Use of ^{23}Na and ^{1}H MRI for the optimisation of methods for salting of Atlantic salmon fillets

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The main goals of the present study were to study the effect of different commercial salting methods on salt and water distribution in salmon fillets. Structure and quality of the salmon fillet muscle may be related to ante-mortem stress during fish harvesting. Anaesthetized (unstressed) and exhausted (stressed) fish were compared. Subsequent development of rigor mortis depends on ante-mortem handling stress. Stressed fish exhibits much shorter time to rigor onset and develop stronger muscle contractions during the rigor process. The fish were salted post rigor. We wanted to study using MRI whether the salt uptake was different in the two groups of fish, i.e. if potential differences in post-rigor muscle structure affected the salting process. T_2 ^{1}H MRI mapping of whole salmon during rigor demonstrated considerable differences in rigor development. On similar fish, this potential difference in post-rigor fillet structure had an influence on salt uptake (see poster on low field NMR study by Aursand et. al.). Subsequent dry salting and brine salting processes were studied by using ^{23}Na and ^{1}H MRI (Bruker Biospec imager at 7 Tesla using a double tuned ^{23}Na/^{1}H probe). This probe allowed imaging of exactly the same fillet portion (slice) for both nuclei. The ^{23}Na images clearly showed inhomogeneous salt distribution whereas the proton images showed that fillet fat distribution in the same slice was, as expected, a limiting factor for salt uptake. Differences in salt distribution in fillets from the two commercial salting methods were also clearly demonstrated.