

Title Cross-contamination of fresh-cut lettuce after a short-term exposure during pre-washing cannot be controlled after subsequent washing with chlorine dioxide or sodium hypochlorite

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Abstract

Chlorine dioxide (ClO₂) has been postulated as an alternative to sodium hypochlorite (NaClO) for fresh-cut produce sanitization to avoid risks associated with chlorination by-products. Experiments were performed to determine the prevention of cross-contamination of fresh-cut lettuce by *Escherichia coli* using chlorine dioxide (3 mg/L) or sodium hypochlorite (100 mg/L) as sanitation agents. The efficacy of these sanitation solutions was evaluated simulating as much as possible the conditions of a fresh-cut processing line. Thus, to evaluate the potential risk of cross-contamination during pre-washing, inoculated fresh-cut lettuce was pre-washed and after that non-inoculated lettuce was then pre-washed in the same water. After this pre-washing, non-inoculated lettuce was cross-contaminated, changing from 0 to 3.4 log units of *E. coli* cells. During washing with sanitizers, none of the tested sanitation agents significantly reduced *E. coli* counts in both inoculated and cross-contaminated lettuce. These results suggest that when cross-contamination occurs, even if the event is recent, subsequent sanitation steps are inefficient for inactivating *E. coli* cells on the vegetable tissue. However, chlorine dioxide and sodium hypochlorite solutions were able to inactivate most *E. coli* cells that passed from inoculated product to wash water. Therefore, they might be able to avoid cross-contamination between clean and contaminated product during the washing step. Scanning electron microscopy micrographs indicated that bacterial cells were mainly located in clusters or tissue stomata where they might be protected, which explains the low efficacy of sodium hypochlorite and chlorine dioxide solutions observed in this study.