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Acrylamide Levels and Associated Health Risks in Traditional Arabic Coffee Roasts

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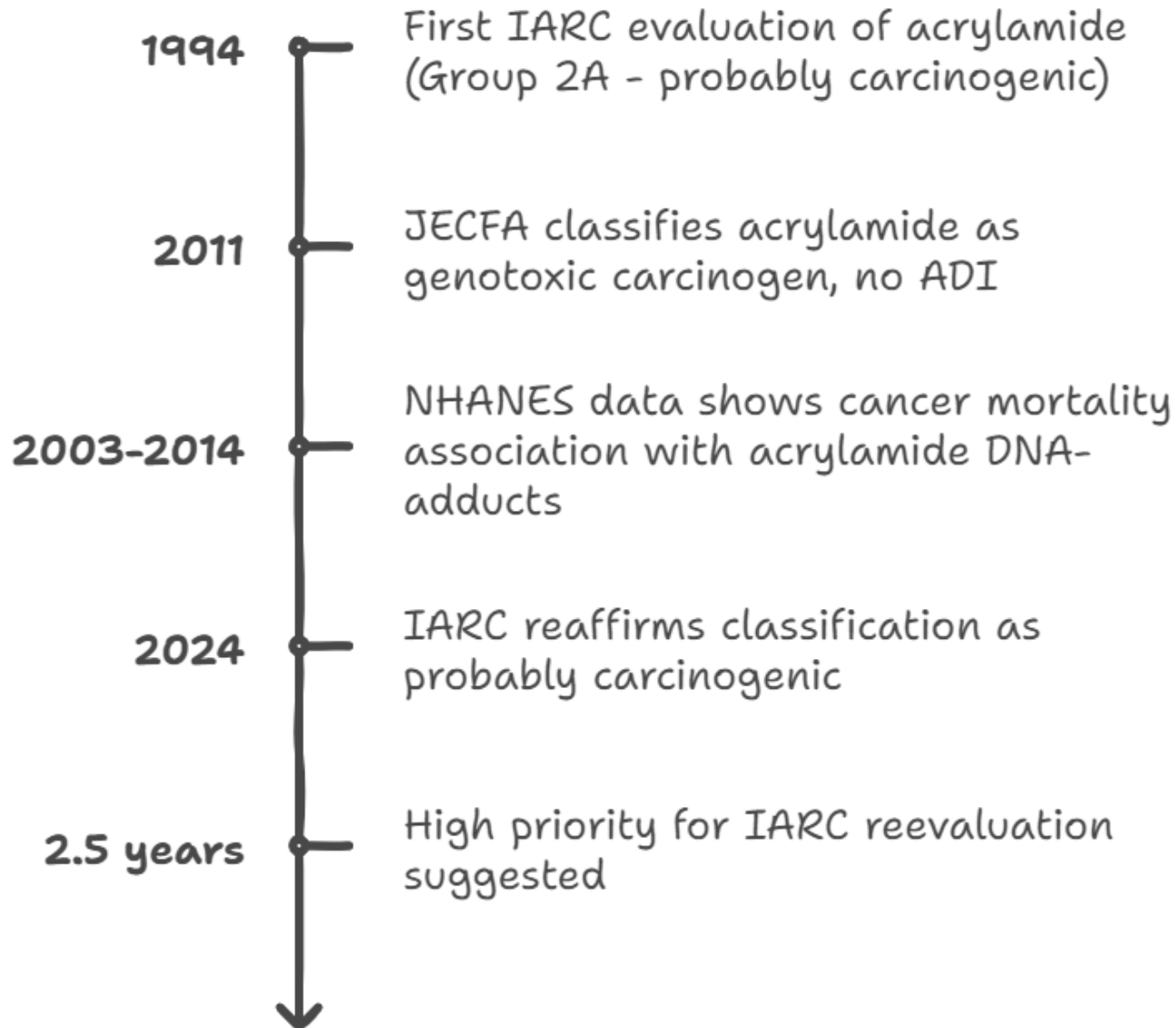
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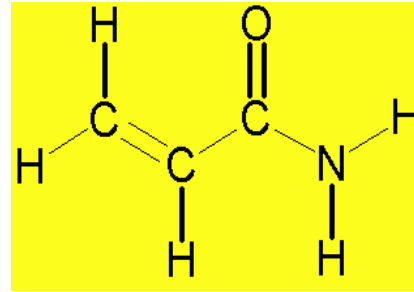
International Coffee Convention 2024



Acrylamide Carcinogenicity Assessment Timeline



Acrylamide



- Scientist from Sweden first discover acrylamide in a number of food in April 2002
- The compound is formed during processing of foods in industry and at home
- Main influences are the presence of reducing sugars (glucose, fructose) and the amino acid asparagine

Results from Official Control

Year of Analysis	Number of Samples	Average [$\mu\text{g}/\text{kg}$]	Median [$\mu\text{g}/\text{kg}$]	90th Percentile [$\mu\text{g}/\text{kg}$]
2002	5	303	313	461
2015	4	118	130	138
2018	22	195	165	306
2019–2024 (LC/MS/MS)	53	188	167	230
2019–2024 (NMR screening)	693	166	161	273

- Only two out of 693 samples (0.3%) exceeded the benchmark level of 400 $\mu\text{g}/\text{kg}$.
- The highest content (912 $\mu\text{g}/\text{kg}$) was an Arabic-style roasted coffee labeled as “Brasil Coffee Super-Light Color”.

Roasting experiment

Profile	Charge (°C)	DROP	DROP (°C)	AUC
1. Coffee fast drying	141	8:25	204	566
2. Coffee slow drying	85	10:22	205	673
3. Espresso fast drying	147	7:56	203	625
4. Espresso slow drying	140	10:49	207	762
5. Scandinavian coffee	145	8:22	200	555
6. Espresso black (Napoletan)	145	10:07	222	796

Results

	Acrylamide	
	Value	Unit
1. Coffee fast drying	200	µg/kg
2. Coffee slow drying	210	µg/kg
3. Espresso fast drying	170	µg/kg
4. Espresso slow drying	150	µg/kg
5. Scandinavian coffee	470	µg/kg
6. Espresso black (Napoletan)	130	µg/kg
	Benchmark level: 400 µg/kg	

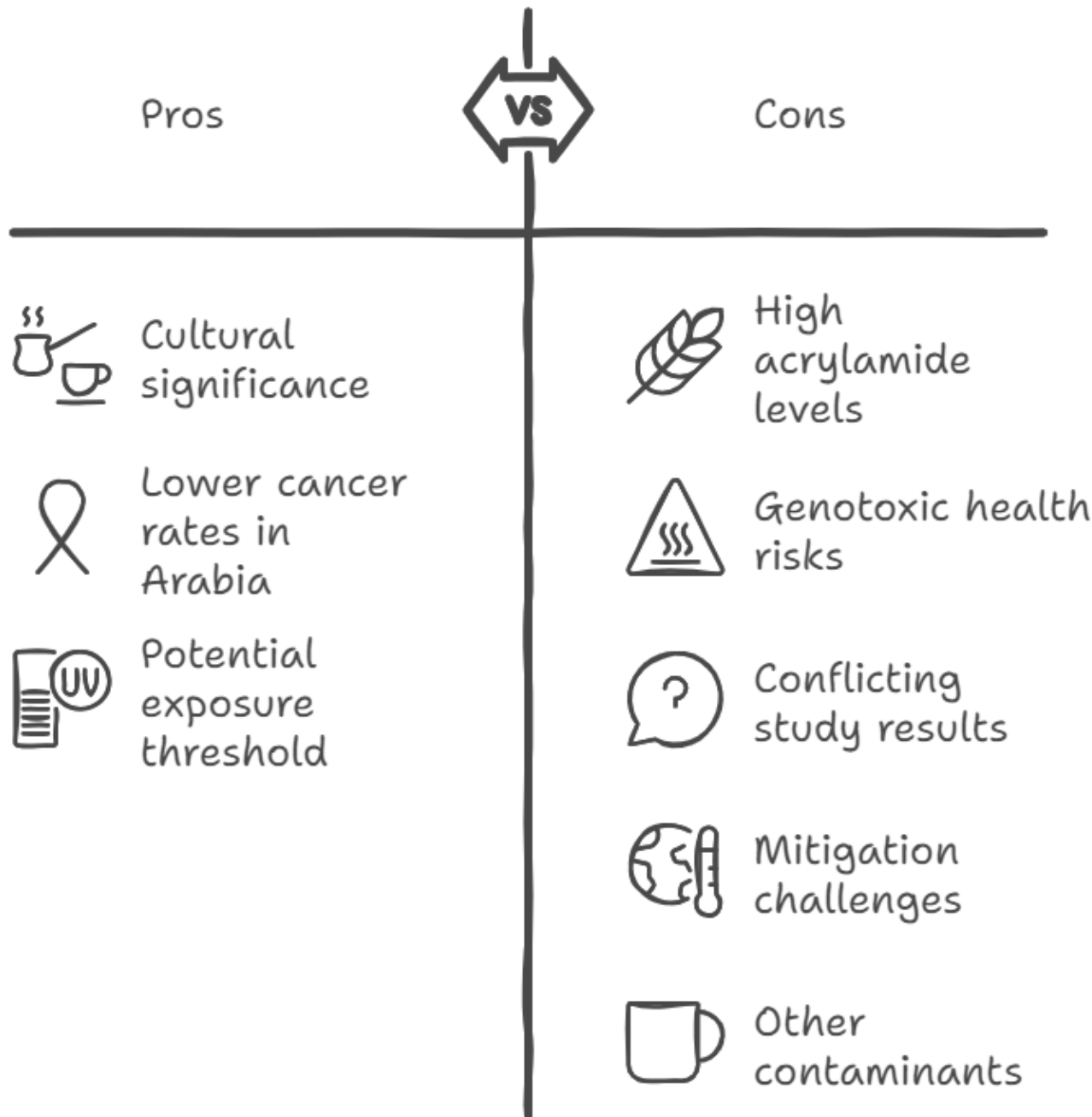
Arabic coffees at a roaster in Bahrain

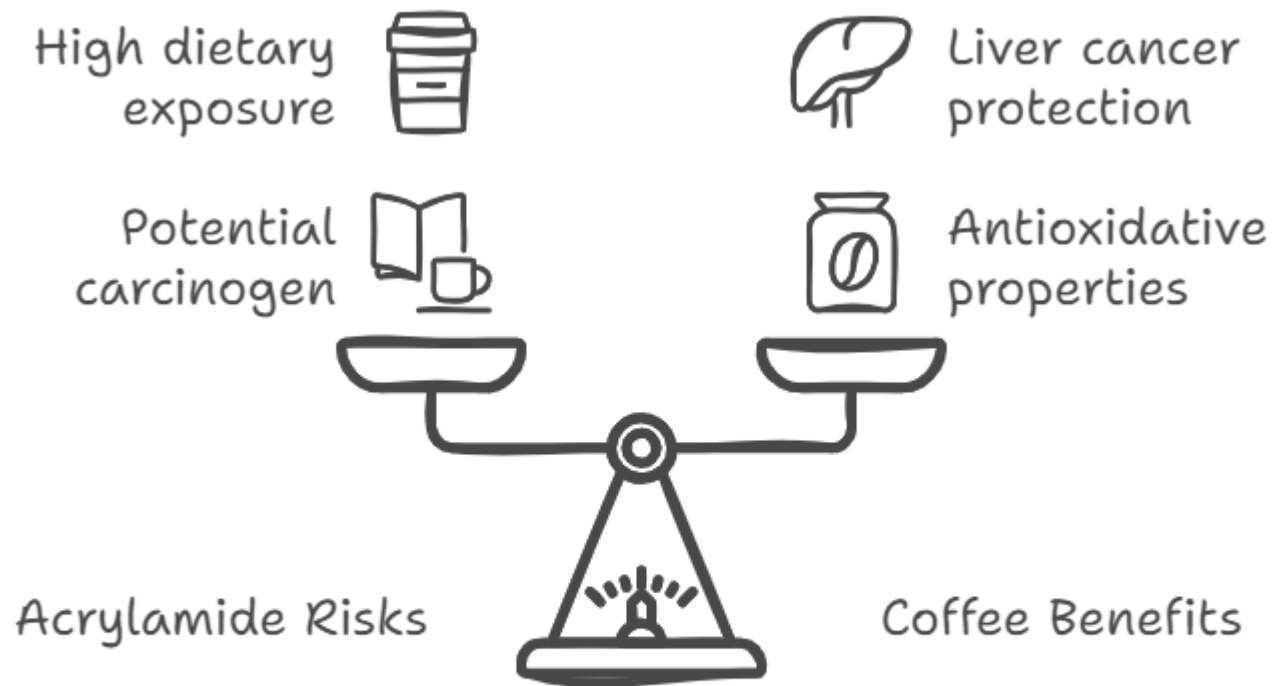


Acrylamide in coffee from Bahrain

Sample No.	Origin According to Labeling	Roast Degree	Acrylamide [µg/kg]
1	Harrar, Ethiopia	Light	902
2	Yemen	Light	327
3	Lugmati, Ethiopia	Light	648
4	Lugmati, Ethiopia	Light	716
5	Harrar, Ethiopia	Medium	184
6	India	Medium	453
7	Brasil	Medium	47
8	Lugmati, Ethiopia	Dark	72
9	Colombia	Medium	50
10	Brazil	Dark	<10

Light-roasted coffee





Balancing acrylamide risks and coffee benefits.

Conclusion

- ❑ Coffee shows inverse behaviour compared to other foods: „the darker the roast, the less acrylamide“
- ❑ Critical are very light roasts (Scandinavian & Arabic roasts)
- ❑ Otherwise using standard/medium coffee/espresso roasts, the benchmark levels cannot be reached
- ❑ Avoid disproportionate mitigation measures leading to other contaminants
- ❑ Holistic risk assessments would be preferable in the future. Measures based on univariate parameters might lead to unintended consequences.

Thank you very much!

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Lachenmeier, D.W.; Schwarz, S.; Teipel, J.; Hegmanns, M.; Kuballa, T.; Walch, S.G.; Breitling-Utzmann, C.M. Potential Antagonistic Effects of Acrylamide Mitigation during Coffee Roasting on Furfuryl Alcohol, Furan and 5-Hydroxymethylfurfural. *Toxics* 2019, 7, 1. <https://doi.org/10.3390/toxics7010001>

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Picture sources (if not otherwise stated):

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