

PROJECT FICHE (bilat BEL-China R&D cooperation-) Projectcode BL/02/C57

Detection of Infectious Noroviruses in Shellfish and Anti-viral Potential Study of Seafood

Project title : Detection of Infectious Noroviruses in Shellfish and Anti-viral Potential Study of Seafood

(Geographic) study area (country/region) : Belgium

BELSPO testsite (if applicable) : NA

Context and objectives

In recent years, noroviruses (NoVs) are more and more identified as a great threat for human health worldwide (Noda et al., 2008). NoVs outbreaks are frequently associated with bivalve shellfish, which can bioaccumulate NoVs at high levels from surrounding marine and estuarine waters, and tend to be eaten raw or lightly cooked, (Le Guyader et al., 2006). Reverse transcription polymerase chain reaction (RT-PCR) is still the most commonly used detection method (Richards, 1999).

Currently, anti-viral activities of extracts and compounds isolated from natural products have already been reported towards several severe pathogenic viruses (Mukhtar et al., 2008). However, anti-NoVs effects of natural specific seafood products are hardly investigated.

The objectives of this research are defined as follows:

1. Detection of Noroviruses (NoVs) in popular shellfish species in Belgium and China.
2. Identification and function study of novel anti-NoVs components from potential functional seafoods.

Methodology

WP1: Monthly sample collection and screening.

- 1.1 Protocol establishment and training.
- 1.2 Sampling planning and contact with shellfish farms.
- 1.3 Monthly sample collection and detection of NoV.
- 1.4 Further confirmation of positive samples.
- 1.5 Data analysis and publication.

WP2: Anti-NoVs study of compounds from sea food.

- 2.1 Literature study and preliminary screening of anti-viral components using MNV-1 as a surrogate.
- 2.2 Further study of anti-viral mechanisms of selected components using human NoVs.
- 2.3 Anti-viral effect with the presence of food matrix.
- 2.4 Data analysis and publication.

Scientific Results

- A protocol for NoVs detection in shellfish has been established based on the standard method of Europe and the Chinese partner was trained with the same techniques by August 2012. Although ca. 26% of samples showed quantifiable NoV genomic copies it is unsure if this relates to infectivity and concern for public health. The NoV screening results of Belgium fishery products (102 samples in total) have been submitted to International Journal of Food Microbiology to be published.

- A literature review (Inactivation of food-borne viruses using natural biochemical substances) was composed based on the study of numerous previous work on Web of Science. The articles was published in Food Microbiology.

- The anti-NoV effect of several substances were investigated by plaque assay using MNV-1 as a surrogate and by binding-based RT-qPCR using authentic human NoV. After the screening of the potential anti-NoV substances, grape seed extract (OligoProanthocyanidinas as the main functioning component) is the only one within the tested substances that showed promising anti-NoV properties. The mechanism of the anti-viral effect was studied by testing the specific binding properties and the morphology of human NoV capsid proteins. In order to evaluate the application potentials of grape seed extract, the anti-viral effect with the presence of food matrix was explored in practical scenarios stimulating the working environment in food industry. The results were published in Applied and Environmental Microbiology.

Products and services (if applicable: maps, database, peer reviewed article(s),weblink...)

- International conference proceedings:

Dan Li, Ambroos Stals, Mieke Uyttendaele. Noroviruses in shellfish products of Belgian food markets: detection, interpretation, and confirmation. Fifth International Conference on Caliciviruses. October 12-15, 2013, Beijing, China.

-(peer review) Journal paper in preparation or published:

Dan Li, Ambroos Stals, Qing-Juan Tang, Mieke Uyttendaele. 2013. Noroviruses in shellfish and fishery products offered at Belgian food market: detection, interpretation and confirmation. International Journal of Food Microbiology. Submitted.

Dan Li, Leen Baert, Mieke Uyttendaele. 2013. Inactivation of food-borne viruses using natural biochemical substances. Food Microbiology. 35: 1-9.

Dan Li, Leen Baert, Dongsheng Zhang, Ming Xia, Weiming Zhong, Els Van Coillie, Xi Jiang, Mieke Uyttendaele. 2012. The Effect of Grape Seed Extract on Human Noroviruses GII.4 and Murine Norovirus-1 in Viral Suspensions, on Stainless Steel Discs, and in Lettuce Wash Water. Applied and Environmental Microbiology, 78(21): 7572-7578.

- others

Informal meeting (with international partners): August 2012, meeting with Chinese researcher Dr. Qing-Juan Tang in Gent for the training and determination of viral detection protocols.

Participation of Coordinator (Mieke Uyttendaele) to FSA-UK Norovirus in food discussion meeting January 13-14th 2013 in London, UK. (http://www.food.gov.uk/news-updates/news/2012/nov/noro_jan)

Workshop for dissemination of knowledge and results in China on May 26th 2013 in Qingdao, China.

Extended Guidance committee (on invitation only) on virus work at UGent, Belgium. (including work to be presented on BELSPO_China collaboration, EU Veg-i-Trade & SPF Public Health TRAVIFOOD project): June 13th 2013.

Extended Guidance committee (on invitation only) on virus work at Brussels, Belgium (including work to be presented on BELSPO_China collaboration, EU Veg-i-Trade & SPF Public Health TRAVIFOOD project): December 10th 2013.

----- Ideas for future research-----

Further collaboration will be discussed between College of Food Science and Engineering, Ocean University of China and LFMFP, UGent on NoV detection and inactivation,

An opinion on the challenges in implementation detection methods of NoV from shellfish will be composed based on the research experience from both Belgium and China sides in this project.

Execution

Period: November 1st 2011 –October 31st 2013

Laboratory/network (promotor names, institutes, mail-adresses, web-site) :

Belgium: (coordinator and divers partners)

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Discipline (select one or more appropriate disciplines)

Microbiology

Food Virology