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Human pathogenic viruses in ready-to-eat food

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Key words
Hepatitis A-Virus, Norovirus, Hepatitis E-Virus, PCR

Aim of the study
(i) Implementation of methods for the detection of foodborne viruses in various foodstuffs.
(ii) Determination of the prevalence of norovirus, hepatitis A virus and hepatitis E virus in ready-to-eat food.
(iii) Establishing a basis for the evaluation of the microbiological safety of such products and for the possible adoption of regulatory or non-regulatory measures to increase food safety.

Material and methods
An ISO method (ISO-TS-15216-1) has been optimized in model experiments for the molecular biological detection of hepatitis A virus and norovirus of genogroups I and II in foods of plant origin such as soft fruit, herbs and vegetables. The method was used within the framework of the BLV's control programs at the border with the Federal Customs Administration to monitor imported foodstuffs of plant origin for the presence of hepatitis A virus and norovirus. Fresh and frozen berries imported from various countries, and herbs and leafy vegetables from Asia and North Africa were in the focus. In addition, imported fresh and frozen berries on the Swiss market and fresh berries from Swiss production were examined.

For the detection of hepatitis E virus in meat products and sausages, a molecular biological method developed at the German Federal Institute for Risk Assessment (BfR) has been established and refined. The Virus Working Group of the German Federal Office for Consumer Protection and Food Safety (BVL) validated the method in an inter-laboratory test, with the participation of the laboratories of the BLV. The method was used to examine raw meat sausages on the Swiss market, collected either by the BLV or as part of a project on the food safety of raw meat products conducted by Agroscope (project number 4.17.03).

Results and significance
In 4 of 39 samples of vegetables and herbs imported from Asia (10.3%) noroviruses were detected. Norovirus and enterovirus were found in 2 of 140 samples of imported frozen berries from Central and Eastern Europe and Chile (1.4%). The results show that contamination by pathogenic viruses is to be expected in vegetables and herbs from Asia. Imported frozen berries may also be contaminated with pathogenic viruses at low prevalence. No viruses were detected in berries from Swiss production.

In a screening of ready-to-eat meat products, RNA from hepatitis E virus was detected in 7 of 37 (18.9 %) liver sausages and 3 of 53 (5.7 %) raw sausages on the Swiss market using the optimized detection method. As part of the project on the food safety of raw meat products (project number 4.17.03) a total of 181 samples were analyzed, four of which tested positive for hepatitis E virus. The raw sausages tested positive were local Swiss specialities produced with raw pig's liver (liver salsiz, mortadella cruda) or with game meat (wild boar, deer).

The BLV laboratories were appointed as Swiss National Reference Laboratory for food-borne viruses. If requested, the methods are transferred to interested laboratories of the cantonal enforcement authorities. Since the methods used are based on virus detection via the genomic material, a positive result does not, however, allow any statement about the infectivity of the detected virus particles.

Publications, posters and presentations

Federal Food Safety and Veterinary Office (2014): Tiefgefrorene Beeren / Untersuchung auf Hepatitis A Virus und Norovirus. Annual report on border controls on foodstuffs, 22-24.

Moor, D., Liniger, M., Felleisen, R. (2017): Viren in verzehrsfertigen Lebensmitteln. Poster. 50th Meeting of the Swiss Society for Food Hygiene (SGLH).

Federal Food Safety and Veterinary Office (2018): Frische und tiefgefrorene Beeren: Untersuchung auf lebensmittelübertragbare Viren. Annual report on border controls on foodstuffs, 26-28.

Moor, D., Liniger, M., Baumgartner, A., Felleisen, R. (2018): Screening of Ready-to-Eat Meat Products for Hepatitis E Virus in Switzerland. Food Environ Virol 10, 263–271. https://doi.org/10.1007/s12560-018-9340-x

Althof, N., Trojnar, E., Böhm, T., Burkhardt, S., Carl, A., Contzen, M., Kilwinski, J., Mergemeier, S., Moor, D., Mäde, D., Johne, R. (2019): Interlaboratory Validation of a Method for Hepatitis E Virus RNA Detection in Meat and Meat Products. Food Environ Virol 11, 1–8. https://doi.org/10.1007/s12560-018-9360-6

Compilation of data for internal use.

Project *15VISA / 15 HEV*

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