Assessing Risk Based Reduction in Purification Times for Bivalve Molluscs

Background

Bivalve molluscs may be gathered from natural shellfish beds or cultivated in our coastal waters. Bivalves are a good source of protein and have been shown to have many health benefits. For example, they provide a valuable source of omega-3 fatty acids and essential nutrients, such as selenium and zinc. They are considered to be very healthy foods.

The issue of food security has risen up the UK political agenda. To help meet the increasing demand for food, bivalve mollusc production from managed natural fisheries and cultivation, provides a good sustainable form of food for us to eat, with very low impacts and increasingly recognised benefits to the wider environment.

Bivalve Purification to Protect Human Health

Water quality, in terms of the bacteria and viruses present, affects the incidence of microbial contamination in shellfish. These bacterial and viral contaminants are derived usually from land-based sources, whose magnitude in coastal waters varies according to factors many of which are weather-related. As bivalve molluscs filter feed on planktonic marine algae, they will also filter bacteria and viruses, some of which may present a risk to human health. There is therefore legislation in place to protect consumers that ensures the shellfish sold into the supply chain meet strict food safety(health and hygiene) standards and that they are obtained from classified[1] harvesting areas and production sites.

Mussels filter feeding (© T. Strohmeier & Ø Strand)

Harvesting areas and production sites are classified on the basis of regular monitoring of *Escherichia coli* (*E.coli*) levels in the bivalve mollusc flesh. Because *E.coli* occurs naturally in the digestive tract of humans and animals, it is used as an indicator organism for the presence of faecal contamination that may contain viral pathogens such as norovirus (NoV, one of the most common causes of gastroenteritis, often referred to as the 'winter vomiting bug'). The classification awarded to a harvest

[1] See FSA and FSS for current classification lists. Seafish guidance on classification is also available.

or production site dictates the post-harvest treatment required prior to the bivalves going to market for human consumption.

E. coli and NoV can be retained by bivalves for varying periods of time that can be influenced by a variety of factors including:

- Bacterial loading of sewage discharges to the coastal zone;
- Volume and duration of discharges;
- The dilution effect of water body;
- Distance from point source of sewage discharge;
- Seawater environmental conditions including current and tidal factors;
- Physical properties of the water body such as temperature, salinity, turbidity;
- Inter-species variability in metabolism; and
- Norovirus seasonality, with greater prevalence in winter (October to March).

Purification

Shellfish purification can also be referred to as 'depuration'. The two terms are interchangeable, but for the purposes of this document 'purification' is used. The term relates to the use of a controlled aquatic environment to reduce low-level contamination by bacteria in live bivalves to a safe, acceptable level for human consumption. Purification is a natural biological process whereby bivalves purge themselves of microbial contamination by filtering sterilised seawater.

Hazard Identification and its Role in Reduced Purification Times

A hazard is anything that has or may have a detrimental effect on the consumer. These should be considered prior to any reduction in purification time. Consideration should be given to:

1. Species to be purified (e.g. mussels, oysters, clams);
2. Will the animal be eaten raw or cooked;
3. Classification of harvesting grounds;
4. Historical trends of *E.coli* and NoV for the harvesting ground;
5. Season (e.g. there is a higher risk of NoV in winter);
6. Location of local combined sewer overflows (CSO) and continually discharging sewage point sources;
7. Notifications of CSO spills, if available;
8. NoV reports in local community;
9. Purification technology and process; and
10. Business controls (e.g. HACCP plan and end product testing (EPT) history).

Risk Management Options

1. Consider purification time required in relation to likely risk (e.g. do not reduce purification during high risk periods such as October and May for ready to eat bivalves).
2. Maintain water temperature within acceptable limits for the species;
3. Use ozone, fractionation, biological filtration etc.;
4. Increase U.V. dose;

5. Use of positive release and enhanced EPT;
6. Cease or delay harvesting at high risk times (e.g. if contamination is known to be linked to high rainfall, avoid harvesting immediately after such an event); and
7. Source from different area.

Reduction in Purification Time

The appropriate risk assessment for the reduction in purification time must be determined by the Food Business Operator (FBO) in collaboration with the Local Authority, normally a local Environmental Health Officer (EHO).

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 seeking approval to vary purification times.

The Risk Assessment

The FBO purification manager 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. There are many different purification system designs and processes that have evolved over time to fit the unique characteristics of the FBO operation. Seafish has produced a variety of guidance on bivalve purification.

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.

Marketing Molluscan Shellfish

A FBO has a legal duty to ensure the food it places on the market is safe. In order to protect human health, all molluscan shellfish must meet an end product standardof less than 230 *E.coli* per 100g of flesh. However, animals that have been through an approved purification unit should achieve a microbiological level of 40 *E.coli* or less per 100g of flesh. EPT helps demonstrate compliance with legal obligations, can add value to the product, and may provide additional control[2] over when bivalves are harvested and sold.

[2] Accurate and reliable EPT require lab facilities and are therefore valuable for determining trends through time that can be used for active hazard management and identifying periods of higher risk. The lateral flow EPT, although considered less reliable, provides quick real time results that are more suitable for positive release of a perishable product.