

**Title** The effect of heat treatments on the fate of foodborne pathogens in horticultural produce

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### **Abstract**

**Purpose of the review:** Fresh fruits and vegetables, including fresh-cut produce, are increasingly associated with outbreaks of foodborne illness. Current pre-market sanitation treatments rely on the application of a chemical sanitiser, primarily chlorine, during washing usually at temperatures <10°C. Unfortunately, such measures are marginally effective against human pathogens. Heat treatments between 45 and 60°C have been proposed as an alternative means for the control of human pathogens in entire or fresh-cut horticultural produce.

**Recent findings:** Human pathogens acquired during production, harvest or postharvest handling are mainly found on the surface of fruits or vegetables, although sub-surface penetration or internalisation within vascular tissues are also believed to occur. Heat treatments have been shown to inactivate human bacterial pathogens such as *Salmonella enterica* or *Escherichia coli* O157:H7 on the surface of fresh produce.

**Limitations/implications:** The lethality of thermal treatments is restricted by the onset of heat-induced physiological defects in the produce. Hence treatments that reliably deliver lethal heat to the surface without raising temperatures in underlying tissues are needed to make these treatments practical. The inaccessibility of internalised microorganisms may limit the efficacy of heat treatments. Furthermore, there is increasing evidence that pathogens that survive such treatments grow at a faster rate in stored packaged produce.

**Directions for future research:** Factors leading to the internalisation of human pathogens in fresh fruits and vegetables need to be better understood in order to reduce the occurrence. Finally, the ecology of human pathogens in post heat-processed fruits and vegetables must be examined in detail before these treatments can be recommended for commercial practice.