

UV-FACTS
ARTICLE
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EGG-SPOSED TO LIGHT

HOW UV TECHNOLOGY CAN BE INTEGRATED IN EGG PROCESSING TO ENSURE QUALITY, HYGIENE, AND ENVIRONMENTAL SUSTAINABILITY.

Scientific research increasingly highlights UV technology's effectiveness in improving egg safety and quality. Numerous studies have demonstrated that ultraviolet light can significantly reduce bacterial contamination on eggshells, including harmful pathogens like Salmonella and E. coli.

UV treatment is gaining recognition as a promising alternative to traditional washing processes by offering a chemical-free, non-invasive method of decontamination. Researchers have also explored combining UV light with other sanitization techniques, further enhancing its potential in large-scale egg production. As the poultry industry seeks safer and more sustainable solutions, the growing body of scientific literature supports UV technology as a game-changer in ensuring cleaner eggs from farm to table.



THE EGG JOURNEY: FROM FARM TO TABLE

Egg processing involves several key steps to ensure safety and quality before they reach consumers. First, eggs are collected from farms and transported to processing facilities, where they are carefully inspected for cracks or defects.

Depending on the country's regulations, eggs may be washed to remove dirt and contaminants. After washing, eggs are typically dried, and some may be coated with mineral oil to help preserve freshness. The eggs are then graded based on size, quality, and shell condition and packaged for distribution. In some regions, eggs are refrigerated to maintain safety; in others, they may be stored at room temperature, depending on whether they have been washed.

Strict hygiene practices are followed throughout the process to prevent bacterial contamination and ensure the eggs meet food safety standards.

TO WASH OR NOT TO WASH?

The decision to **wash or not wash eggs before processing or packaging is influenced by regulatory requirements**, food safety concerns, and consumer preferences.

In some countries, including the **United States, Japan, and Australia**, eggs are washed before being sold. This practice is largely driven by food safety regulations, such as those set by the U.S. Food and Drug Administration (FDA), which **mandate washing eggs with warm water and a mild detergent** to reduce Salmonella contamination. After washing, eggs are dried and sometimes coated with mineral oil to prevent moisture loss.

Washing helps maintain hygiene, but it also **removes the egg's natural protective cuticle** (or bloom), a thin coating that **helps prevent bacteria from entering the porous shell**. Because of this, **washed eggs must be refrigerated to ensure safety and maintain freshness**.

In contrast, many European countries, as well as south America, Middle East, parts of Asia, prohibit egg washing.

The EU encourages maintaining good farm hygiene instead, ensuring that eggs are laid in clean nests so they do not require washing. This approach is based on the fact that eggs naturally have a protective cuticle. **If this cuticle remains intact, eggs can be stored at room temperature without refrigeration.**

So, if an egg is washed, good practice and refrigeration are essential to prevent bacteria from penetrating the now unprotected shell.

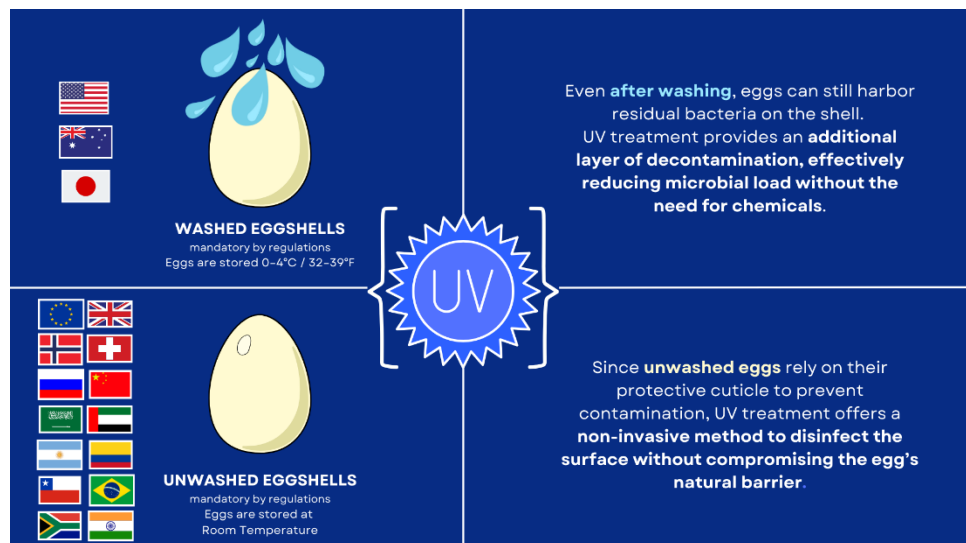
However, if the egg remains unwashed, strict farm-level hygiene practices

are crucial to prevent bacterial contamination from the start, ensuring food safety with a “dry” additional treatments.

Beyond regulatory policies, **consumer habits also shape these practices.**

In Europe, unwashed eggs are often associated with freshness and natural quality, while in places like the U.S., consumers prefer the appearance of clean, pre-washed eggs.

The choice between washing or not washing eggs ultimately depends on food safety approaches, industry regulations, and cultural expectations regarding how eggs should be handled and stored.

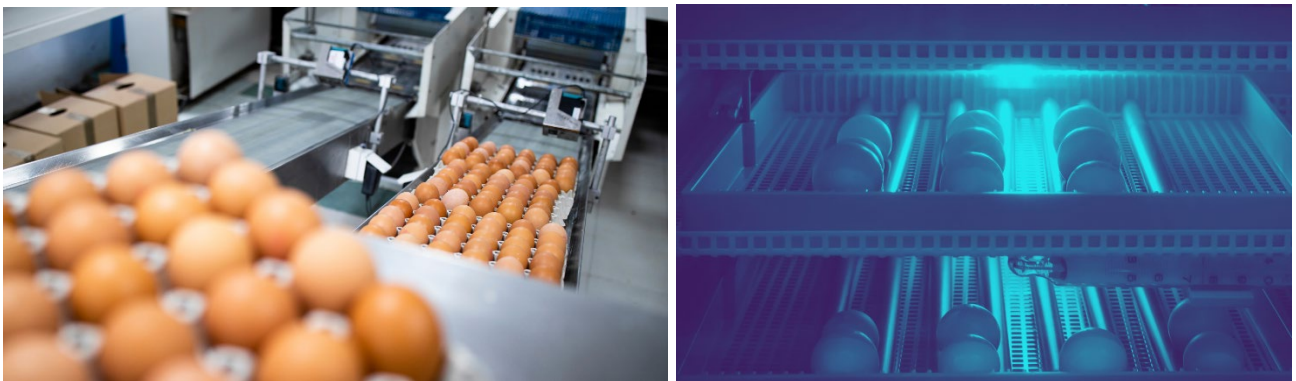


Methods for Eggshell Decontamination: The Role of UV Light

Egg decontamination is a critical step in ensuring eggs' safety and quality before reaching consumers. Several methods are used to reduce microbial contamination on eggshells, including **thermal treatments, chemical sanitization, and physical decontamination techniques.**

Traditional thermal methods, such as **hot water or dry heat**, can effectively kill bacteria but **may compromise egg quality.**

Chemical sanitization, widely used in industrial egg processing, involves disinfectants like quaternary ammonium compounds, sodium hydroxide, phenol, hydrogen peroxide, or formaldehyde. While these chemicals are effective, they **often leave residues on eggshells that may damage the cuticle layer, potentially increasing the risk of contamination.**



To address these concerns, **alternative non-chemical decontamination techniques have been developed, with ultraviolet (UV) radiation emerging as a promising solution.**

UV light treatment has been shown to effectively inactivate bacterial populations on both clean and recently contaminated eggshells. Studies also indicate that combining UV light with ozone or hydrogen peroxide (H₂O₂) enhances microbial inactivation, making it a viable alternative to conventional methods. Recent advancements in science and engineering highlight UV light's competitive advantage over traditional sanitation techniques, offering a residue-free, non-invasive, and efficient approach to eggshell decontamination.

HOW DOES UV-C TREATMENT FOR EGGS WORK?

UV-C light is an advanced **technology** that harnesses precise wavelengths (primarily around 254 nm) to inactivate microorganisms effectively.

When eggs are exposed to UV-C light, it eliminates harmful pathogens, disrupts their DNA, and prevents them from multiplying. This **offers a safe and efficient method for eggshell decontamination**, which has been proven **effective on contaminated eggshells.**

One of the major advantages of UV-C treatment is its **ability to sanitize without the use of harsh chemicals.** This not only preserves the shell's natural protective layer but also reduces the environmental impact compared to traditional chemical treatments.

PRACTICAL APPLICATIONS IN EGG PROCESSING

In facilities that process eggs, UV-C treatment can be applied at various stages of the production chain:

- * **Transport from laying areas to sorting stations:** During the transportation of eggs from laying areas to process facilities, UVC systems can be used to reduce bacterial proliferation and provide an initial stage of hygiene.
- * **Post-washing treatment:** After washing, eggs can be exposed to UV-C light to eliminate any remaining microorganisms and extend the product's shelf life.
- * **Sanitization during packaging:** Machinery that packages eggs into cardboard trays can integrate UVC systems to sterilize both the eggs and packaging materials, ensuring a safe product for the end consumer

BENEFITS OF UVC TREATMENT FOR EGGS

- **Enhanced food safety:** Effectively reduces bacterial contamination, improving the microbiological quality of eggs.
- **Environmental sustainability:** Eliminates the need for harmful chemicals, reducing residues and environmental impact.
- **Shell preservation:** UV-C maintains low contamination of the external layer, which is crucial for protecting the egg's quality.
- **Versatility:** Can be combined with other technologies, such as ozone or hydrogen peroxide, for optimal results.
- **Cost efficiency:** UV-C systems require minimal maintenance and are highly energy-efficient.



THE FUTURE OF UVC TREATMENT IN THE EGG INDUSTRY

As advancements in UV-C technology continue, its application in the egg industry is poised to grow. This sustainable, chemical-free method not only meets increasing consumer demands for safer and more environmentally friendly food products but also offers operational efficiencies for producers. By incorporating UVC systems into egg processing lines, companies can ensure high standards of hygiene, longer shelf life, and a reduced ecological footprint—a win-win solution for both businesses and consumers.

For over 35 years, we have specialized in UVC disinfection systems for industrial production lines.

Contact one of our product specialists to receive an installation proposal and a detailed quote.

A comprehensive overview of all UVC solutions for the food industry is available here:

<https://www.lightprogress.it/en/solutions/uv-systems-for-industrial-production/>

References: *Decontamination of egg shells using ultraviolet light treatment*, Published online by Cambridge University Press: 15 May 2014, [M. TURTOI](#) and [D. BORDA](#)

[A review on egg pasteurization and disinfection: Traditional and novel processing technologies](#)