Factors influencing the microbial safety of fresh produce: a review

Abstract

Increased consumption, larger scale production and more efficient distribution of fresh produce over the past two decades have contributed to an increase in the number of illness outbreaks caused by this commodity. Pathogen contamination of fresh produce may originate before or after harvest, but once contaminated produce is difficult to sanitize. The prospect that some pathogens invade the vascular system of plants and establish “sub-clinical” infection needs to be better understood to enable estimation of its influence upon risk of human illness. Conventional surface sanitation methods can reduce the microbial load, but cannot eliminate pathogens if present. Chlorine dioxide, electrolyzed water, UV light, cold atmospheric plasma, hydrogen peroxide, organic acids and acidified sodium chlorite show promise, but irradiation at 1 kGy in high oxygen atmospheres may prove to be the most effective means to assure elimination of both surface and internal contamination of produce by pathogens. Pathogens of greatest current concern are Salmonella (tomatoes, seed sprouts and spices) and Escherichia coli O157:H7 on leafy greens (spinach and lettuce). This review considers new information on illness outbreaks caused by produce, identifies factors which influence their frequency and size and examines intervention effectiveness. Research needed to increase our understanding of the factors influencing microbial safety of fresh produce is addressed.