

## **Tracking the Invisible in Food: Monitoring Irradiated Foods and Labeling Compliance in Seoul**

*Jihye Kim*

*Seoul Research Institute of Public Health and Environment*

This study investigated compliance with food irradiation labeling regulations and the detection of irradiated products in 474 processed food samples collected from retail markets in Seoul between 2020 and 2025. Thermoluminescence (TL) analysis was applied to identify irradiation treatments, and four samples (0.8%) were found to be irradiated without proper labeling, indicating that the domestic labeling system is generally well enforced.

Additionally, regulatory frameworks and the scope of approved irradiated foods were compared across major regions. Globally, most countries adhere to international guidelines, but the range of authorized commodities and applications varies considerably. The United States approves a wide range of products, including meat, seafood, fresh produce, and spices, all requiring explicit labeling under FDA and USDA regulations. EU-wide approvals are limited, but individual member states may expand authorized items: Belgium and France focus mainly on spices and frog legs, with Belgium leading EU irradiation volumes, while the Netherlands operates on a smaller scale. Japan maintains the most restrictive policy, permitting only potatoes. China authorizes a wide spectrum of commodities, including meat, seafood, grains, vegetables, fruits, teas, spices, and medicinal plants, and has rapidly expanded industrial applications. Vietnam, supported by the IAEA, increasingly applies irradiation for tropical fruit exports to markets such as the U.S. and Australia. Australia and New Zealand primarily approve irradiation for tropical fruits and herbs to meet export-related phytosanitary requirements. South Africa serves as a regional hub, focusing on spices, cereals, and seafood to enhance safety and shelf life. Korea authorizes irradiation for selected items, including cereals, vegetables, fruits, and specific processed foods, under a regulatory framework aligned with international standards.

Recent IAEA reports (2020–2023) highlight evolving trends in food irradiation technologies, demonstrating their growing importance beyond food preservation and safety, extending to international agricultural trade. Electron-beam (E-beam) and X-ray irradiation have been emphasized as cost-effective and efficient alternatives to traditional gamma-ray processing, with increasing adoption for microbial reduction, shelf-life extension, and phytosanitary treatments. These advancements have facilitated exports of tropical fruits and meat products in several countries while promoting the concept of “cold pasteurization” to enhance consumer acceptance.

The findings of this study provide valuable insights into domestic labeling practices within a global

context and contribute baseline information for future discussions on harmonizing international labeling standards, reducing trade barriers, and supporting consumer confidence.

**Key words: Food irradiation; labeling compliance; thermoluminescence (TL) analysis**