

TOTAL DIET STUDY IN SUB-SAHARAN AFRICA HIGHLIGHTS THE CO-OCCURRENCE OF POPS AND OTHER CONTAMINANTS AND RESIDUES IN SMOKED FISH

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Introduction

The **Total Diet Study (TDS)** approach provides a snapshot of the exposure of populations to food chemicals.

We carried out a multi-center Total Diet Study for assessing the dietary exposure to a wide spectrum of chemical contaminants and residues in a representative sampling of the populations' diet in **Benin, Cameroon, Mali and Nigeria** (2014-2018).

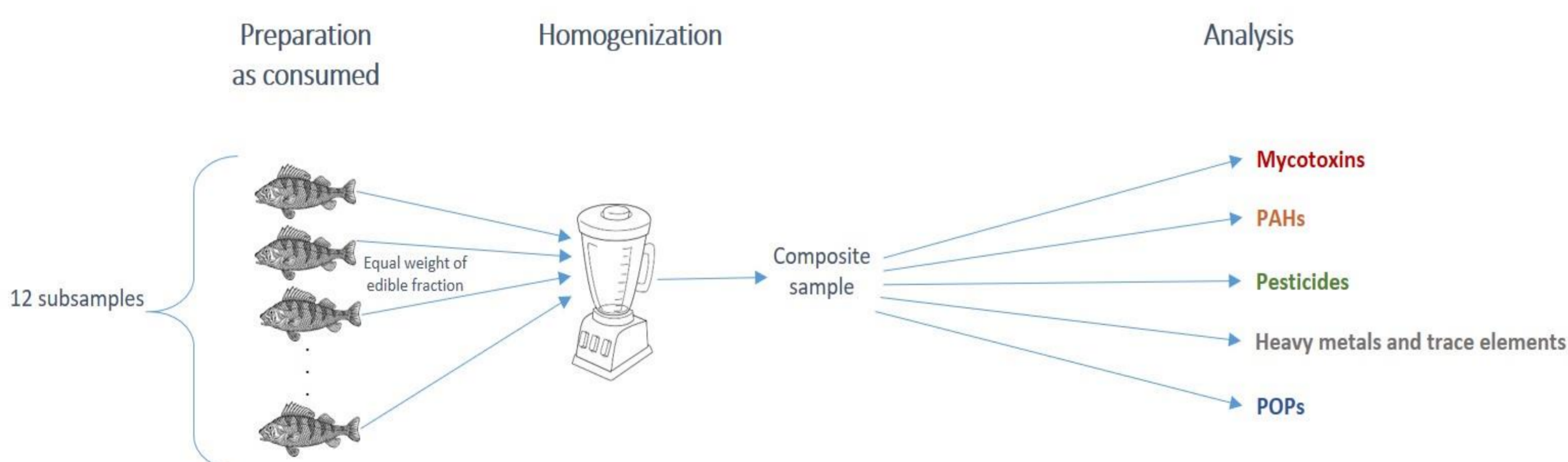
Although we assessed the contamination levels in all food groups, including cereals, tubers, legumes, vegetables, fruits, nuts and seeds, meat, eggs, dairy products, oil and fats, beverages, the food group "fish" and more particularly **smoked fish** clearly stood out from other samples, as highlighted in this poster.

Experimental

Figure 1: photograph of smoked fish



Figure 2: Total Diet Study pooled sample approach



Materials and Methods: We derived food consumption patterns from household budget surveys and allowed for the identification of a food list that covered the average diet in excess of 90% in eight study centres. We collected and prepared 4020 samples of the food list according to local customs and pooled by 12 subsamples to form composites. We tested those food composite samples for various chemicals, including PAHs, PCDD/Fs, PCBs, BFRs, and PFAS and various classes of pesticides.

Results and discussion

Table 1: concentration of POPs in smoked fish composite samples

COUNTRY	Study centre	TEQ -WHO 2005 (pg/g)			PBDE (pg/g)		PFOS (ng/g)
		PCDD/F	DL PCB	Total	7 indicators	8 indicators	
BENIN	Littoral	0.024	0.081	0.105	1.68	14.86	0.04
	Borgou	0.262	0.302	0.564	220.64	726.47	0.39
CAMEROON	Duala	0.125	0.064	0.189	56.91	112.89	0.02
	North	0.041	0.024	0.066	28.81	319.84	0.12
MALI	Bamako	0.483	0.142	0.626	249.54	326.81	0.92
	Sikasso	0.313	0.079	0.392	217.1	365.40	10.44
Mean		0.208	0.115	0.324	129.11	311.05	1.99

Interpretation: Among the various core foods that we sampled and tested for food chemicals, smoked fish stood out for various reasons. The PAHs levels exceeded the EU regulated maximum tolerated limit in 100% of smoked fish, collected Benin, Cameroon and Mali. We did not collect any smoked fish from Nigeria, where it is not as significant in the diet as it is in the other countries. In Mali, smoked fish contained six different pesticides, including 5-18 mg/kg of chlorpyrifos, in Sikasso and Bamako, respectively. The higher PFOS concentration in smoked fish from Mali than compared to in the other countries may be relate explained to by the concomitant presence of pesticides in this commodity, in Bamako and Sikasso. The difference in PCDD/F and PCB profiles of in the smoked fishes compared to non-smoked fishes suggests that the origin of the contamination can be the combustion material used in the smoking process. Moreover, we also identified the presence of secondary metabolites, such as aflatoxin B1 and cereulide in some smoked fish composites.

Conclusion

The characteristics of this Total Diet Study, including the multi-center approach, the spectrum of analytes, as well as the analytical results, are unprecedented. Of all the foods that we collected, smoked fish represented the highest concentration of a number of food chemicals, and particularly of POPs. Appropriate management actions based on the measurement of the chemical contamination profiles of smoked food products will allow better control of the smoking process as well as the improvement of the storage and preservation conditions.

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