A critical review of the effects of heat, pH and water activity on the survival of hepatitis A and E viruses

Area of research interest: Foodborne pathogens
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Background

Human enteric viruses are a major cause of infectious intestinal disease (IID), with foodborne transmission thought to be an important route of infection. However, foodborne transmission of hepatic viruses (eg hepatitis A and hepatitis E) is becoming an increasing public health concern which raises questions regarding the survival of these viruses in a range of different foods. Hepatitis A outbreaks have previously been reported; these have been associated with such foods as berry fruits (including strawberries), shellfish, vegetables and sun-dried tomatoes. Hepatitis E transmission has also been implicated in illness involving strawberries and shellfish, although hepatitis E is more commonly associated with undercooked pork meat and processed pork products (including figatellu; an uncooked or smoked pig liver sausage).

There are significant knowledge gaps regarding survival of hepatitis A and E viruses in different foods, fomites (any object or substance capable of carrying infectious organisms) and the environment. However, there are indications within the literature that these hepatic viruses are capable of prolonged survival under certain conditions and may survive conventional cooking processes.

Research Approach

This critical review draws together our current knowledge on the survival characteristics of hepatitis A and E, especially on foods and contact surfaces. The approach to this desk-based review was to undertake a database search to identify relevant literature detailing the effects of heat, pH and water activity on the survival of hepatitis A and E viruses.

Searching the databases (Medline, CAB Abstracts, Biosis, Food Science and Technology Abstracts) identified 487 articles, with further refinement providing 129 articles selected for review. An additional 39 publications were added over the lifetime of this project, totalling 168 articles within this final review.

Papers included:

- studies on hepatitis A or E survival or elimination

- data for food, surfaces, water
- data from studies on the effect of heat on hepatitis A in therapeutic products

Papers excluded:

- data on other viruses
- data on putative surrogate viruses

Quantitative datasets from these articles were aggregated to provide a meta-analysis on the survival of hepatitis; this analysis was performed on the effects of heat on hepatitis A, being the only virus-factor combination with sufficient data published. Statistical analysis was performed on time to first log10 reduction (TFL) values for hepatitis A (144 datasets on infectivity and 11 sets on genome degradation) as a function of temperature, using a linear regression model. .

Final report

England, Northern Ireland and Wales

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