

Organochlorinated pesticides (OCPs; DDT and its metabolites) in soils from a small Native American (Guarani-Ñandeva - Tehoe Oco'y) territory near the Itaipu hydroelectric reservoir located at Paraná State, southern region of Brazil.

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Introduction

The first decade of the XXI century was marked by the tremendous impact of terrorism as well by the understanding that the immediate effects of the explosion of urban population, as a result of the improvement of the general life quality through antibiotics and vaccination, is the explosive demand for food items.

Looking exclusively by a global market perspective, the growing food production was supported by the beneficial utilization of a bunch of different pesticides:

“I need them to safeguard harvest and my profits... their appearance in the supermarket shelves is a key issue for my product acceptance... without pesticides I cannot produce” (typical local farmer speech)

The loss by infrastructure fails; in all procedures between the crop fields and the cities are maximum and neglected. Pesticide residues are a result of the agricultural practices, the product dynamics and the pesticide environmental persistence, in this case the legacy POPs like the OCPs is high enough to maintain a bad perspective for the Brazilian agricultural soils, that presence was increased by half a century of anti-vectorial use of such pesticides¹, with promotes the accumulation of such products in natural food chains.

In southern Brazil, the consolidation of agro industrial models was set by the exclusion/ extermination of the original populations, when the territories were conquest by gun power during the western marches. More recently, at Paraná State, the overall deforestation of a huge Atlantic and *Araucaria* forests lead stage to the formation of the reservoir of the biggest hydroelectric dam of the country. The remaining Guarani population were forced to leave their original land and after sometime installed at a fringe of land located between the lake and the soybean and corn plantations (> 60% of total crops at this region).

This research refers to the evaluation of the environmental conditions of this very small tribe of Guarani-Ñandeva that inhabited the Oco'y-Jacutinga ancient land in the far west of Paraná State. In 1973 their territory was invaded

by INCRA, the office for agrarian reformation of the ruled by military government of those days, and relocated at a small land parcel on the left margin of the Paraná River. In 1982 this area was inundated by the formation of the lake of the Itaipu hydroelectric dam and the native population of 600 families was forced to live at Tehoe Oco'y of São Miguel do Iguacu municipality, probably the smallest Indian settlement of Brazil nowadays.

The available space is not sufficient and is inadequate for the survival of this population, in fact is only one finger of lake marginal forest with 7 km long and 200 m wide.

This part of Paraná State represents one of the few places of Brazil outside the Amazon where the transmission and incidence of Malaria is ongoing. It is also the unique inhabited place on the shore of the lake where human settlements are not forbidden. The mosquitoes of the genus *Anopheles* found very good conditions to reproduce, and its control is based on periodic use of toxic pesticides sprayed on land, water margins and inside the houses.

Material and methods

Several soil samples were collected in January 2017 in different points of the Avá-Guarani settlement of Tehoe Oco'y in São Miguel de Itaipu (PR) and kept refrigerated upon arrival at the Eduardo Penna Franca Radioisotopes Laboratory of the Biophysics Institute of the Federal University of Rio de Janeiro. Local air temperature ranged from 30 °C to 35 °C while humidity ranged from 57% to 60% along the day.

The samples were extracted with non-polar pesticide grade solvents on a heated ultra-sound bath (60 °C). Clean-up of extracts to get rid of sulfur followed the Jensen protocol². Limits of quantification were considered as 3x the standard deviation of the analytical blank noise. Recovery (70 – 120%) was calculated by surrogate addition of the standards PCB 103/198. Five points external calibration ($r = 0,999$) plus internal standardization with TCMX at the 100 ppb level was used for quantification³

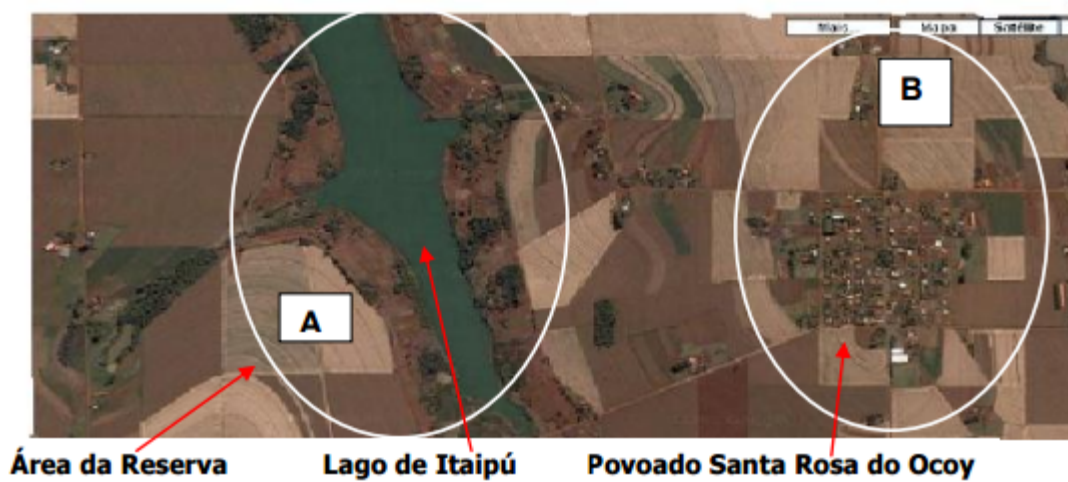


Figure 1: Google Satellite image showing the rural village SANTA ROSA DO OCO'Y and the Indian Reserve OCO'Y.

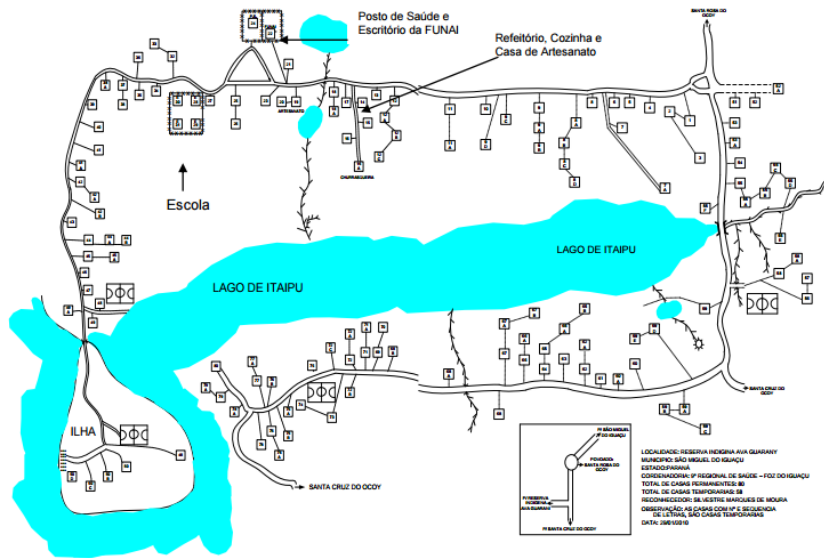


Figure 2: OCO'Y Indian Reserve at SÃO MIGUEL DO IGUAÇU (PR).

Results and Discussion

Table 1: Organochlorinated compounds found in soils of the Oco'y area ($\mu\text{g.kg}^{-1}$ = p.p.b.).

Sampling point	HCB	HCH	Chlord	Heptachlor	Methoxychlor	Endo	DDT	Drins
House 1	27	1115	649	175	191	80	1374	869
House 2	9	277	366	134	1	447	649	868
House 2 dry	7	256	209	120	1	167	519	913
House 3	2	731	325	48	89	28	1051	22
House 3 dry	36	174	423	6	1	176	483	1408
House 4	17	754	574	221	202	87	14907	2225
Farm house 2	14	370	201	209	356	123	10651	608
PT-Daniel	6	1040	548	105	172	56	1100	241
PT-Daniel dry	8	133	39	10	103	145	641	115
Spring	19	645	310	101	125	34	1951	92
River	14	1336	650	213	254	78	1581	140
River dry	9	43	238	9	153	23	1005	1795
Maize	11	644	678	184	1	160	1670	1780
Manioc	10	582	287	143	1	470	659	335
Soy 01	6	528	440	138	196	72	1191	1387
Soy 01 dry	6	108	50	52	110	26	555	255
Soy Ocoy dry	2	130	84	60	42	32	262	478
Ocoy II	11	89	202	20	1	191	500	437
Ocoy II island	21	392	881	188	5	51	16748	2783
Mean	12	492	376	112	105	129	3026	882
Std.Dev.	8	379	236	74	105	129	5057	804

HCB = Hexachlorobenzene; HCH = α -, β -, δ - and γ -Hexachlorocyclohexane; Chlord = cis- and trans-chlordane + oxychlordane; Endo = α - and β -endosulfan; DDT = o,p' and p,p'-DDD + o,p' and p,p'-DDE + o,p' and p,p'-DDT; Drins = aldrin + isodrin + dieldrin + endrin.

The presence of high DDT levels is a reflection of its persistence on the acidic soils of the region but may also represent the possibility of illegal uses due to smuggling of forbidden pesticides since the proximity of the federal border may also represent a key piece of such pollution puzzle⁴.

Acknowledgements

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References

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