Incidence and Survival of *Escherichia coli* O157:H7 and *Listeria monocytogenes* on salad vegetables

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**Abstract**

Salad vegetables contaminated with pathogens can cause food poisoning. The isolation of *Escherichia coli* O157:H7 and *Listeria monocytogenes* from different salad vegetables; cucumber, cabbage, carrot, and lettuce was carried out. *E. coli* O157:H7 was isolated from all the salad vegetables while *L. monocytogenes* was isolated from only cabbage and lettuce. The isolates were identified based on their cultural, morphological and biochemical characteristics. The effect of different storage temperatures on the survival and growth of *E. coli* O157:H7 and *L. monocytogenes* on cabbage and lettuce was studied. Known population of each isolate was inoculated into sliced cabbage and lettuce separately and stored at 5°C (refrigerator temperature) and 28°C (room temperature) for 10 days. Bacteria were counted on daily basis. Result showed initial increase in most cases on second and/or third day followed by decrease in bacterial population all through storage. There was no growth towards the end of storage at 28°C. In all cases there was decrease in pH. On cabbage, the count of *E. coli* O157:H7 ranged from 2.7×10³ - 4.0×10² cfu/g and the pH, 7.09 - 5.72 at 5°C, while at 28°C the count was 2.5×10³ - 1.0×10² cfu/g and the pH, 7.09 - 4.15. The count of *E. coli* O157:H7 on lettuce at 5°C was in the range of 3.6×10³ - 5.0×10² cfu/g and the pH decreased from 7.11 to 5.66. At 28°C, the count was 3.9×10³ - 1.0×10² cfu/g and the pH decreased from 7.11 to 4.06. For *L. monocytogenes* on cabbage, the count ranged from 1.51×10⁴ - 4.8×10² cfu/g and the pH, 7.12 - 5.92 at 5°C. The count at 28°C was 1.43×10⁴ - 2.0×10² cfu/g, while pH was 7.12 - 4.14. In the case of lettuce, the count of *L. monocytogenes* at 5°C ranged from 1.32×10⁴ - 3.9×10³ cfu/g and the pH decreased from 7.12 to 5.84, while at 28°C, the count was 1.49×10⁴ - 2.0×10² cfu/g and pH was 7.14 - 4.34. The decline in pH may be due to possible presence of lactic acid bacteria in the stored salad vegetables. Both bacterial pathogens survived at storage temperatures at which salad vegetables are normally stored in practice. This is of public health significance because salad vegetables receive little or no heat treatment before consumption.

**Keywords:** *Escherichia coli* O157:H7; *Listeria monocytogenes*; salad vegetables
Introduction

Salad vegetables are consumed without any heat treatment, sometimes without washing and peeling and therefore the possibility of food borne diseases is more. Vegetables can become contaminated with pathogenic microorganisms from harvesting equipments, transport containers, and domestic animals. The pathogenic microorganisms which reside in intestinal tracts of animals or humans are more likely to contaminate vegetables through faeces, sewage, untreated irrigation water or surface water (Harris, et al., 2003). In developing countries such as Nigeria, continued use of untreated waste water and manure as fertilizers for the production of fruits and vegetables is a major contributing factor to contamination (Amoah et al., 2009). Unsafe water used for rinsing the vegetables and sprinkling is also a source of contamination (Mensah, et al. 2002). Several outbreaks of gastroenteritis have been linked to the consumption of contaminated fresh vegetables and fruits. Concern for pathogens in vegetables has risen because of increasing number of outbreaks of food borne illnesses caused by consumption of fresh and minimally processed vegetables (Khandaghi et al., 2010).

The objectives of this research are to: 1. Isolate, characterize and identify E. coli O157:H7 and L. monocytogenes from different salad vegetables. 2. Study the effect of different temperatures and changes in pH on the survival and growth of E. coli O157:H7 and L. monocytogenes on cabbage and lettuce.