

SENSORY ASSESSMENT FOR THE DETECTION OF PETROGENIC TAIN IN FISH AND SHELLFISH



Background

Contaminants are unwanted materials introduced to the natural environment as a result of predominantly anthropogenic (human) activities. Fish and shellfish can accumulate chemical contaminants, including polycyclic aromatic hydrocarbons (PAHs), in their tissues and in severe cases, these contaminants can present a risk to human health. In order to protect human health, EU Member States are required to adopt appropriate surveillance measures regarding the presence of contaminants in foodstuffs.

Following an oil spill or release of hydrocarbons into environments where fish and shellfish are harvested for human consumption, Marine Scotland Science (MSS) would receive samples for testing for taint by sensory assessment and chemical analyses.

What is taint?

Taint is a sensory experience and can only be detected and measured by a sensory procedure such as smelling or tasting the food. A 'taint' is defined by the International Standards Organisation as a 'taste or odour foreign to the product originating from external contamination'.

Polycyclic aromatic hydrocarbons

Polycyclic Aromatic Hydrocarbons (PAHs) are a group of over 100 different chemicals. PAHs enter the environment as products of incomplete combustion of fossil fuels, motor vehicles and power stations and from other sources. PAHs are also constituents of crude oil, and are present in the marine environment as a result of natural seeps, oil spills and activities associated with offshore oil and gas exploration and production, and more importantly, general shipping movements. PAHs, in particular the lighter 2-ring PAHs which are the main PAH constituents of crude oil and some oil fractions, can also result in the tainting of fish and shellfish. This taint can be detected by a trained assessor.

How do PAHs affect human health?

PAHs can only affect human health in very extreme circumstances. For example, if contaminated fish or shellfish is consumed in large quantities or over a sustained period of time acute and chronic effects, such as chemical poisoning and long-term systemic effects related to specific contaminants could occur.

Sensory assessment

The MSS Marine Laboratory, is the designated facility for sensory assessment of fish and shellfish



within the UK national contingency plan for response to offshore incidents, such as hydrocarbon spills. The work is accredited at MSS under ISO 17025. The procedure for assessing taint in fish and shellfish uses an objective sensory method. A panel of assessors is trained in using a numerical scale to indicate the intensity of taint resulting from hydrocarbon contamination. Assessors are trained using artificially tainted rainbow trout (*Oncorhynchus mykiss*) which have been exposed to Forties crude oil for up to four hours.

Sensory assessment procedure

PAH concentrations in the fish flesh are measured prior to the sensory assessment training sessions, to assist in the selection of samples for use in training exercises. Samples of the same fish used in the chemical analysis are used for the sensory assessment.

Each assessor is provided with fresh drinking water, plain water biscuits, plastic cutlery and plastic cups for expectoration (spitting out). Each assessor is also provided with a score sheet ([Taint assessment scoring sheet](#)) to record individual assessment of samples. The mouth is rinsed with fresh drinking water before commencing with the first sample which is tested by taking an initial deep inhalation followed by one or two shallower sniffs. The sample

is tasted to confirm judgment and the intensity of the taint recorded. The sample is expectorated. Assessors record the intensity of the taint using a 6-point numerical scale where 0 is the absence of taint and 5 represents extremely strong taint. If taint persists in the mouth after rinsing, the palate is cleansed with a plain water biscuit and rinsed again with fresh drinking water. The assessor should only proceed to the next sample when confidence in sensory judgement has returned.

The sensory assessment method used at MSS defines a 'tainted' sample as one in which 50% or more of the assessors taint, assign a sensory assessment score of 1 or more to the sample. The total PAH concentration at which 50% of assessors detect some taint can be considered as an analytical 'detection limit'. From this, the detection limit of a typical assessor, is 350 ng g⁻¹.

Training activities

At MSS, the panel members participate in a continuous training programme to maintain their expertise in sensory assessment. Assessors are required to be familiar with several species of fish and shellfish in order to distinguish between the naturally occurring flavour variations typical of the species and those flavours produced by tainting substances.

