

MRI of meat related food system

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MRI is widely used in medicine. Researches in MRI methodology dealing with clinical field are performed to improve the diagnosis accuracy and examination time. Food science benefits from these MRI developments although the objectives are very different. The quality of meat and meat products depends on raw product and technological processes. In meat industry, it is impossible to install NMR spectrometer on line. The size, the heterogeneity itself inside a single carcass and the slaughter frequency are not compatible with NMR control. The MRI approach allows to develop knowledge on muscle / meat and to improve the technological processes for a better nutritional and organoleptic quality.

Some examples will show how MRI is a suitable tool for the characterisation of raw product. Then, different approaches will be presented for the optimization of salting process, taking into account the raw meat quality.

The water holding capacity is highly related to juiciness and technological yield. A lot of NMR work deals with the WHC by measuring the water relaxation times in the whole sample. The measurement of diffusion coefficients of water gives information on the anisotropy of water mobility (Hansen). Its preferential axis along the fibre direction and the repartition of water inside the meat give opportunity to follow the water diffusion during drying, salting, cooking etc...

The connective tissue is related to tenderness. The 3D repartition of connective tissue (collagen and fat) inside the whole muscle adds new information about the muscle structure (Bonny). The collagen content can be determined so far by destructive method and the histochemistry gives structural information on very small pieces of muscle. The NMR susceptibility difference allows today to visualize the whole connective tissue network and to follow its in vivo setting-up and evolution during technological process.

The quantitative determination of free and bound Na⁺ ion by DQF (Mouaddab), the repartition of Na⁺ and fat inside the product and the diffusion of water on the same slice help to improve the salting process.

These results point out that, NMR associated with specific methodology development, allows to obtain significant information which would be impossible otherwise.

References:

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