# A critical review of approaches to assessing the infectivity of hepatitis E virus (HEV)

Area of research interest: Foodborne pathogens
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## Background

Hepatitis E is an emerging issue within the UK with the number of confirmed non-travel related Hepatitis E cases increasing since 2010. There appears to be epidemiological evidence suggesting a potential link between these cases and consumption of undercooked pork products. HEV strains have also been detected in UK pigs and also in pork sausages sold at retail in the UK. However, it is difficult to tell whether HEV which has been detected is infectious and therefore likely to cause illness. Without this knowledge, it is difficult to assess the risk to human health if HEV is present in foods. There is an urgent need to develop a method which would allow us to determine whether HEV detected in foods is infectious or not and therefore likely to cause illness. Some experimental methods have been developed, particularly for other virus types, and it needs to be determined whether they will be useful for HEV.

## Research Approach

There is a body of published information on methods/approaches to measure the infectivity of HEV and other foodborne viruses. The aim of this study is to critically review the available information with the purpose of identifying the most promising approaches/methods to evaluate the survival characteristics of HEV in foods and assess the effects of elimination procedures against it. This in turn will inform the our considerations on future research to reduce the risk to the public of infection caused by this foodborne virus, in accordance with the our Strategic Plan for 2015-2020.

The critical review will be structured around 5 objectives:

1. To review the current approaches for measuring infectivity of HEV. This will take the form of a search of current literature, with subsequent compilation of relevant information.
2. To participate at the FSA / EFSA Foodborne Viruses Research Workshop, and present initial information from the critical review for further discussion among assembled stakeholders.
3. To identify current knowledge and technology gaps in regard to determining infectivity of HEV in raw, cooked and processed pork products and other potential foods which may harbour the virus.
4. To recommend a potential approach to producing a method for determining infectivity of foodborne HEV.

5. To provide a comprehensive report to the Food Standards Agency on methods/approaches used for detection of infectious HEV, with recommendations on development of a feasible infectivity measurement method for foodborne HEV.

## Results

HEV infectivity can be clearly demonstrated by monitoring for signs of infection in an animal model. However this approach has several disadvantages, such as lack of reproducibility and unsuitability for performing large numbers of tests, and not least ethical considerations.

Growth in cell culture can unambiguously show that a virus is infectious and has the potential for replication, without the disadvantages of using animals. Large numbers of tests can also be performed, which can make the results more amenable to statistical interpretation. However, no HEV cell culture system has been standardised, and few studies have shown that any are useful for measurement of HEV infectivity in food samples.

The main recommendation of this review is that a cell culture-based method for assessing HEV infectivity in pork products should be developed. Systems comprising promising cell lines and HEV strains which can grow well in cell culture should be tested to select an assay for effective and reliable measurement of HEV infectivity over a wide range of virus concentrations. The assay should then be harnessed to a procedure which can extract HEV from pork products, to produce a method suitable for further use. The method can then be used to determine the effect of heat or other elimination processes on HEV in pork meat and products, or to assess whether HEV detected in any surveyed foodstuffs is infectious and therefore poses a risk to public health.

## Published Papers

The publication Potential approaches to assess the infectivity of hepatitis E virus in pork products: a review is now available for purchase and download on the website of Food and Environmental Virology

1. Nigel Cook, Martin D'Agostino & Reimar Johne (2017) Potential Approaches to Assess the Infectivity of Hepatitis E Virus in Pork Products: A Review. Food Environ Virol. DOI 10.1007/s12560-017-9303-7

## Research report

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