Review of approaches for establishing exclusion zones for shellfish harvesting around sewage discharge points

Area of research interest: Foodborne pathogens
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Conducted by: Aquatic Water Service, (with Intertek, Exeter University, Aquafish Solutions Ltd)

Background

Raw bivalve shellfish are widely recognised to be a high risk commodity with regard to viral contamination and norovirus in particular, although the relative contribution of different sources and transmission routes (including foodborne transmission) to the overall burden of norovirus in the community is not yet established.

The European Food Safety Authority (EFSA) has recommended that control options to reduce the risk from norovirus-contaminated oysters should focus on preventative approaches that avoid viral contamination. EFSA suggested several potential preventative control options including introduction of prohibition zones ('exclusion' or 'buffer' zones) around sewage discharges where shellfish may not be harvested. Exclusion zones are likely to be a key risk management option for further consideration at EU level.

The study provided an evidence base to inform development of UK policy in respect of possible establishment of exclusion zones and contributed to risk management discussions within the EU.

Research Approach

The study undertook a review of published and unpublished scientific literature relating to setting and management of exclusion zones (preventing oyster harvesting) to mitigate viral risks from point source sewage discharges. The review included a comparison between norovirus and other viral models with respect to environmental degradation and bioaccumulation factors and also considered the significance of wastewater discharges from diffuse sources (eg pleasure craft) and their capacity to be controlled by norovirus exclusion zones. Review activities incorporated the essential elements of a systematic review supported by direct contact with known working groups.

Overseas experience with respect to exclusion/buffer zones from European settings and US/NSSP based suppliers was also reviewed. A questionnaire was used to construct a database, and where positive examples were identified information was sought to generate potential case study illustrations.

An assessment of the level of the potential impact exclusion zones may have upon the UK oyster industry was carried out. This included construction of a UK-wide database of oyster harvest bed status using available information (eg shellfish hygiene classification, sanitary survey and pollution reduction plan data) and gathering of shellfish industry opinion on management options/business stability.

The study also aimed to assess whether existing computer modelling tools previously developed to meet E.coli environmental regulatory requirements in the Shellfish Water Directive could be utilised for norovirus ‘exclusion zones’. This component of the project included a sensitivity analysis for the potential extent of prospective exclusion zones to meet a range of potential shellfish flesh norovirus standards using outputs from the literature review. Additional data requirements and future model developments required to adapt models for this purpose were identified.

The potential for developing a generic viral risk management matrix for use by harvesters that incorporates an exclusion/proximity component was also evaluated.

Results

Exclusion zones are one possible regulatory approach to limit food hygiene risks from shellfish harvested in close proximity to potentially Norovirus-contaminated wastewater discharges.

This study looked at overseas examples where various types of exclusion, buffer or prohibition zones are used to separate shellfish harvest or production areas from contaminant sources. European examples of proximity based zoning preclude shellfish production a set distance from wastewater discharges, ports, marinas and rivers. The US (and affiliated countries) use a combination of dilution and time-based criteria to attain a bacteriological shellfish water quality standard.

The literature review highlights that Norovirus has a different risk profile from bacterial Faecal Indicator Organisms (FIOs) used in food hygiene and environmental management controls.

- Seasonal Norovirus loading in crude wastewater reflects the variation in ‘catchment health’ of the sewerage connected population.
- Waste Water Treatment Plants (WWTPs) are less effective at removing Norovirus than FIOs.
- UV disinfection efficacy and environmental degradation of Norovirus cannot be demonstrated using current analytical tools.
- Bioaccumulation of Norovirus from water into shellfish flesh has a very different mechanism from that of FIOs. (Literature data suggests hyper-accumulation of viruses can occur during the winter.)

Applicability of exclusion zoning within the UK would need to recognise the strong regional variation in Norovirus risk profile. The potentially high concentration of NoV in wastewater can mean that even small volumes from multiple public and private wastewater discharges can theoretically compromise shellfish quality. Intermittent Combined Sewer Overflows (CSOs) may be particularly problematic in some areas.

As no single shellfish risk management measure is likely to be effective for Norovirus. A ‘whole system’ approach may be required which could include a dynamic ‘active management’ approach to zoning based on risk scoring. The suitability of such ‘enhanced management zones’ would need to be assessed on a catchment specific basis.

Please note that certain references in the final report were amended and the report was re-published on 1st May 2015.

Final report

England, Northern Ireland and Wales

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