

IAFI Statement on uncontrolled hazards associated with the smoked fish business in developing countries

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Polycyclic aromatic hydrocarbons (PAHs)

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[Mutat Res.](#) 1999 Jul 15;443(1-2):139-47.

Polycyclic aromatic hydrocarbons in the diet.
[Phillips DH](#)¹.

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Abstract
Polycyclic aromatic hydrocarbons (PAHs), of which benzo[a]pyrene is the most common combustion of organic matter. They are widely distributed in the environment and human benzo[a]pyrene, are carcinogenic and mutagenic, and they are widely believed to make humans. Their presence in the environment is reflected in their presence at detectable levels. Processes can generate PAHs in food. PAHs can also be formed during the curing and roasting of food. Studies have been carried out to determine the levels of exposure to PAHs from representative human diets. In most cases, it is concluded that the major dietary sources of PAHs are cereals and vegetables, rather than meat and fish. More recently, biomonitoring procedures have been developed to assess whether diet is a major source of exposure. Exposure to nitro-PAHs through food consumption a

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Cancer

Article

Polycyclic hydrocarbons in commercially-and home-smoked food in Iceland

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EU Maximum levels of PAHs in smoked fish ($\mu\text{g}/\text{kg}$)

Maximum levels at EU level for polycyclic aromatic hydrocarbons (PAH) are laid down in [Commission Regulation \(EC\) No 1881/2006](#).

Provisions for methods of sampling and analysis for the official control of PAH levels are laid down in [Commission Regulation \(EC\) No 333/2007](#).

Product	<u>benzo(a)pyrene</u>	Sum of <u>benzo(a)pyrene</u> , <u>benz(a)anthracene</u> , <u>benzo(b)fluoranthene</u> and <u>chrysene</u>
Muscle meat of smoked fish and smoked fishery products, excluding fishery products listed in points	5,0 until 31.8.2014	30,0 as from 1.9.2012 until 31.8.2014
	2,0 as from 1.9.2014	12,0 as from 1.9.2014
Smoked sprats and canned smoked sprats (<u>sprattus sprattus</u>); bivalve molluscs (fresh, chilled or frozen); heat treated meat and heat treated meat products sold to the final consumer	5.0	30.0
Bivalve molluscs (smoked)	6.0	35.0

Levels of PAHs in African smoked fish

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	Classification	case	change	Reference	Country	Subject
	▼ ▲	▼ ▲	▼ ▲	▼ ▲	▼ ▲	
1.	border rejection	26/05/2014	05/06/2014	2014.AVO	BE	benzo(a)pyrene (6.2 µg/kg - ppb) and polycyclic aromatic hydrocarbons (46.1) in smoked sardinellas (<i>Sardinella aurita</i>) from Ghana
2.	border rejection	06/03/2014	06/03/2014	2014.AKT	DE	benzo(a)pyrene (35 µg/kg - ppb) in smoked sardines (<i>Sardinella aurita</i>) from Ghana
3.	alert	03/02/2014	18/07/2014	2014.0146	BE	benzo(a)pyrene (36.7 µg/kg - ppb) and polycyclic aromatic hydrocarbons (sum of benzo(a)-pyrene, benz(a)anthracene, benzo(b)fluoranthene and chrysene: 221 µg/kg - ppb) in smoked sardines (<i>Sardinella aurita</i>) from Ghana
4.	border rejection	02/01/2014	06/01/2014	2014.AAE	GB	benzo(a)pyrene (33 µg/kg - ppb) in smoked sardinella (<i>Sardinella</i> spp.) from Ghana
5.	alert	09/08/2013	09/08/2013	2013.1107	BE	benzo(a)pyrene (45.1 µg/kg - ppb) in smoked fish from Ghana
6.	alert	16/05/2013	03/02/2014	2013.0683	DE	benzo(a)pyrene (61.2 µg/kg - ppb) in dried fish from Ghana, via Belgium



Implications – Public health - Africa

Exposure assessment


- Estimated 78% of marine catch is smoked (West Africa) and 2/3 of all fish is smoked: estimated consumption: ~ 20kg/capita
- Average level of benzo(a)pyrene = 36 µg/kg (EU RASFF data)
- Average annual exposure = 730µg/capita from fish alone
- cf. 28 ng/kg b.w./day from fish cf. EU exposure of 3-4 ng/kg b.w./day from all sources
- consider also exposure to PAH from other sources (e.g. bushmeat) and elevated exposure to aflatoxins

Improved smoking technologies

COMPARISON OF KILN DESIGN OPTIONS FOR TRADITIONAL SMOKED FISH PRODUCTION

Type of Kiln	Background	Design features	Cost (US\$)	Picture	Advantages	Disadvantages
Chorkor (benchmark)	Common usage Traditional	Stackable trays Direct heat and smoke	200-250		More efficient than drum/ <u>banda</u> smokers Cheap Technology understood and accepted	Fire under fish results in lack of control Fish may burn Relatively inefficient cf. other modified designs Smoky environment Fish may burn Requires annual refurbishment of walls and trays
FAO- <u>Thyarore</u> Technology (FTT)	Designed and tested by FAO	Stackable trays Remote smoke generator Brick construction	1500-2000		Efficient Safe use Safer products Highly controllable process variables Multipurpose cooking oven Long lasting (10years) Remote fire (reduces burning)	Expensive Needs steel fabrication Operators need substantial training

Improved smoking technologies

<p><u>Kosmos</u></p>	<p>Installed by <u>Kosmos Energy Co.</u> as communal ovens at <u>Sekondi, Nkotopopo, Anlo Beach and Shama</u></p>	<p>Chimney damper Fire not directly under fish</p>	<p>3000</p>		<p>Efficient Controllable process Safe use Long lasting (10years) Remote fire (reduces burning)</p>	<p>Difficult to load/unload Expensive to construct Needs steel fabrication</p>
<p><u>Morisson (modified Chorkor)</u></p>	<p>Local design with evolutionary improvements</p>	<p>Stackable trays Direct heat and smoke Close sealing trays (rebated) Insulated walls (with sawdust) Chimney/ recirculation</p>	<p>300-350</p>		<p>Efficient (40% saving cf. Chorkor) Safe use Reduced labour Cheap Technology understood and accepted</p>	<p>Fire under fish results in lack of control Requires annual refurbishment of walls and trays Construction requires trained builder</p>

How to implement?

Policy instruments

- Legislation and enforcement
- Incentives for investment:
 - human capital
 - Infrastructure/facilities
 - capacity limits (e.g. withdrawals, alternative activities)



Policy measures for improved food safety of smoked fish

Some or all of:

- Risk assessment studies
- Advice to consumers
- Limits for PAHs
- Regulations to limit traditional smoking/restrict markets
- Investment incentives for improved smoking technology

Cross cutting:

- fisheries
- environment
- food safety/public health
- trade
- occupational health

Conclusions

1. Fish smoking is a strategically important fisheries sector activity for many developing countries (for incomes, employment, food security), particularly in Africa
2. There is strong evidence that the consumption of smoked products leads to elevated rates of intestinal and liver cancers; worker health impacts due to inhalation are also a concern.
3. Exposure of African populations to carcinogenic substances in smoked fish is estimated to be at least 7 times higher than in the EU.
4. This risk to public health is not widely recognised or addressed by food safety administrations of developing countries.

What does IAFI say?

Draft statement for discussion:

Exposure of developing country populations to carcinogenic substances in smoked fish can be at least 7 times higher than in the EU. The International Association of Fish Inspectors, whilst recognising the importance of the production and marketing of smoked fish industry for food security and sustainable livelihoods, calls on Governments especially in developing countries to consider addressing the risk to public health of fish smoking activities and an elevated consumption of carcinogenic substances present in smoked foods, including fish.

IAFI therefore strongly supports ongoing efforts by Governments and calls for more research to determine precise level of risk, and the socio-economic impacts of possible risk management measures, which may include dietary and food preparation advice, investment incentives for introduction of improved smoking kilns, and processing guidelines, as well as regulatory measures where appropriate.