

HEALTH RISK ASSOCIATED WITH ELEMENTAL IMPURITIES IN ALGAE OMEGA-3 FATTY ACID FOOD SUPPLEMENTS

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INTRODUCTION & AIM

The ability to accumulate **toxic metal(loid)s** from the aquatic environment makes algae and their products susceptible to contamination.

This study aimed to assess the health risk associated with toxic metal(loid)s in omega-3 fatty acid supplements made from microalgae oil.

METHOD



The **omega-3 fatty acid supplements** were tested in an accredited laboratory using the technique of **inductively coupled plasma mass spectrometry** after microwave digestion. Analyses included certified reference materials, complementing regular participation in proficiency testing.

According to the **labelled consumption recommendations**, the supplements (8 algae and 1 cannabis based), collected in the central Balkans (Serbia, Bosnia and Herzegovina, Croatia), were aimed at infants, children, adolescents, adults and/or pregnant women.

Exposure was calculated based on supplement usage instructions.

RESULTS & DISCUSSION

➤ 23 elements tested:

22 elements detected in highly variable concentrations.

➤ **Regulation (EU) 2023/915** on food contaminants:

compliance with the maximum allowed concentrations

(Pb 0.82 vs. 3.0 mg/kg. Cd 0.004 vs. 3.0 mg/kg. Hg 0.005 vs. 0.10 mg/kg).

Risk indicators (acceptable level):

➤ **Hazard quotient (HQ)** and **Minimum risk level (MR)** (<100%) :

below 1% of threshold levels for all elements. with the exception of As, Co, and Cu in the case of infants under one year of age.

HQ levels for As and Co were the highest for infants aged 1–3 months. peaking at 4.6 and 3.5%. similar to the MR for Cu of 3.6%.

➤ **Hazard index (HI)** (cumulative indicator) (<100%):

youngest infants (10.2%) > toddlers (4.1%) > adults (2.8%).

➤ **Margin of exposure (MOE)** (>1):

no risk from Pb and As.

➤ **Lifetime cancer risk (LCR)** (1 cancer case per 100.000 people):

above the limit of for the two infant supplements.

CONCLUSION

Although the study findings indicate safe elemental profiles of algal oil supplements, manufacturers' recommendations for supplement consumption by **infants and young children** should be carefully considered by parents in consultation with pediatricians.

		ALGAE OIL SUPPLEMENTS													CANN ABIS
Popul. group:		Infants 1-3 m		Infants 3-6 m		Infants 6-12 m		Toddlers 1-3y		Children	Adolescents	Pregnant women	Adults		Adults
Element	Risk indicator	range	mean±STD	range	mean±STD	range	mean±STD	range	mean±STD	3-10 y	10-14 y	14-18 y	range	mean±STD	
Be	HQ (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	HQ (%)	0-0.089	0.043±0.036	0-0.063	0.031±0.026	0-0.048	0.023±0.020	0-0.036	0.017±0.015	0	0	0	0-0.0003	0.0001±0.0002	1.75
Al	HQ (%)	0.007-0.019	0.013±0.005	0.005-0.014	0.009±0.004	0.004-0.010	0.007±0.003	0.003-0.008	0.005±0.002	0.015	0.008	0.006	0.0002	0.0001-0.001	1.41
V	HQ (%)	0-0.028	0.011±0.012	0-0.020	0.008±0.009	0-0.015	0.006±0.007	0-0.011	0.005±0.005	0	0	0	0.001	0-0.007	0.186
	MRL (%)	0-0.014	0.006±0.006	0-0.010	0.004±0.004	0-0.0008	0.003±0.003	0-0.006	0.002±0.002	0	0	0	0.0004	0-0.004	0.093
Cr	HQ (%)	0-0.002	0.001±0.001	0-0.001	0.001±0.001	0-0.001	0.001±0.0005	0-0.001	0.001±0.0003	0	0	0	0	0-0.0002	0.0001±0.0001
Mn	HQ (%)	0.001-0.012	0.006±0.005	0.001-0.008	0.004±0.003	0-0.006	0.003±0.002	0-0.005	0.002±0.002	0	0	0	0.0004	0-0.0001	7.97
Fe	HQ (%)	0.026-0.055	0.037±0.013	0.018-0.039	0.026±0.009	0.014-0.030	0.020±0.007	0.010-0.022	0.015±0.005	0.027	0.014	0.010	0.001	0.0003-0.005	7.76
Co	HQ (%)	0.168-3.48	1.84±1.35	0.12-2.50	1.31±0.97	0.092-1.9	1.00±0.74	0.068-1.40	0.740±0.546	0	0	0	0.008	0-0.032	24.49
	MRL (%)	0.002-0.035	0.018±0.014	0.001-0.025	0.013±0.010	0.001-0.019	0.010±0.007	0.001-0.014	0.007±0.005	0	0	0	0.0001	0-0.0003	0.245
Ni	HQ (%)	0-0.244	0.139±0.102	0-0.174	0.099±0.073	0-0.133	0.076±0.056	0-0.098	0.056±0.041	0.040	0.021	0.015	0	0-0.024	0.911
Cu	HQ (%)	0.062-1.78	0.638±0.805	0.045-1.27	0.457±0.576	0.034-0.969	0.348±0.439	0.025-0.717	0.258±0.325	0	0	0	0.017	0.0009-0.057	6.10
	MRL (%)	0.125-3.55	1.28±1.61	0.089-2.54	0.915±1.15	0.068-1.94	0.696±0.878	0.050-1.43	0.515±0.649	0	0	0	0.034	0.002-0.114	12.20
Zn	HQ (%)	0-0.190	0.063±0.090	0-0.136	0.045±0.064	0-0.104	0.035±0.049	0-0.077	0.026±0.036	0	0	0	0.002	0-0.006	5.42
As	HQ (%)	0-4.58	2.76±1.98	0-3.28	1.98±1.42	0-2.50	1.50±1.08	0-1.85	1.11±0.80	0	0	0	0	0	5.57
	MOE	4-766	258±359	6-1070	361±501	8-1405	474±658	11-1900	641±890	270	508	718	5600	875-5600	4
	LCR (E-05)	0.012-2.1	1.2E±0.89	0.008-1.5	0.89±0.64	0.006-1.1	0.68±0.48	0.005-0.83	0.50±0.36	0.033	0.018	0.013	0.002	0.002-0.01	2.5
Se	HQ (%)	0	0	0	0	0	0	0	0	0.194	0.103	0.073	0.002	0.003-0.043	0.623
Sr	HQ (%)	0.002-0.003	0.002±0.0003	0.002-0.002	0.002±0.0002	0.001-0.002	0.001±0.0002	0.001-0.001	0.001±0.001	0.001	0.001	0.001	0	0-0.003	0.414
Mo	HQ (%)	0-0.069	0.034±0.028	0-0.049	0.024±0.020	0-0.037	0.018±0.015	0-0.028	0.013±0.014	0.019	0.010	0.007	0	0-0.008	3.40
	MRL (%)	0-0.006	0.003±0.002	0-0.004	0.002±0.002	0-0.003	0.002±0.001	0-0.0002	0.001±0.001	0.002	0.001	0.001	0	0-0.001	0.283
Cd	HQ (%)	0.025-0.089	0.053±0.026	0.018-0.064	0.038±0.019	0.014-0.049	0.029±0.014	0.010-0.036	0.019±0.022	0	0	0	0	0-0.013	2.10
	MRL (%)	0.127-0.445	0.267±0.132	0.091-0.319	0.191±0.095	0.069-0.243	0.146±0.072	0.051-0.179	0.1088±0.053	0	0	0	0	0-0.066	10.48
Sn	HQ (%)	0-0.010	0.006±0.004	0-0.007	0.004±0.003	0-0.005	0.003±0.002	0-0.004	0.003±0.002	0	0	0	0	0-0.0001	0
	MRL (%)	0.001-0.020	0.012±0.008	0.001-0.014	0.009±0.006	0.001-0.011	0.006±0.004	0-0.008	0.005±0.003	0	0	0	0	0-0.0002	0
Sb	HQ (%)	0.079-0.302	0.221±0.101	0.056-0.216	0.158±0.072	0.043-0.165	0.121±0.055	0.032-0.122	0.114±0.089	0	0	0	0	0	0.602
	MRL (%)	0.052-0.201	0.147±0.067	0.038-0.144	0.106±0.048	0.029-0.110	0.080±0.037	0.021-0.081	0.059±0.027	0	0	0	0	0	0.401
Ba	HQ (%)	0-0.03	0.017±0.013	0-0.023	0.012±0.010	0-0.018	0.009±0.007	0-0.013	0.007±0.007	0.005	0.003	0.002	0	0.0003-0.005	0.728
Hg	HQ (%)	0.021-0.075	0.054±0.024	0.015-0.054	0.039±0.017	0.011-0.041	0.029±0.013	0.008-0.030	0.022±0.010	0.205	0.109	0.077	0.003	0.003-0.071	0
Tl	HQ (%)	0	0	0	0	0	0	0	0	0	0	0	0	0-6.18	129.2
Pb	MOE neuro	27-174	98±60	37-243	137±84	49-320	180±111	66-432	244±150	532	1000	1413	11025	107-11025	69
	MOE card									1268	2381	3364	26250	255-26250	165
Cumul.	HI (%)	3.58-10.2	7.66±2.91	2.57-7.28	5.49±2.08	1.95-5.54	4.18±1.59	1.45-4.10	3.09±1.17	0.301	0.16	0.113	0.143	0.209-6.29	198.6