ENTERIC VIRUSES AS EMERGING RISKS IN FOOD SAFETY

Jesús L Romalde

Department of Microbiology and Parasitology, CIBUS-Faculty of Biology, Universidade de Santiago de Compostela, Spain

jesus.romalde@usc.es
Molluscs act as vectors of viral gastroenteritis and other diseases as they concentrate and retain pathogens, some of them being endemic in developing countries.
1. INTRODUCTION

Evaluation of emerging risks (climate change, aging, etc.), and development of preventive measures

- Totally new risks
- New risks by the kind of product
- New risks for specific geographic areas
- Risks diminished for areas geographic specific
- Risks increased for areas geographic specific
Globalization has increased the risk for infectious foodborne diseases due to the international trade of food products, including bivalve molluscs.
1. INTRODUCTION

DOI 10.1007/s10123-001-0041-0

**RESEARCH ARTICLE**

J.L. Romalde · I. Torrado · C. Ribao · J.L. Barja

Global market: shellfish imports as a source of reemerging food-borne hepatitis A virus infections in Spain


Human enteric viruses in Coquina clams associated with a large hepatitis A outbreak.

Bosch A¹, Sánchez G, Le Guyader F, Vanaclocha H, Haugarreau L, Pintó RM.
1. INTRODUCTION

Internationally Distributed Frozen Oyster Meat Causing Multiple Outbreaks of Norovirus Infection in Australia

R. J. Webby, K. S. Carville, M. D. Kirk, G. Greening, R. M. Ratcliff, S. K. Crerar, K. Dempsey, M. Sarna, R. Stafford, M. Patel, ... Show more

DOI: https://doi.org/10.1086/512807

A New Zealand outbreak of norovirus gastroenteritis linked to the consumption of imported raw Korean oysters.

Simmons G, Garbutt C, Hewitt J, Greening G.
Novel enteric viruses have emerged as responsible for food-borne outbreaks associated with this type of food, or have been detected in meat, shellfish, fruits, etc.

<table>
<thead>
<tr>
<th>Aichi virus (AiV)</th>
<th>Sapovirus (SaV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family <em>Picornaviridae</em></td>
<td>Family <em>Caliciviridae</em></td>
</tr>
<tr>
<td>Genus <em>Kobuvirus</em></td>
<td>Genus <em>Sapovirus</em></td>
</tr>
<tr>
<td>Icosahedral morphology</td>
<td>Icosahedral morphology</td>
</tr>
<tr>
<td>Non-enveloped</td>
<td>Non-enveloped</td>
</tr>
<tr>
<td>Genome 8.4 Kb (ssRNA)</td>
<td>Genome 7.5 Kb (ssRNA)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hepatitis E virus (HEV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family <em>Hepeviridae</em></td>
</tr>
<tr>
<td>Genus <em>Orthohepevirus</em></td>
</tr>
<tr>
<td>Icosahedral morphology</td>
</tr>
<tr>
<td>Non-enveloped</td>
</tr>
<tr>
<td>Genome 7.2 Kb (ssRNA)</td>
</tr>
</tbody>
</table>
2. OBJECTIVES

The detection and quantification of emerging enteric viruses (AiV, SaV and HEV) in shellfish samples from harvesting areas in Galicia (NW Spain).

Detection of enteric viruses in clinical samples. Epidemiology.

The detection and quantification of Aichi virus (AiV) and Sapovirus (SaV) from shellfish samples imported to Spain.

The efficiency of depuration in the elimination of enteric viruses from shellfish.
3. MATERIAL & METHODS

PROCESSING & EXTRACTION

- Homogenization from digestive tissue
- RNA extraction: NucleoSpin RNA Virus Kit

DETECTION & QUANTIFICATION

- RT-qPCR with specific primers and TaqMan probes,
- Standard curve: serial dilutions of cloned fragment in plasmid

ISO/TS/15216:2013 / 2017
4. RESULTS
4. RESULTS
Total of 54 shellfish samples imported between Sep-2006 and Jan-2011

**Morocco**
- *Callista chione* n=21
- *Ensis sp.* n=6
- *Donax sp* n=2
- *Crassostrea angulata* n=1
- *Cerastoderma edule* n=1
- *Solen marginatus* n=1

**Peru**
- *Transanella pannosa* n=6
- *Argopecten purpuratus* n=5
- *Donax sp* n=3
- *Ensis sp.* n=2

**City of Melilla** (Spain)
- Clams (n=2) and mussels (n=1)

**South Korea**
- *Meretrix lyrata* n=1

**Vietnam**
- *Meretrix lyrata* n=2
4. RESULTS

SaV was detected in 29 samples

<table>
<thead>
<tr>
<th>SaV</th>
<th>Detection</th>
<th>Quantification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL</td>
<td>Clams</td>
</tr>
<tr>
<td>TOTAL</td>
<td>53.7 %</td>
<td>43.2 %</td>
</tr>
<tr>
<td>Morocco</td>
<td>37.5 %</td>
<td>21.7 %</td>
</tr>
<tr>
<td>Peru</td>
<td>68.8 %</td>
<td>66.7 %</td>
</tr>
<tr>
<td>Vietnam</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>S. Korea</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>Melilla</td>
<td>100 %</td>
<td></td>
</tr>
</tbody>
</table>

AiV was detected in 18 samples

<table>
<thead>
<tr>
<th>AiV</th>
<th>Detection</th>
<th>Quantification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL</td>
<td>Clams</td>
</tr>
<tr>
<td>TOTAL</td>
<td>33.3 %</td>
<td>35.1 %</td>
</tr>
<tr>
<td>Morocco</td>
<td>37.5 %</td>
<td>34.8 %</td>
</tr>
<tr>
<td>Peru</td>
<td>18.8 %</td>
<td>22.2 %</td>
</tr>
<tr>
<td>Vietnam</td>
<td>50.0 %</td>
<td>50.0 %</td>
</tr>
<tr>
<td>S. Korea</td>
<td>100 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Melilla</td>
<td>33.3 %</td>
<td>50.0 %</td>
</tr>
</tbody>
</table>
Mixed contamination with AiV and SaV was detected in 10 samples. It occurred in all countries but especially in Morocco (5).

Results compared with previous studies of Norovirus (NoV), hepatitis A virus (HAV) and Astrovirus (AsV).
Experimental depuration system

- Close circuit (ASE M BINS)
- 500 kg of capacity
- Water volume 1,750 L
- Water disinfection by $O_3$ and UV
- Mechanic, chemical and biological filter
Different mollusks showed different depuration rates

Always a two-phases kinetic
ENTERIC VIRUSES AS EMERGING RISKS IN FOOD SAFETY
Jesús L Romalde

Digestive tissue

Viral load

Time

\[ c(t) = c_r + (1 - c_r) e^{-\lambda t} \]
5. CONCLUSIONS

• It is important to continue the studies with shellfish and clinical samples in order to detect shifts in the major viral groups/genotypes, and to try to determine the vehicles of transmission.

• A great variety of mixed contaminations are observed, both in Galician harvesting areas and in imports, especially when comparing these results with previous studies for Norovirus and hepatitis A virus.

• Further depuration studies are needed with the known and emerging viruses.

• Further research is needed in order to determine the importance of emerging enteric viruses, as SaV, HEV and AiV, as cause of possible foodborne outbreaks associated to shellfish.
Moitas grazas pola vosa atención !!