

## 1. Why are companies receiving Proposition 65 Notices of Violation for cadmium in spinach?

Naturally occurring cadmium in the primary spinach growing regions can result in concentrations of cadmium in spinach. Certain regions of the U.S., including some agricultural regions in southern and central coast California, have higher concentrations of cadmium in the soil due to their proximity to the marine shales of the Monterey Formation along the Pacific Coast. Marine shales, such as the Monterey Formation, are known to contribute to elevated cadmium concentrations. Naturally occurring cadmium in soil is considered to be the primary source of cadmium in spinach grown in California (Burau, 1983, Page et al. 1987, Smith et al. 2014).

Additionally, scrutiny and focus by non-profit and environmental organizations, in addition to the U.S. Food and Drug Administration's (FDA) "Closer to Zero" approach to reducing dietary exposures and Make America Health Again (MAHA) food safety initiatives, are putting a spotlight on metals in produce. Trends in Proposition 65 Notices of Violation are often driven by public perception and action by advocacy groups.

## 2. What evidence is there that demonstrates spinach is safe?

Fresh spinach represents an important and accessible food commodity with key health benefits. A recent publication notes that "spinach emerges as an exceptional leafy green vegetable characterized by its remarkable nutritional density and diverse array of bioactive compounds that collectively contribute to human health and well-being" (Balasubramaniam et al. 2025).

A recent peer-reviewed publication, sponsored by Western Growers, demonstrates that exposure estimates from long-term spinach consumption, including for the general U.S. population and young children, are well below the toxicological reference values established by the FDA as part of its "Closer to Zero" initiative (Scrafford et al. 2025).

### 3. What is the difference between OEHHA and FDA assessments, and why do we have to deal with both?

California's Office of Environmental Health Hazard Assessment (OEHHA), the regulatory body that administers The Safe Drinking Water and Toxic Enforcements Act of 1986, commonly referred to as Proposition 65, and the FDA, have different approaches and regulatory requirements related to metals in food. FDA regulates the presence of cadmium and other metals in food through national testing and monitoring programs and industry oversight. Proposition 65 can be publicly enforced by the California Attorney General, although it is typically privately enforced by private law firms and consumer advocacy groups.

Additionally, the two agencies utilize different safety thresholds to determine risk. FDA developed a cadmium toxicological reference value (TRV) range as part of its "Closer to Zero" program (0.21 to 0.36  $\mu\text{g}/\text{kg}$  bw/day). FDA utilizes this value to determine if the level of cadmium in food is unsafe. If necessary, FDA will take action by either working with the manufacturer to resolve the issue or take steps to remove the food from the market (FDA 2024).

OEHHA established a Safe Harbor Level for exposure to cadmium of 4.1  $\mu\text{g}/\text{day}$  (i.e. 0.0041 mg/day), the value above which OEHHA considers exposures to be significant and requires a warning under Proposition 65. Public and private enforcers need only confirm the presence of cadmium in the product and allege the product presents a significant exposure to cadmium to issue a **Notice of Violation** (OEHHA 2017). A **Notice of Violation** does not represent knowledge or demonstration of significant exposures. Unfortunately, the grower or distributor carries the burden of demonstrating that cadmium concentration does not represent a significant exposure.

### 4. Are concerns about cadmium in spinach different than other metals such as lead?

While cadmium and lead are metals that can be found in food, they differ in their uptake and exposure pathways in produce (Seyfferth et al. 2024). Lead can occur naturally in soil but can also come from industrial sources. Lead contamination in food often arises from environmental contamination and post-harvest sources (e.g., processing, storage, and packaging), rather than plant uptake (Seyfferth et al. 2024). In addition to post-harvest sources, sample collection and sample processing can also introduce lead contamination.

With all heavy metals, "the dose makes the poison," meaning that any substance can be harmful at a high enough amount, and the potential for harm depends on the concentration of the substance and the duration and frequency of exposure. The cadmium levels typically found in spinach are not expected to pose a health risk from normal dietary consumption (Scrafford et al. 2025).

## 5. Why is conducting additional testing for cadmium in spinach not a solution?

Representative sampling and data on cadmium concentrations in spinach already exist. An industry representative sampling program, supported by Western Growers, was conducted between 2014 and 2017, and the results were presented in a peer-reviewed journal publication (Scrafford et al. 2025). The sampling programs included 1,871 field spinach samples collected in primary leafy greens growing regions in California and Arizona between 2014 - 2015 and 245 retail-level spinach samples collected from multiple consumer markets in California in 2017.

This type of representative sampling is important because a single sample or limited sampling is not representative of potential concentrations of cadmium in spinach and cannot be meaningfully used to estimate potential exposures. Additionally, there are important considerations in terms of timing of growing and sample collection, and the number of samples needed for meaningful analysis and interpretation of data. It is also important to consider what is available to the consumer over a one week, one month and one year time frame, further limiting the usability of limited sampling.

## 6. What has Western Growers done to investigate and support growers with this issue?

Western Growers has led and supported initiatives to address cadmium in spinach for more than 10 years, including research efforts, industry outreach, and regulatory support. Western Growers supported research as well as industry and regulatory outreach related to both the FDA and California Department of Public Health spinach recalls in 2013 and 2015, respectively. Western Growers supported the formation of the Healthy Soils Initiative (HSI) in 2014 to 1) conduct an extensive and industry representative sampling program to better understand the prevalence and range of concentration of naturally-occurring cadmium in spinach; 2) research agronomic and managerial practices that might reduce those concentrations where warranted; 3) educate growers and handlers; and 4) equip the industry to respond to inquiries about this issue from regulators and buyers (Giclas 2016).

Western Growers has also provided support to growers related to management of cadmium in spinach. Western Growers has coordinated with the Leafy Greens Marketing Agreement to develop and continually improve leafy green food safety guidelines (LGMA 2020), including resources on sampling and analysis if cadmium in soil may present a risk (Western Growers 2020).

## 7. What is Western Growers currently doing to support growers?

Western Growers recently supported the development and publication of an exposure assessment focused on estimated potential exposures to cadmium from consumption of spinach related to the FDA's safety threshold developed under its "Closer to Zero" program (Scrafford et al. 2025). This assessment found that long-term dietary exposure to cadmium from spinach alone was well below the FDA's safety threshold.

Western Growers is currently collaborating with technical experts and attorneys to support communications with OEHHA on the cadmium and spinach issue related to Proposition 65. This assessment has shown that even with the variable levels of exposure to cadmium from consumption of fresh spinach, there is no exceedance of the warning threshold under Proposition 65. Western Growers has been leading efforts to coordinate with OEHHA regarding a natural occurrence exemption.

## References

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