Commentary on EFSA's draft scientific opinion on acrylamide in food

By

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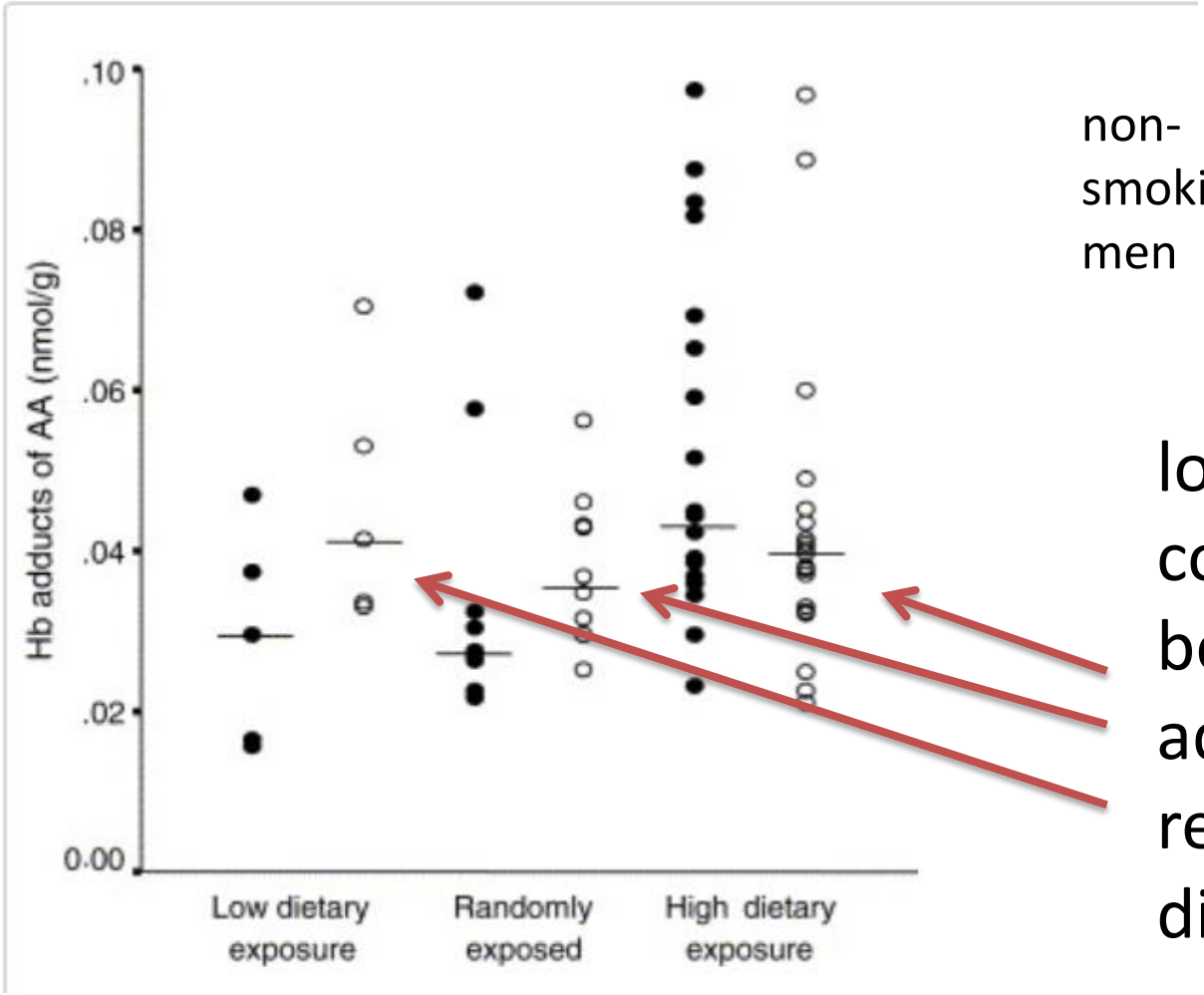
Human studies are equivocal

- AA and GA -adducts – twofold variation over time for the same person (Vikström et al. 2012)
- Low correlation between calculated intake and AA/GA- adducts (Hagmar et al. 2005)
- AA variate greatly in diff groups of food (NFA, Sweden)



non-smoking men

low correlation between AA-adducts and reported dietary intake

Hagmar et al 2004

AA varies greatly

French fries

~ 200 - 900 µg/kg

Chips

~ 200 - 3000 µg/kg

Coffée

~ 200 - 400 µg/kg

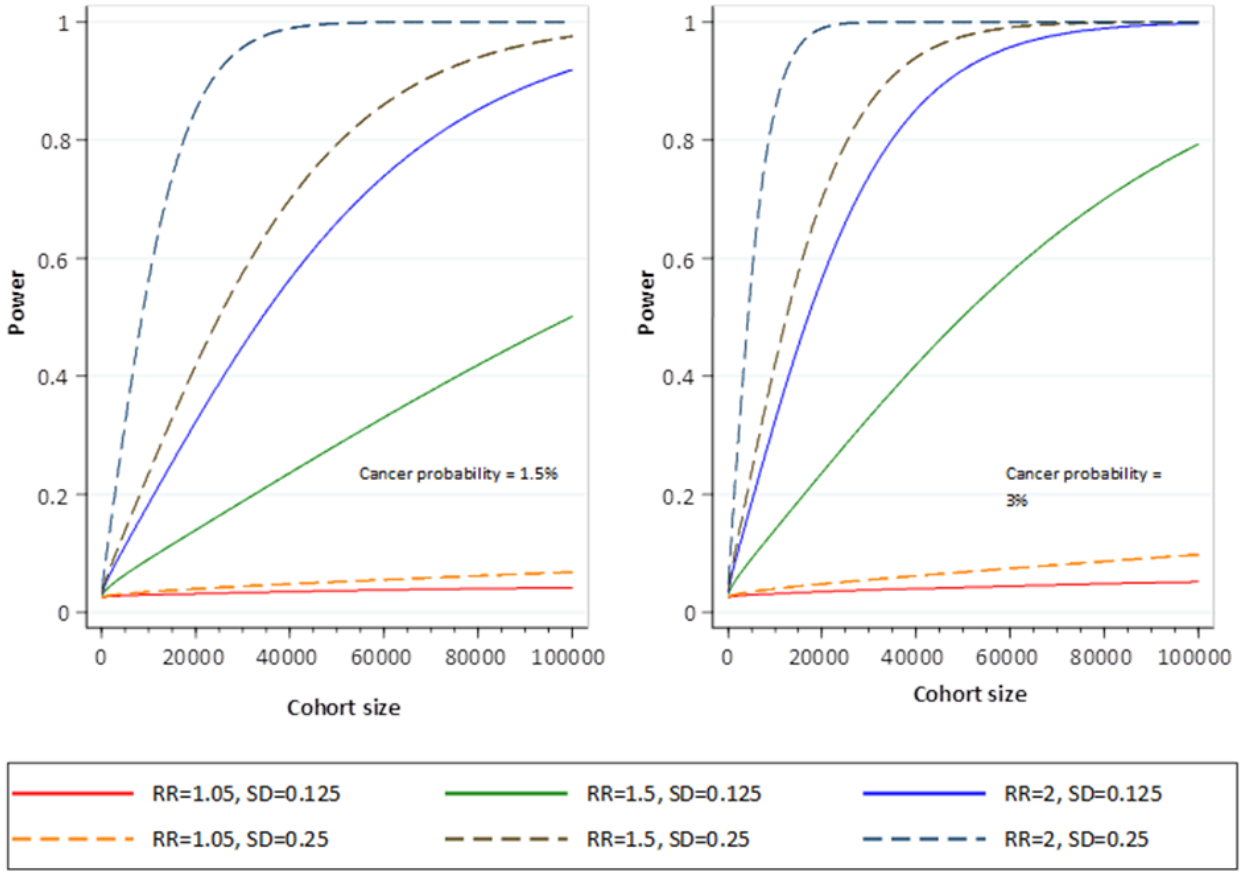
Bread

~ 200 - 1000 µg/kg

Biscuits

~ 20 - 1000 µg/kg

Calculation of the relationship between statistical power and cohort size



- Calculations were performed for two different combinations of RR(relative risk) and two acrylamide intake distributions. The left side shows the situations of having a probability of 1.5% for finding cancer cases in the cohort during the period studied, the right side is for a probability of 3% (SD: Standard deviation in µg/kg bodyweight/day).

Power and sample size calculations for a continuous risk model

211,020

	Power 0.6		Power 0.8		Power 0.6		Power 0.8	
	N	Cancers	N	Cancers	N	Cancers	N	Cancers
	Probability of cancer 1.5%				Probability of cancer 3%			
SD=0.125								
RR = 1.01	$2.1x10^8$	$3.2x10^6$	$3.4x10^8$	$5.1x10^6$	$1.1x10^8$	$3.2x10^6$	$1.7x10^8$	$5.1x10^6$
RR = 1.05	$8.8x10^6$	131,705	$1.4x10^7$	211,020	$4.4x10^6$	131,705	$7.0x10^6$	211,020
RR = 1.20	628,779	9,432	1.0e+06	15,112	314390	9,432	503,722	15,112
RR = 1.50	127,136	1,908	203,700	3,056	63,568	1,908	101,850	3,056
RR = 2.00	43,504	653	69,703	1,046	21,752	653	34,852	1,046
RR = 2.50	24,895	374	39,887	599	12,448	374	19,944	599
SD=0.5								
RR = 1.01	1.3x107	197,911	2.1x107	317,098	$6.6x10^6$	197,911	$1.1x10^7$	317,098
RR = 1.05	548,769	8,232	879,249	13,189	274,385	8,232	439,625	13,189
RR = 1.20	39,299	590	62,966	945	19,650	590	31,483	945
RR = 1.50	7,946	120	12,732	191	3,973	120	6,366	191
RR = 2.00	2,719	41	4,357	66	1,360	41	2,179	66
RR = 2.50	1,556	24	2,493	38	778	24	1,247	38

- Calculations were performed for different combinations of RR and the SD in the AA intake distribution in the population expressed in µg/kg bodyweight/day for a probability of 1.5% of finding cancer case during the studied period in the cohort (upper parte) and that of 3% (lower part). The N-column gives the size of the cohort, and Cancers-column gives the number of cancer cases needed to reach the power level indicated (the presented RR are for a 1 µg/kg bodyweight/day increase).

Power and sample size calculations for a continuous risk model

$5.1x10^6$

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	N	Cancers	N	Cancers	N	Cancers	N	Cancers
	Probability of cancer 1.5%				Probability of cancer 3%			
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Power and sample size calculations for a continuous risk model

317,098

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Implications for the risk assessment

- Estimates of theoretical RR's derived from animal studies range from 1.0003 to 1.016 (Wilson *et al.* 2006, Törnqvist *et al.* 2008)
- The hitherto conducted epidemiological studies are not likely to be sufficiently sensitive to detect the RR estimated from animal studies
- In general, in cases where the epidemiological studies show clear positive or negative associations they should weigh heavily in any risk assessment
- In cases where the epidemiological studies show no clear associations, it is vital that conclusions are not drawn beyond the predictive capacities of these studies.

Suggestions for EFSA

- To clarify how data from animals studies and mode of action studies should be weighed when epidemiological studies are “limited and inconsistent”
- To consider how the statistical power of human epidemiological studies can be included in the evaluation of the epidemiological evidence

Thank you for your attention