Reducing the depuration time of bivalve molluscs:

Assessing risk based reductions in depuration times

E. coli and Norovirus (NoV) can be retained by bivalves for varying periods of time within affected coastal areas, where faecal pollution takes place. The retention time that bivalves maintain *E. coli* and NoV in their bodies is determined by a number of factors that can have an effect independently and also in concert with each other. Some of these are listed below:

- Bacterial loading of faecal discharges to the coastal zone.
- Volume of discharges.
- Duration of faecal discharges.
- Dilution effect of water body.
- Distance from point source of sewage discharge.
- Seawater environmental conditions.
- Temperature.
- Salinity.
- Turbidity.
- Current and tidal factors.
- Inter-species variability in metabolism.
- Norovirus seasonality.

Winterbourn et al. (2016) have stated that, '…coliform/*E. coli* concentrations do not accurately reflect viral dispersal in marine waters and contamination of shellfish by sewage-derived viral pathogens…'

Lowther (2011) found for the period of a two year study that air temperature and NoV laboratory reports from Public Health England shared a very strong inverse common seasonality (highest norovirus during periods of lowest air temperature). In short NoV is more prominent in the winter months (October – March) than at any other time of the year.

Depuration

'Depuration' or 'purification' are interchangeable words used in the context of holding live bivalve molluscs in clean seawater in enhanced conditions that allow the bivalve to purge itself of any low level bacterial contaminants.

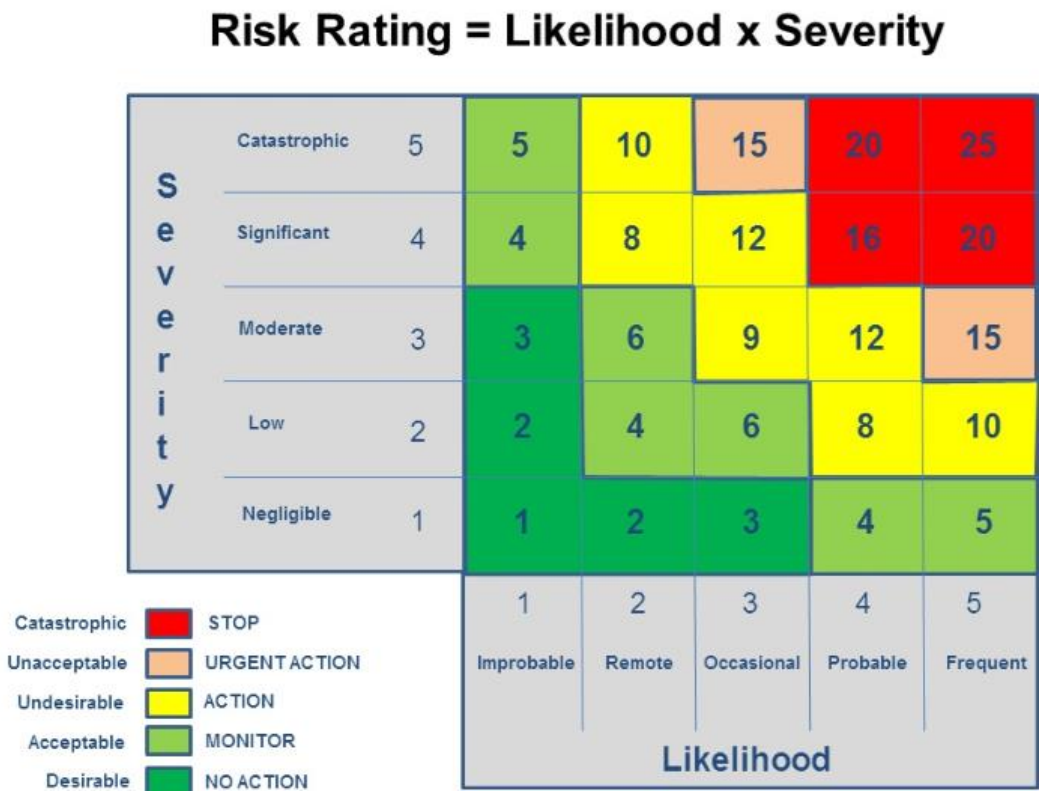
The environmental parameters and the treatment of the depuration water determines the ability of the bivalves to cleanse themselves of bacterial contamination.

Risk Assessment

It is not possible for an external agency to carry out an appropriate risk assessment unless being in the premises that bivalves are being depurated and having the full knowledge of the current batches' history. For this reason, the appropriate risk assessment for the reduction in depuration time must be determined by the Food Business Operator (FBO) in collaboration with the Authorising Officer (AO), normally a local Environmental Health Officer (EHO) or Port Health Officer.

This assessment of risk should include elements of the previously discussed text plus any additional factors known to the FBO that are not outlined above.

The likelihood and severity of a risk can be tabulated in many differing ways and the example below taken from the web[1] may help a FBO to formulate a system of identifying when a reduction in depuration time is not suitable.



[1] http://blog.mindgenius.com/2011/04/risk-management-with-gordon-wyllie.html

Hazard identification and its role in any reduced depuration times

A hazard is anything that has or may have a detrimental effect on the consumer, which should be considered in sequence, prior to reducing depuration time.

Below are some elements which could if improperly considered produce a hazard and should be considered when applying to the Authorising Officer (AO) for a reduction in the depuration time from the standard 42 hours:

1. Species to be depurated (ready to eat or normally cooked).
2. Classification of harvesting grounds.
3. Historical trends of *E. coli* and or NoV for harvesting ground.
4. Season.
5. Location of local combined sewer overflows (CSO) and continually discharging sewage point sources.
6. Notifications of CSO spills, if available.
7. NoV reports in local community.
8. Depuration technology and process.
9. Business controls (pre-requisite requirements / end product testing (EPT) history).

Risk management options

1. Do not reduce depuration time between October and May for ready to eat bivalves.
2. Increase water temperature.
3. Use ozone, fractionation, biological filtration etc.
4. Increase U.V. dose.
5. Enhance EPT.
6. Positive release.
7. Increase depuration times.
8. Cease / delay harvesting at high risk times.
9. Source from different area.
10. Map and determine plume movements from CSOs for differing tidal and metrological conditions[2].

Reduction in depuration time

Clearly any reduction in depuration time from the traditional 42 hours would be unwise without substantive evidence that to do so would not result in unsafe product going on the market.

The adoption of methodical, evidence based, risk assessment that identifies the elements needed to be in place for a reduction in depuration time is essential before approaching an AO to gain approval of this variation.

[2] http://www.seafish.org/media/publications/GMPG_coastal_characterisation.docx.pdf

The Depuration Plant Operator (DPO) is the only person who can access the likely risk and success of any treatment of the bivalves that pass through the centre. This is because they will have the information on each batch that identifies the level of potential contamination based on the conditions prior to and during harvesting.

Also within the UK there are a plethora of depuration system designs and processes that have evolved over time to fit the unique characteristics of the FBO operation.

If a DPO cannot simply and adequately explain the depuration process and why a shorter depuration time will still produce safer seafood they are unlikely to gain approval from an AO.

Evidence in the form or records taken from the pre-requisite procedures will indicate when a FBO has control of the process of handling the bivalves, from harvesting ground to consumer in a safe manner.

Sources of information and further guidance

Fitzgerald A, Syvret M, Hamilton A, Pyke M (2011). Review and cost-benefit analysis for industry of reduced depuration times for the mussel *Mytilus edulis*. SARF066. Scottish Aquaculture Research Forum (SARF). Available from http://www.sarf.org.uk/cms-assets/documents/29383-342050.sarf066.pdf

Lowther J (2011). Investigation into the prevalence, distribution and levels of norovirus titre in oyster harvesting areas in the UK. Cefas ref C3027. Available from https://www.food.gov.uk/sites/default/files/Norovirus%20surveillance%20report_0.pdf

Bowes M, Pyke M (2013). Coastal Characterisation & the CSO Text Alert Initiative. Seafish Report Number SR665. Available from http://www.seafish.org/media/publications/GMPG_coastal_characterisation.docx.pdf

Winterbourn JB, Clements K, Lowther JA, Malham SK, McDonald JE, Jones DL (2016). Use of *Mytilus edulis* biosentinels to investigate spatial patterns of norovirus and faecal indicator organism contamination around coastal sewage discharges. Water Research **105**, 241–250. http://dx.doi.org/10.1016/j.watres.2016.09.002

See also the Seafish Bivalve mollusc safety webpage

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