

Memorandum

Date: November 28, 2022

Subject: Cadmium (Cd) in Roasted Organic Seaweed Snack

Re: CMS Case # 646463, Task # 679193, Private laboratory sample # 3824380
CMS Case # 646470, Task # 679195, Private laboratory sample # 3868851

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As requested by OFS, DRDA evaluated the safety of exposure to Cd in two samples of Kirkland brand Organic Roasted Seaweed Snack (seaweed snack). Samples of the seaweed snack (samples # 3824380 collected in Pearl City, HI, and # 3868851 collected in Rosedale, MD) were analyzed by a private laboratory, Certified Laboratories, and found to contain 1.280 and 0.750 mg/kg ($\mu\text{g/g}$) Cd, respectively. Kansas City Elements Laboratory reviewed the data package for sample # 3824380, and Southwest Regional Laboratory reviewed the data package for sample # 3868851, and both samples were found to be acceptable with borderline results.

DRDA Conclusion

DRDA concludes that exposure to Cd from consumption of seaweed snack sample # 3824380 is likely to be a health concern for children (MF 0-6 y), but not for the general population (MF 2+ y). Cd exposures from consumption of seaweed snack sample #3868851 are not likely to be a health concern for children (MF 0-6 y) or the general population (MF 2+ y).

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Consumption and Exposure Estimates

DRDA generally relies upon results of the National Health and Nutrition Examination Survey (NHANES), What We Eat In America (WWEIA) component for estimating dietary intakes of foods and for estimating contaminant exposures from intake of those foods. However, the number of WWEIA/NHANES respondents reporting dried seaweed consumption is too low to assure statistical reliability of estimates. Seaweed snacks generally are packaged as 5 g single servings, and DRDA generally estimates upper-level daily intake of seaweed snacks assuming consumption of one 5 g serving per day. The seaweed snack that is the subject of the current case is sold in 17 g packages, with a labeled serving size of 1/5 package, or 3.4 g. However, for consistency, DRDA estimated upper-level daily intake of the dried seaweed snacks to be 5 g/day, for both adults and children.

Estimated Cd exposures from consumption of the seaweed snack are shown in Table 1.

Table 1. Estimated exposure to Cd from consumption of seaweed snack.

Contaminant	Population	Contaminant Concentration (µg/g)	Estimated Upper-Level Chronic Consumption of Seaweed Snack ^a (g/kg bw/day)	Estimated Upper-Level Chronic Contaminant Exposure from Seaweed Snack ^b (µg/kg bw/day)
Cd (sample # 3824380)	MF 0-6 y	1.280	0.31	0.40
	MF 2+ y		0.07	0.09
Cd (sample # 3868851)	MF 0-6 y	0.750	0.31	0.23
	MF 2+ y		0.07	0.05

^a Estimated based on serving size of most single packages of seaweed snacks. Intakes were converted to g/kg bw/day using body weights of 75.4 kg for the general population and 16.1 kg for children (based on average body weights measured in NHANES 2017-2018).

^b Concentration in sample (µg/g) * upper-level consumption (g/kg bw/day) = estimated total exposure (µg/kg bw/day)

Safety Assessment

Cadmium (Cd)

Cd is an accumulative toxic element with a long biological half-life between 10 to 33 years in humans. Therefore, the toxicity of Cd generally results from chronic exposure. For the general population who are non-smokers, diet is the major source of Cd exposure. Chronic exposure to Cd in food may lead to its accumulation in the kidney (generally regarded as the most sensitive target for Cd toxicity), and this can cause renal tubular dysfunction and damage over time (WHO, 2011). EFSA has established a tolerable weekly intake (TWI) of 2.5 µg/kg bw/weekly for Cd, corresponding to **0.36 µg/kg bw/day** (EFSA, 2009). The TWI is based on a meta-analysis of human

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epidemiological studies assessing the relationship between urinary Cd and beta-2-microglobulin levels and a toxicological model to convert urinary Cd to dietary Cd exposure.

As shown in Table 1, Cd exposure from regular consumption of seaweed snack sample # 3824380 for children (MF 0-6 y) is above the TWI, adjusted for daily exposure, and is therefore likely to be a health concern for this population, but not for the general population (MF 2+ y), for which Cd exposure resulting from consumption of seaweed snack sample # 3824380 is below the TWI adjusted for daily exposure. Cd exposures resulting from consumption of seaweed snack sample #3868851 are below the TWI adjusted for daily exposure for children and the general population and are therefore not likely to be a health concern for either of these populations.

References

European Food Safety Authority (EFSA) (2009). Cadmium in Food. Scientific Opinion of the Panel on Contaminants in the Food Chain. *EFSA Journal* 980, 1-139.

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