Virus contamination in shellfisheries: Controlling the risk?

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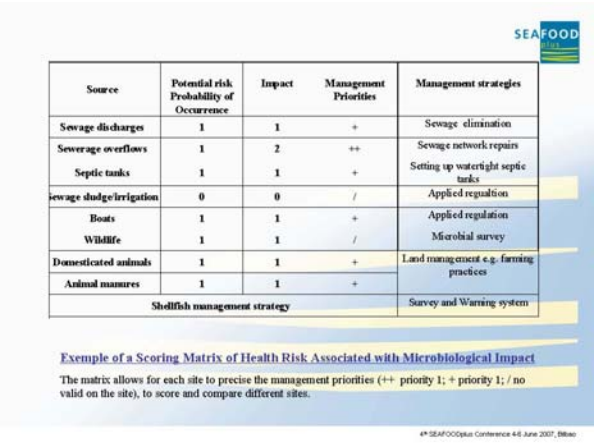
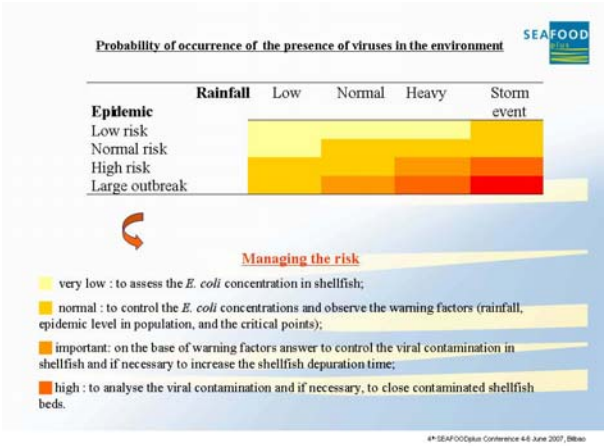


Source	Potential risk Probability of Occurrence	Impact	Management Priorities	Management strategies
Sewage discharges	1	1	+	Sewage elimination
Sewerage overflows	1	2	++	Sewage network repairs
Septic tanks	1	1	+	Setting up watertight septic tanks
Sewage sludge/irrigation	0	0	/	Applied regualtion
Boats	1	1	+	Applied regulation
Wildlife	1	1	/	Microbial survey
Domesticated animals	1	1	+	Land management e.g. farming practices
Animal manures	1	1	+	
Shellfish management strategy				Survey and Warning system

Exemple of a Scoring Matrix of Health Risk Associated with Microbiological Impact

The matrix allows for each site to precise the management priorities (++ priority 1; + priority 1; / no valid on the site), to score and compare different sites.



Probability of occurrence of the presence of viruses in the environment

Epidemic	Rainfall Low	Normal	Heavy	Storm event
Low risk				
Normal risk				
High risk				
Large outbreak				

Managing the risk

very low : to assess the *E. coli* concentration in shellfish;

normal : to control the *E. coli* concentrations and observe the warning factors (rainfall, epidemic level in population, and the critical points);

important: on the base of warning factors answer to control the viral contamination in shellfish and if necessary to increase the shellfish depuration time;

high : to analyse the viral contamination and if necessary, to close contaminated shellfish beds.

Although seafood in general is regarded as a wholesome safe and nutritious food it may on occasions pose consumer risks. Regulations are currently based on routinely monitoring shellfish for faecal bacteria to determine their sanitary quality. However, currently viral contamination of bivalve molluscs is recognised as one of the major causes of illness associated with seafood. Outbreaks of infectious hepatitis and gastroenteritis caused by hepatitis A virus and norovirus are frequently documented. The REDRISK project objective is to identify the key environmental factors responsible for viral contamination in shellfish harvesting areas using the standardised virus methods and to evaluate the data useful to develop risk management strategy for viral contamination. The REDRISK study is the first application of a viral genome quantification-based method to be carried out in Europe in the environment, and more particularly on shellfish contamination in farming areas.

To answer the question “How can the risk be reduced?” The REDRISK study highlighted the following points:

- Collecting basic knowledge about the sources (occurrence and level of viruses) and dilution mechanisms of the area where shellfish are grown is the first step of the investigation to be made. For example, a sewage treatment plant close to the shellfish farming areas is often the main source of viral contamination. Nevertheless, the river inputs due to the size of the flow must be taken into account.
- When the sources are far from farming areas, dilution could limit viral contamination: in the REDRISK selected sites were found to be under the input's influence and most of the time dilution was not sufficient to reduce the contamination of the plume.
- To limit shellfish contamination, the first solution would be to reduce the viral input. This could be done in limiting the urban input in the watershed where there are villages and dwellings which must be equipped with small individual treatment tanks to comply with the regulations. Another solution would be to move the shellfish towards the outer estuary were the dilution is greater.
- Rainfall clearly increases the river flows and the overflow of untreated raw water leading to contamination. On the sites, but in Spain, we demonstrated that these events could be predicted one or two days before the contamination. An early warning system based on salinity variation could be proposed to advise the administration and shellfish growers about possible shellfish contamination.

The collaborative work allowed us to develop and propose a matrix approach to manage the risk.