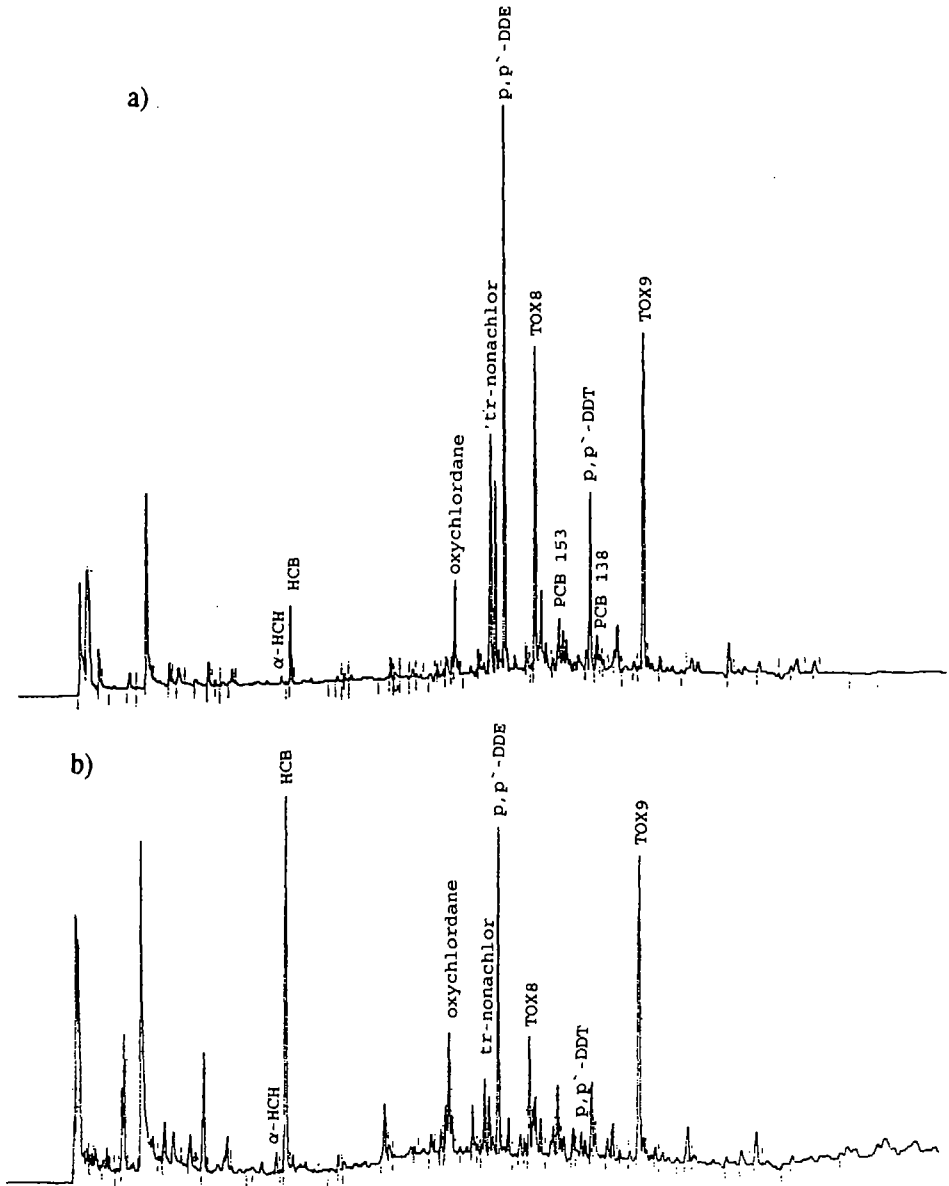
Seal species	n	ΣDDT	PCB 153	PCB 138	PCB 180
Weddell seals	4	98 - 117	8 - 10	6 - 7	2 - 4
crabeaters	3	8 - 39	2 - 3	1 - 2	< 1 - 1

Weddell seals are significantly higher contaminated than crabeater seals with PCBs and DDE (see Tab. 1). This is due to differences in the preferable diet of the species. Weddell seals mainly are fish eaters and the major prey of crabeaters is crill (*Euphausia superba*). Thus, Weddell seals feed on a higher trophic level and this leads to the higher pollution with DDT and PCBs measured in the blubber.

Additionally, Weddell seals are also higher contaminated with the two toxaphene congeners that crabeaters. However, the relative ECD signal abundances of TOX8 and TOX9 were in inverse order. While TOX8 dominated TOX9 in the ECD chromatograms of blubber extracts of Weddell seals, TOX9 was more abundant than TOX8 in the ECD chromatograms of crabeaters (see Fig. 1).

TOXA

Fig. 1: ECD-Chromatograms of blubber extracts of
a) Weddell Seal and b) Crabeater



Apparently, the bioconcentration of TOX8 and TOX9 depends on the seal species. To investigate a selective enrichment of toxaphene compounds in seal species (Weddell seals, crabeaters, leopard seals, elephant seals, Antarctic fur seals) blubber samples were analyzed for the contamination with toxaphene.

Full scan NCI mass spectra of the blubber extracts of the different seal species from the Antarctic were recorded, and mass traces which are representative of toxaphene congeners were extracted from the total ion current chromatograms (TICs). Fig. 2 shows the octa- and nonachloro traces (m/z 377 and m/z 413, respectively) of an extract of seal blubber. Besides TOX8 and TOX9, the NCI TIC of a blubber extract of a Weddell seal shows further signals which are part of the technical toxaphene.

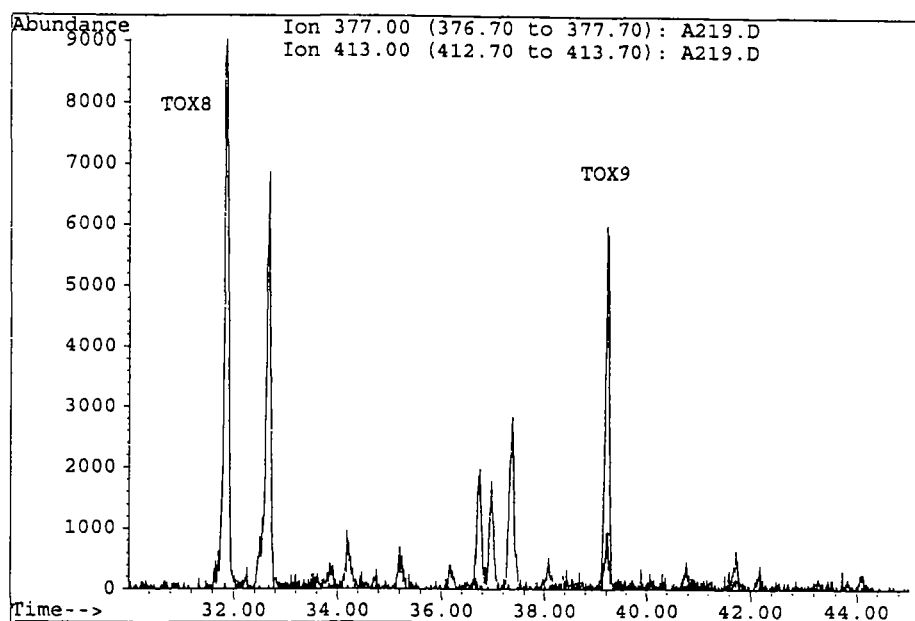


Fig. 2: GC/MS NCI ion traces extracted from the full scan TIC of blubber extract of Weddell seal (instrument: HP 5989B MS Engine; for MS parameters see ref ⁷⁾)

The congener specific composition of the toxaphene compounds were determined and changes in the residue patterns were discussed.

By application of NCI-GC/MS in the SIM mode the toxaphene concentrations in the samples were quantified using toxaphene single standard compounds.

Finally, the results for toxaphene contamination of seal blubber obtained by application of GC/MS and GC/ECD were compared and characteristic distributions of toxaphene compounds in the different seal species were evaluated.

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3. References

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