



Issue 36: January, 2021: This e-bulletin is aimed at personnel in fisheries and aquaculture, at fish packers, processors, distributors, retailers and finally, consumers.

Smoked oily fish tick many boxes

Smoked oily fish are stocked by all leading food retailers and also by many smaller stores. Smoked Atlantic salmon (*Salmo salar*) (mostly farmed) is the most prevalent followed by smoked mackerel (*Scomber scombrus*), smoked sea trout (*Oncorhynchus mykiss*) and smoked herrings (*Clupea harengus*) (kippers). Smoked oily fish tick many boxes: (i) high in omega-3s EPA and DHA; (ii) good source of high quality protein and beneficial peptides; (iii) good source of vitamin D; (iv) shelf life of 3-6 weeks at 2-5°C with a number of protective hurdles; (v) excellent flavour and texture; (vi) moderately priced; and (vii) versatile from a culinary point of view. A 'nutritional negative' of smoked oily fish is salt content which usually ranges 2-3.5%. However, consumed in moderation, smoked oily fish are an excellent part of a balanced diet.

Technology of smoking

Smoking may be cold, hot, liquid or electrostatic depending on the method and temperature (Ioannis, 2014). Fish is usually filleted and pin bones removed. However, gutted mackerel and other fish are sometimes smoked whole. Salting is either dry (by hand) or by brine injection. Cold smoking is at 18-25°C/6-24h. The flesh is not cooked, just dried a little and infused with smoke flavour. Alternatively, hot smoking is at 70-90°C/1-8h and is normally preceded by cold smoking. In hot-smoking the fish cooks during the process and flesh is firm and flaky. Modern smoking methods use smoke condensates which convert the smoke into liquid or solid form via calcination (Suñen *et al.*, 2003).

Omega-3, protein & vitamin D status of smoked oily fish

Fresh farmed salmon, mackerel and herrings are excellent sources of EPA and DHA which are very important for human health [see SeaHealth-ucd, Issues 2 (2012) & 27 (2018)]. Data on the EPA/DHA content of farmed seatrout are limited but it is likely they are largely similar to farmed salmon. Cronin & O'Sullivan (1990) have shown that EPA and DHA are surprisingly stable to heat in a range of oily fish both smoked and unsmoked as have Bhuiyan *et al.* (1993) for fresh versus smoked mackerel. Based on these data smoked oily fish are excellent sources of EPA and DHA.

Oily fish and their smoked counterparts are a rich source of good quality protein (circa 18-19%). The protein breaks down on digestion into polypeptides, peptides and amino acids. Many of these compounds have bioactive properties, e.g. (i) some fish protein hydrolysates inhibit

proliferation of tumour cells (*in-vitro* trials), and (ii) some fish peptides are ACE inhibitors, i.e. they help reduce blood pressure and prevent atherosclerosis (see SeaHealth-ucd, Issue 1, 2012).

On 7 December 2020 over 100 scientists, doctors, and leading authorities called for increased vitamin D use to combat COVID-19 as strong scientific evidence indicates vitamin D reduces infections and deaths. Their letter was sent worldwide to all governments, public health officials, doctors, and healthcare workers and is on-line at: <https://vitamindforall.org/letter.html> Among recommendations made is that adults consume 2000-4000 IUs of vitamin D daily; this level is widely regarded as safe. Smoked oily fish and their fresh counterparts are a rich dietary source of vitamin D supplying 600-800 IUs (15-20µg) per 100g as eaten.

Shelf life & safety of smoked oily fish

Smoked oily fish have shelf life ranges of 3-6 weeks at 2-5°C depending on species, level of salt inclusion and other factors. Protective safety hurdles include salt (2-3.5%), reduced moisture level, reduced water activity (a_w circa 0.85), the antibacterial effect of smoke, the inclusion of spices in some products, and chill storage temperatures. Salt content is inversely correlated with a_w so trends to reduce salt content of foods, including smoked oily fish, will result in a rise in a_w and potentially a shorter shelf life. In theory, *Clostridium botulinum* could grow in smoked oily fish in blister packs (anaerobic). However, the minimum a_w at which *Clostridium botulinum* growth and toxin formation occurs is 0.97 (Briozzo *et al.*, 1986). The hurdles above plus good manufacturing practice and HACCP should prevent contamination/growth by/of the psychrophiles *A. hydrophila*, *Y. enterocolitica* and *L. monocytogenes*.

Estimated average daily salt intake in Irish adults exceeds the WHO's recommended level of 5g/day. There is extensive research linking excess salt to high blood pressure/hypertension which is a precursor for coronary heart disease (Damodaran *et al.*, 2017). However, Giner *et al.* (2000) suggest the extent of salt induced hypertension varies from person to person based on genetic determinants and over 40% of the 50 persons in a small trial were not salt sensitive in a hypertensive sense. i.e. increased salt intake did not increase their blood pressure.

References

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