Artisan Curing & Smoking at Home

Curing and smoking is the oldest form of food preservation known to man with evidence of tools and cave paintings dating back over 3,500 years. No doubt, early caveman discovered that meat hanging near the fire lasted longer and that wood smoke imparted an interesting flavour to his meat or fish.

Without *preservation* mankind would not have survived the cold of Winter or the drought of Summer and crop failures let alone pestilence or wars. The most successful and developed societies were those that produced a surplus of food which they preserved and traded.

By the age of the Vikings, curing and smoking was an organised trade with whole settlements from Norway to Grimsby dedicated to curing and air drying fish in the open and smoking in longhouses - a practice that has changed little in 2000 years.

In Britain, Arbroath Smokies and Finnan Haddock are prized fish only eclipsed by the bigger North Atlantic Salmon and the redder Sockeye Salmon whilst from Norway to Napoli in Europe stockfish or *stockafisso* (salt cod) is king.

The use of *salt* and, to a lesser extent *sugar*, as a means of reducing the *water content* of meat or vegetables is integral to curing whilst the process of *curing* and *fermentation* is a process common to making salami or kimchi which dates back to 600BC-1000BC.

Reducing what is known as the water activity of organic material[1] is the process of curing since harmful or food spoilage bacteria require *water, oxygen, ph, warmth* and *food (or host)* to replicate. By using organic requirements as *tools* to inhibit or control bacterial growth, man learned over the ages to preserve seasonal foods from his locality to consume all year round and trade surpluses elsewhere.

[1] http://www.edinformatics.com/math_science/science_of_cooking/brining.htm

Salt is the most efficient culinary dehydrator, altering the water activity which inhibits bacterial growth and subsequent spoilage. It can be applied to meat or vegetables either direct as a rub or dissolved in a salt solution which is known as a *brine*[2]or a *pickle* when combined with an acid.

Typically, you would be looking to use 25% salt by weight of water dissolved in water to make a 20% brine solution[3] (approximately 80° measured with a salometer) or apply a salt (and sugar which is a much less effective dehydrator but can counter the saltiness of the end product) based cure direct and drain away or replace the cure during the curing process (known as 'dry' curing) so that the foodstuff does not become too salty to eat (you rinse the subject to stop the process as you would take meat off heat when cooking with heat).

The use of salt directly, which is *sodium chloride* (plus a variety of trace elements in the case of sea salt[4]) takes out or 'binds' *free water* content from the cells by *osmosis* whilst brining works by *diffusion* over time[5]. Both processes have a preservative effect since bacteria cannot reproduce or move about without water since most bacteria are not motile (e.g. no legs).

Diffusion is different to osmosis since it *flavours* the proteins being immersed whilst dehydration by moves moisture through a breathable membrane with water moving outwards when there is a pressure gradient e.g. the humidity or osmotic pressure is lower outside the membrane so free water from the cells moves outwards by *osmosis*. Over time the process of diffusion works the negatively charged chloride ions in sodium chloride through the protein in organic material e.g. molecules in the meat, fish or vegetables will move from an area of higher concentration to an area of lower concentration until they reach a state of *equilibrium*. It is a significant difference and one which can be used as a tool interchangeably in the preservation process.

The degree of salinity - that is the percentage of salt in water - has a direct relationship with curing time *at a given temperature* so you can brine for given time or measure the amount of salt in the brine until the brine and meat or fish reach a similar degree of salinity e.g. like cooking to a given temperature at which point the cooker turns off. Interestingly, brining can be used to retain moisture in proteins.

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[2] Seawater contains between 3.0 to 3.5% salt in solution so it will yield about 30g to 35g per litre)approx 1kg) of sea salt when naturally dried. To measure the strength of a brine use a salometer and refer to a brining table since salinity varies according to temperature and concentration.

[3] Organic material like meat or fish will usually taste over salted with more than 1% salt content if cooked with heat before eating. If you put a subject into a 5% by weight salt solution it will gradually become over salted as the negatively charged chloride ions in sodium chloride work through the meat and the process will only stop when the degree of salinity in the meat equals the salinity of the solution in the brine.

[4] Roman authors like Homer (850 B.C.) noted the colour fixing qualities of salt which was more likely to have been caused by impurities containing nitrate which we now know to be an anti-clostridial.

[5] Obviously, if meat or fish is in a water based solution where the solvent, in this case water, is considerably greater by percentage than the solute (salt) it is not *osmosis* at work since the rh of the solution is greater than the meat (protein).