

Methodology for Lunchly Analysis

GOALS

CR tested three Lunchly lunch kits to gauge the levels of heavy metals (particularly lead), phthalates, nitrites/nitrates, and sodium in them. We also did a nutritional analysis based on the information provided on the Nutrition Facts panel on the product packages. This study was a follow-up to CR's testing of Lunchables and other lunch kits published in the spring of 2024.

TEST APPROACH AND METHODS

This study included three Lunchly models: Fiesta Nachos, Turkey Stack 'Ems, and The Pizza. Each model comes with a savory food component, a 12-ounce Prime Hydration drink, and a 0.4-ounce Mr. Beast Feastables Milk Crunch bar.

We tested three samples of each model, each sample from a different lot, for heavy metals, phthalates, and sodium. We combined the samples of the savory food components for each model to create a composite sample so that the results represented an average for each model. (The drinks and chocolate bars were not included in the composites, but the chocolate bars were tested separately for heavy metals. The drinks were not tested.) For nitrates and nitrites, we tested only the two Lunchly products that contained processed meat (Turkey Stack 'Ems and The Pizza). These two composites were prepared in the same manner as above, but homogenizing only the meat portions of the lunch kits.

The Lunchly meal kits were prepared and analyzed in accordance with the following methods:

- Total cadmium, lead, mercury, and arsenic testing using Inductively Coupled Plasma – Triple Quadrupole Mass Spectrometry (ICP-QQQ MS) according to method AOAC 2015.01.
- Phthalates by GC-MS using Agilent Application Note_ Phthalates_5990-9510EN with modifications. We tested for the following 10 phthalates: butyl benzyl phthalate (BBzP), di(2-ethylhexyl)phthalate (DEHP), di-n-butyl phthalate (DBP), dicyclohexyl phthalate (DCHP), di-ethyl phthalate (DEP), diisobutyl phthalate (DiBP), diisononyl phthalate (DINP), dimethyl phthalate (DMP), di-n-hexyl phthalate (DnHP), and di-n-octyl phthalate (DNOP).
- We also tested for the following three phthalate replacements: di(2-ethylhexyl) adipate (DEHA), diisononyl cyclohexane-1,2-dicarboxylate (DINCH), and di(2-ethylhexyl)terephthalate DEHT).
- Sodium by ICP-MS using SOP based on EPA 6020B and AOAC 2013.06 and AOAC 2015.01 Mod.
- Nitrates by HPLC according to AOAC 935.48.
- Nitrites by Colorimetric method, AOAC 973.31.

We reviewed all the test results and quality control data provided by the contract lab for accuracy and clarity.

EXPOSURE ASSESSMENT

We determined the estimated intake per serving of each product for sodium and for all chemicals detected during testing, namely total arsenic, cadmium, lead, DEHP (the only phthalate found in our testing), nitrates and nitrites. (We did not detect mercury in any of the products.) We used several published health-based exposure limits to inform our assessment (see Tables 1 to 3).

Arsenic: Noncancer exposure risks were calculated by the Hazard Quotient (HQ) Method and the following equation:

$$HQ = \text{Exposure Dose} / \text{Reference Dose}.$$

An HQ >1 indicates that consumption of one serving per day would pose a comparatively higher health risk.

We estimated a 75-kilogram (165-pound) adult's intake of total arsenic from the tested levels in a serving of each product and compared the intake estimate to the exposure limit for inorganic arsenic in Table 1. Inorganic arsenic was not measured because total arsenic levels were not high enough to pose a health risk based on CR's risk assessment for a person 6 years or older consuming one serving of each food per day.

Cadmium and lead: To assess the risk from cadmium and lead posed by the products, CR used the California Office of Environmental Health Hazard Assessment (OEHHA) Maximum Allowable Dose Levels (MADL) as the benchmarks for CR's

Table 1: Health-Based Exposure Limits Informing CR's Exposure Assessments for Heavy Metals

Heavy Metal	EPA RfD, mcg/kg bw/day	OEHHA MADL, mcg/day
Inorganic Arsenic	0.1 ¹	NA
Cadmium	NA	4.1 ²
Lead	NA	0.5 ³

OEHHA = California Office of Environmental Health Hazard Assessment.
MADL = Maximum Allowable Dose Level.
RfD = Oral Reference Dose.
NA = Not applicable.

continued

¹ Environmental Protection Agency Integrated Risk Information System (IRIS) Chemical Assessment Summary, Arsenic, inorganic ([Link](#)). ² State of California, OEHHA, Cadmium ([Link](#)). ³ State of California, OEHHA, Lead ([Link](#)).

levels of concern. MADLs are levels established through California's Proposition 65 law. CR uses these values because the standards are the most protective available. A CR level of concern >100 indicates that consumption of one serving per day would pose a comparatively higher health risk.

However, while we use the MADLs involved in Prop 65, we approach our exposure assessment differently from what's outlined in Prop 65. Prop 65 takes into consideration consumers' average exposure over time and dietary frequency to calculate whether a product exceeds the MADL and requires a warning label. By contrast, Consumer Reports assumes one serving a day of the product in its risk assessment calculations. This difference in methodology means no Prop 65 judgments can be made from CR's findings. Our results are meant to provide guidance on which products have comparatively higher levels of lead, not to identify the point at which lead exposure will have measurable harmful health effects, or to assess compliance with California law.

Phthalates, nitrates, and nitrites: We used the same HQ approach as we did for arsenic for DEHP, the only phthalate found in our testing, and for nitrates and nitrites. We used several published health-based exposure limits to inform our assessment (see Tables 2 and 3).

Table 3: Health-Based Exposure Limits Informing CR's Exposure Assessments for Nitrates and Nitrites

Chemical	EFSA ADI mg/kg bw/day ⁹	EPA RfD mg/kg bw/day ¹⁰
Nitrates	3.7	7.0
Nitrites	0.07	0.33

ADI = Acceptable Daily Intake.

Sodium: We measured the sodium levels in the lunch kits and compared them to the levels listed on the Nutrition Facts panels on the product packages.

Table 2: Health-Based Exposure Limits Informing CR's Exposure Assessments for Phthalates

Phthalate	EPA RfD mcg/kg bw/day	EFSA TDI mcg/kg bw/day	ECHA RfD mcg/kg bw/day	OEHHA MADL mcg/day	DEHP Messerlian Limit mcg/kg bw/day
DEHP	20 ⁴	50 ⁵	34 ⁶	20 ⁷	0.03 ⁸

EFSA = European Food Safety Authority.

TDI = Tolerable Daily Intake.

ECHA = European Chemicals Agency.

⁴ Environmental Protection Agency Integrated Risk Information System (IRIS) Chemical Assessment Summary, Di(2-ethylhexyl)phthalate ([Link](#)). ⁵ Frederiksen, H.; Upmeyer, E.; Ljubicic, M.; Fischer, M.; Busch, A.; Hagen, C.; Juul, A.; Andersson, A., "Exposure to 15 phthalates and two substitutes (DEHP and DINCH) assessed in trios of infants and their parents as well as longitudinally in infants exclusively breastfed and after the introduction of a mixed diet," *Environment International* 161, 2022, 107107 ([Link](#)). ⁶ European Chemical Agency, Di(2-ethylhexyl)phthalate ([Link](#)). ⁷ State of California, OEHA, Di(2-ethylhexyl)phthalate ([Link](#)). ⁸ Messerlian, C.; Souter, I.; Gaskins, A.J.; Williams, P.L.; et al. "Urinary phthalate metabolites and ovarian reserve among women seeking infertility care," *Human Reproduction* 31, no. 1 (2016): 75-83 ([Link](#)). ⁹ "Safe levels for nitrites and nitrates added to food confirmed by EFSA," *The Compliance People* ([Link](#)). ¹⁰ "Nitrate and Nitrite," *Agency for Toxic Substances and Disease Registry*, page 227 ([Link](#)).