Hepatitis E virus is inactivated in liver pâté during heat treatment

Lene Meinert, Nanna Svenningsen and Anette Granly Koch
Department of Food Safety, Danish Meat Research Institute, Danish Technological Institute, Taastrup, Denmark

BACKGROUND

Hepatitis E virus (HEV) is the causative agent of the liver disease hepatitis E, which has been increasing in the EU during the last 10 years. The prevailing variant of HEV found in the EU is zoonotic and can be found in liver from healthy pigs, among others. Hence, questions have been raised in relation to the risk of acquiring a HEV infection after intake of pork products.

Liver pâté (meat spread popular in Northern and Eastern Europe) may constitute a risk product regarding HEV due to the high content of pig liver. Inactivation of foodborne viruses is most efficiently obtained by heat treatment. For HEV, no clear recommendations on requirements for heat treatment exist, as the D-values for HEV cited in the literature are highly variable.

OBJECTIVE

The objective of this study was to estimate D-values (time to obtain 1 log reduction) for thermal inactivation of HEV in Danish style liver pâté and to assess the risk of acquiring a HEV infection after intake of heat-treated liver pâté.

CONCLUSION

According to the estimated D-values, a 6 log reduction of HEV is obtained after heating at 68°C for 42 minutes, 70°C for 8.4 minutes and at 72°C for 7.2 minutes (worst case scenarios).

Based on the D-values and an estimation of the concentration of HEV in a highly contaminated liver, the overall conclusion is that liver pâté is a safe product when a 6 log reduction is obtained.

MATERIALS AND METHODS

Emulsion of liver, lard, milk, onion, and spices were either inoculated with MS2 bacteriophages (virus) (ATCC® 15597-B1TM) or with HEV strain 47832c. Subsequently, the emulsion was packed (1-2 mm emulsion) in PE bags, submerged into water baths at 68°C, 70°C and 72°C, respectively, and collected and placed on ice at specific times. Intact MS2 particles after the heat treatment were quantified by a cell infectivity assay. Total RNA of MS2 or HEV was quantified by reverse transcriptase qPCR.

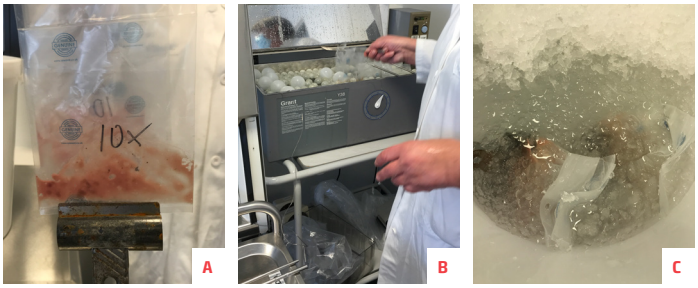

Figure 1. A. Emulsion of liver and lard packed in PE bags. B. Bags were placed in water bath and then submerged in ice (C).

RESULTS

- D-values were obtained for HEV by PCR quantifying both viruses with intact protein coats (i.e., infectious viruses) and viruses with compromised protein coats (i.e., non-infectious).
- In addition, D-values were obtained for the surrogate virus MS2 by a cell infection assay quantifying only infectious viruses.

Temperature	D-value MS2 (minutes) (cell assay)	D-value MS2 (minutes) (PCR)	D-value HEV (minutes) (PCR)
68°C	2	3.5-4.1	7
70°C	0.5-0.6	0.2 - >2.5	1.4
72°C	0.2-0.3	0.4-0.6	N/A

Table 1. D-values (time for 1 log reduction) in minutes for the surrogate virus MS2 and for HEV.

CONTACT INFORMATION

Lene Meinert
Director of Food Safety
lme@dti.dk

ACKNOWLEDGEMENT
The HEV strain was kindly provided by Professor Reimer Johne, Federal Institute for Risk Assessment, Berlin, Germany. The Danish Pig Levy Fund financed the experimental work.