PAH in Tea and Coffee

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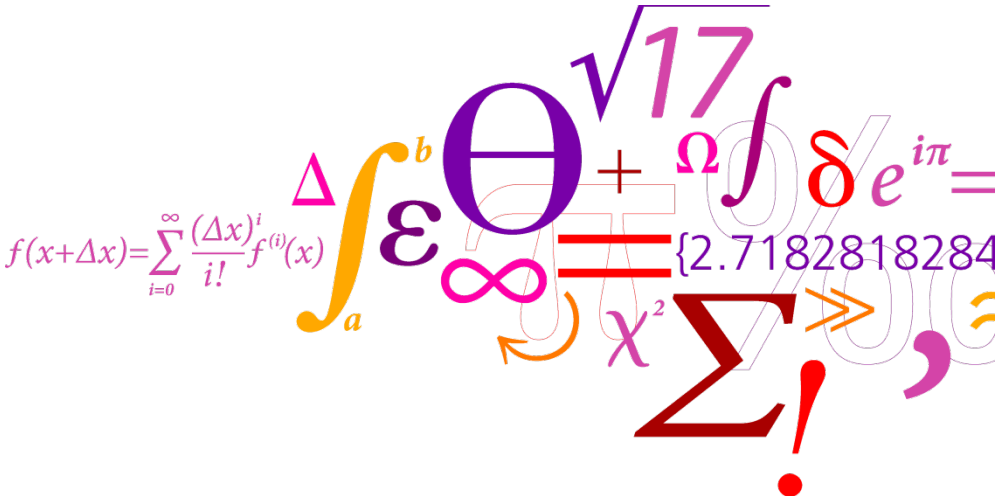


Overview

- Production of Tea and Coffee

- Analytical method
- Results on Tea leaves (n=18) and ground Coffee (n=11)
- Tea and Coffee Extracts

- Danish consumers PAH4 intake

Tea production

Black Tea

- Withering (18-24 hrs)

- Rolling
- Fermenting (2-4hrs)
- Firing

Green Tea

- Steaming

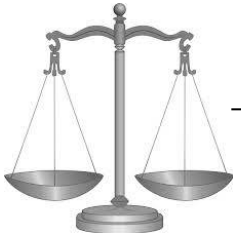
- Rolling
- Drying

Coffee production

- Drying (up to 4 weeks)
- Milling

- Fermentation (12-48 hrs)
- Drying (65 - 85°C)
- Roasting (180 – 250 °C, 3-12 min)

Analytical method



Deuterated ISTD

100°C, 1500psi, 2 cy, 75% vol. hex:ac (1:1)

S-X3 BioBeads (cy:ea, 1:1)

500mg Si

Select PAH 15m * 0.15mm (0.1 µm) 3µl, PTV ,

Temp. (°C)	Heat rate (°C/min)	Hold time (min)
70		1
180	60	0
230	4	10
280	28	10
340	14	5

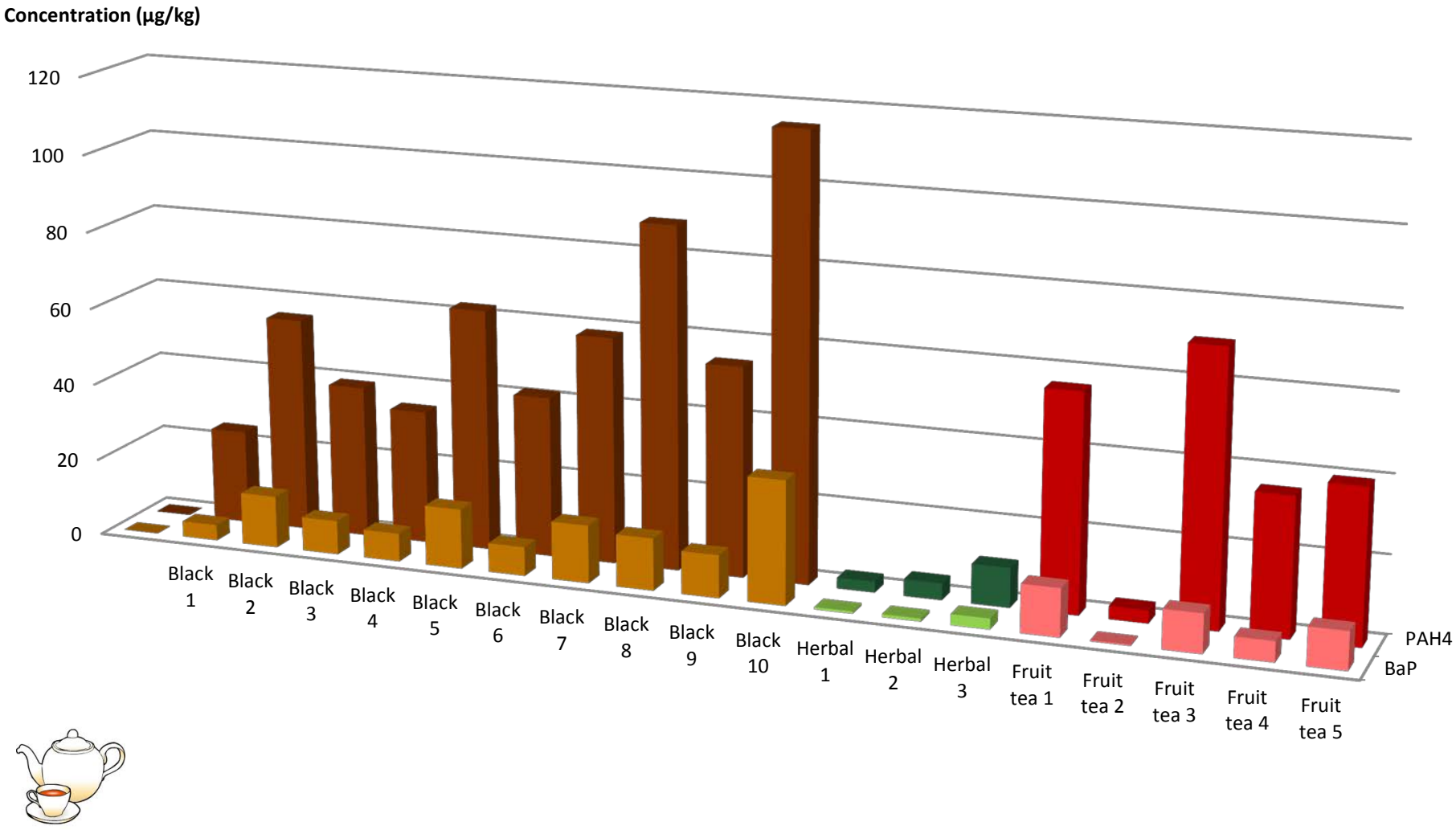
Quality Assurance

Compound	LOD (µg/kg) (n=21)	Recovery % (n=6)
Chrysene	0.1	98 (88-105)
Benz[*a*]anthracen	0.1	97 (92-105)
Benzo[*b*]fluoranthen	0.2	106 (102-110)
Benzo[*a*]pyrene	0.2	103 (94-119)

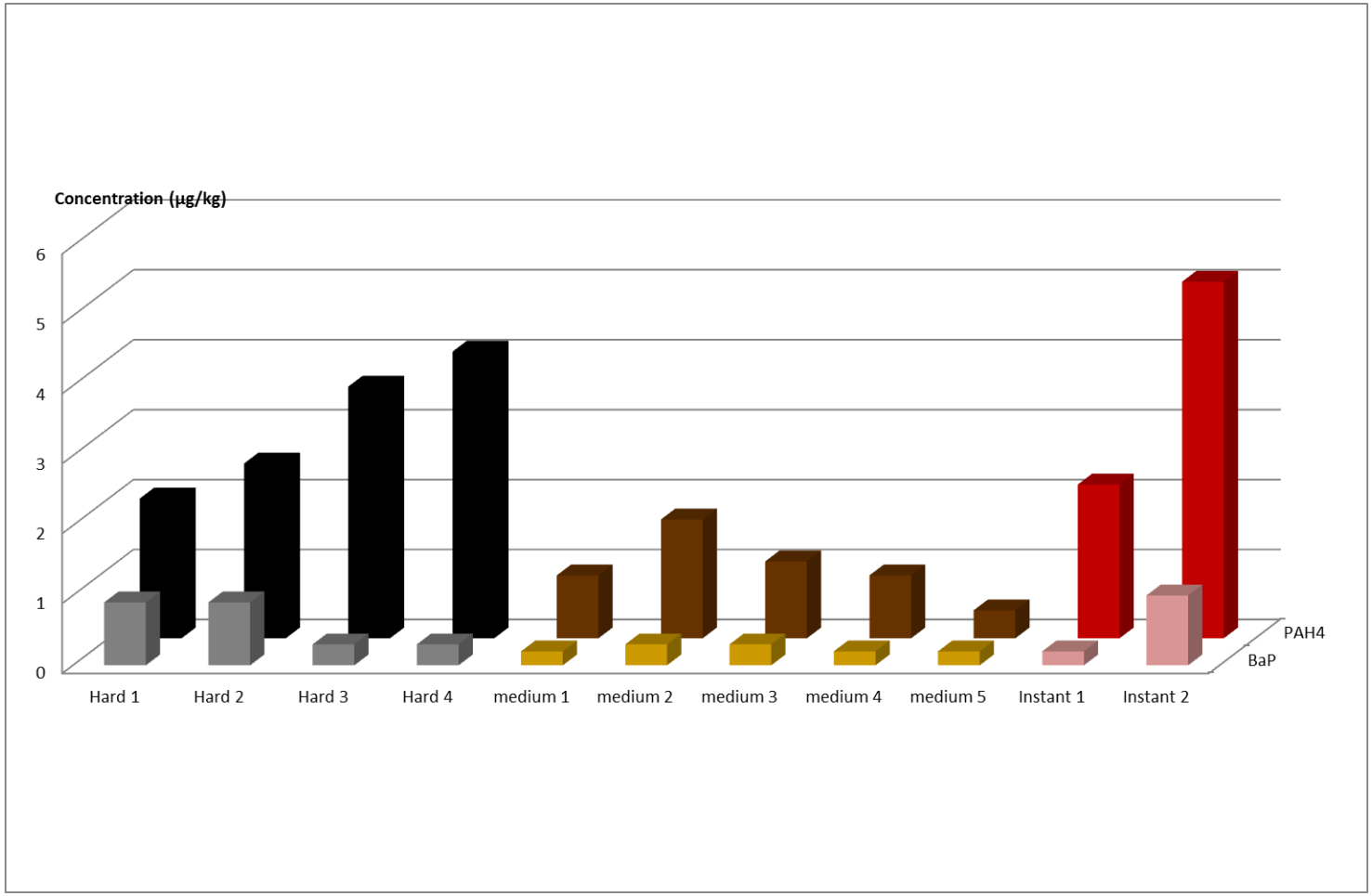
Addition of ISTD

Calibration curves with 7 values in the range 2-250 ng/ml

Tea

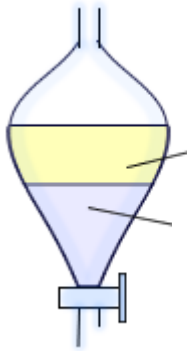

Concentration (µg/kg)
120
100
80
60
40
20
0
Black 1
Black 2
Black 3
Black 4
Black 5
Black 6
Black 7
Black 8
Black 9
Black 10
Herbal 1
Herbal 2
Herbal 3
Fruit tea 1
Fruit tea 2
Fruit tea 3
Fruit tea 4
Fruit tea 5
PAH4
BaP

Coffee


Concentration (µg/kg)
6
5
4
3
2
1
0
Hard 1
Hard 2
Hard 3
Hard 4
medium 1
medium 2
medium 3
medium 4
medium 5
Instant 1
Instant 2
PAH4
BaP

Analytical method

Hexane; vacuum



Hexane

S-X3 BioBeads

500mg Si

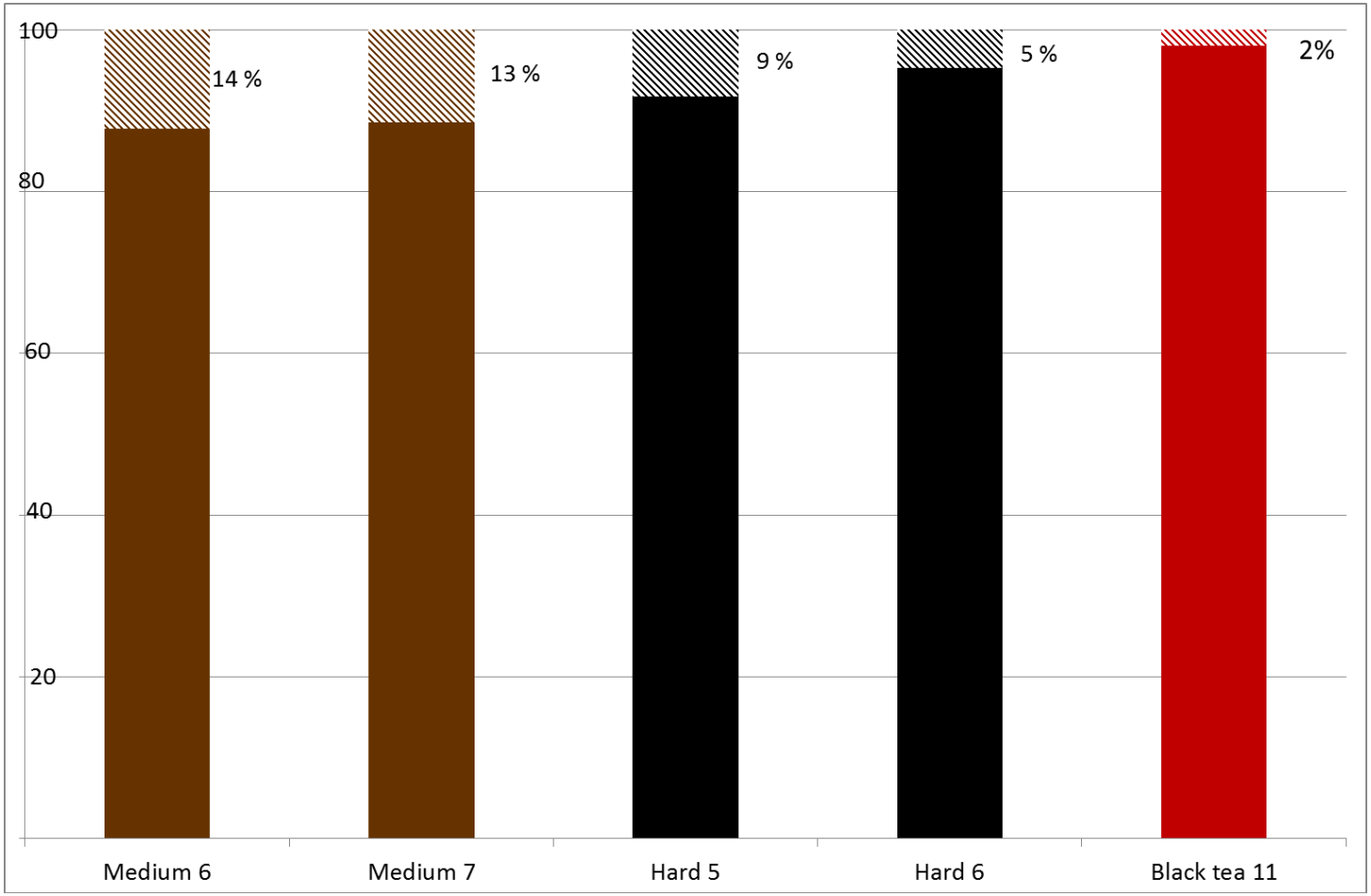
Select PAH 15m * 0.15mm (0.1 µm) 3µl, PTV ,

Temp. (°C)	Heat rate (°C/min)	Hold time (min)
70		1
180	60	0
230	4	10
280	28	10
340	14	5

Limit of Detection, extracts

Compound	LOD, coffee (µg/kg) (n = 8)	LOD, tea (µg/kg) (n = 8)
Chrysene	0.1	0.3
Benz[*a*]anthracen	0.1	0.3
Benzo[*b*]fluoranthen	0.1	0.3
Benzo[*a*]pyrene	0.1	0.3

Transfer from ground Coffee to extract



Danes Dietary Exposure to PAH4 from Coffee

Coffee	Consumption (g/person/day)	Dietary exposure PAH4 (ng/kgbw/day)
Average	509	3.0
High coffee intake	3331	19.8

European citizens average total PAH4 29 ng/kg bw/day

European citizens high level intake consumer 34.5 ng/kgbw/day

REF; Scientific Opinion of the Panel on Contaminants in the Food Chain on a request from the European Commision on Polycyclic Aromatic Hydrocarbons in Food. The EFSA Journal 724: 1-114

REF: DTU 2010; Dietary habits in Denmark 2003-2008. Main results. Available at www.food.dtu.dk. Report in Danish with English Summary

Margin of Exposure

- MOE = BMDL10/Dietary Exposure to PAH 4
- BMDL10 = 0.34 mg/kg bw/day (REF; Scientific Opinion of the Panel on Contaminants in the Food Chain on a request from the European Commision on Polycyclic Aromatic Hydrocarbons in Food. The EFSA Journal 724: 1-114)

Coffee	MOE
Average	113300
High level intake	17200

- **MOE < 10,000**

Summation

- PAH4 in Tea leaves (2.8 to 115 µg/kg)
  - Highest for orient tea
  - Lowest for herbal tea
- Hardly any transfer to extracts from leaves

- PAH4 in ground Coffee beans (0.4 to 5.1)
  - Highest for instant coffee
  - Lowest for medium roasted coffee
- Approx. 14% transfer to extracts

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