D. COOKING AND ITS PROBLEMS

1. Cooking : desired results and techniques

Cooking is the transformation of foodstuffs using heat.

Foodstuffs are heated in order to achieve several goals. These are the main ones:

- In order to give a certain texture or a certain taste or flavour that consumers find pleasing
- To preserve food
- To increase digestibility
- To destroy micro-organisms

Various cooking methods are possible (Joyeux 1994):

- Blanching
- Pasteurisation
- Sterilisation
- Boiling in a pan – in other words at 100° C (212° F).
- Frying in oil in a frying pan – between 150° degrees and 190° C (300°-375 ° F).
- On a wood fire or charcoal fire barbecue - between 300° and 500° C (570°-930° F).
- In a normal domestic type oven, between 100° and 275° degrees C (212° – 530° F.)
- In a microwave oven
- In contact with a hot surface
- In steam in a pressure cooker
- In a steam cooker below 100° C (212° F).
- In a pan with the lid on, without liquid and at less than 100° C (212° F).

In all of these cases, increased temperature is obtained by agitation of the molecules in the foodstuff, the surrounding area and the cooking vessel in which it is contained.

2. Visible results of cooking

Cooking leads to obvious changes in foodstuffs and the changes are all the more pronounced when the rise in temperature is either high or prolonged. Thus:

- Vegetables and fruits become much softer.
- Egg changes from a liquid to a solid.
- The lean parts of a beet steak which are red to start with show a tendency to blacken and the fat which is white to start with tends to become yellow.
- A progressive drying out takes place.

The taste of the foodstuffs is changed to a greater or lesser extent, along with its smell, which is sometimes the distinctive aroma of grilled food. The simple evidence of our senses tells us that the cooked product differs from the raw food. This impression is to a great extent born out by chemical analysis.

3. The chemical consequences of cooking

During cooking, under the effect of thermal agitation, the molecules impact each other, break up and stick randomly to other structures, forming new and very complex combinations, some of which do not exist in nature. This point was correctly pointed out by Burger (1988) and Comby (1989).

Sugars polymerise, oils oxidise and undergo even more cyclization if they are unsaturated. For this reason it's best to avoid heating sunflower oil, corn oil, and rape seed oil, all rich in unsaturated fatty acids. Less damage is done with ground nut oil which only contains 30% of unsaturated fatty acids. (Mendy 1986). *(Translator's note: Seignalet was writing before the relatively recent discovery by the health food movement of the merits of virgin coconut oil.)*

Isomers are produced:

- Oses. Type D oses become type L.
- Type L amino acids become type D.
- Cis type fatty acids become trans fatty acids

Thus, as we explained in chapter 3 (Enzymes), **our enzymes can only act on the original, natural substance and not on the isomer. An enzyme can be compared to the right hand, which can fit perfectly in a right hand glove but not in the left hand glove (the isomer is the mirror image of the natural substance). What happens to isomers once they have crossed the intestinal barrier remains unknown. At best they are not usable. At worst they are dangerous and this is probably sometimes the case. In the chapter on the problem of oils, we will come back to the subject of the harmfulness of trans fatty acids.** *(Bold emphasis is Seignalet's own).*

As Burger (1998) observed, only the slightest difference, compared to that of the normal molecule results in a molecule which the organism cannot process. So, for instance, 2-desoxyglucose is very similar to glucose but it is missing a hydrogen atom linked to the second carbon atom. 2- desoxyglucose is transported and absorbed by the same systems as glucose but once it ends up in the cells, it can no longer be processed and accumulates in them.

Heat has a particulary marked impact on proteins and Cuq and Lorient (1992) carried out an extremely good analysis of this.

1) Modification of the spatial structure

No covalent bonds are broken and the primary structure is not affected. Hydrogen bonds <u>are</u> broken however and the intramolecular hydrophobic bonds are reinforced, thus bringing about a change in the spatial structure.

2) Modification of side chains in amino acids residues

Tryptophan produces carbolinic derivatives, the carbolines α, β and γ. The γ carboline, when potentiated by the β carboline is a powerful carcinogen. The mutagenic potential of Trp-P1 and Trp-P2, contained in the γ carboline, as mesured by the Ames-Salmonella test is very high: 104,000 and 39,000 revertants per microgram respectively. These are record figures, much higher than those registered with other known carcinogenic substances.

Glutamic acid also gives rise to potential carcinogenic derivatives. The carbolines Glu-P1 and Glu-P2 have a mutagenic power of 49,000 and 1,900 revertants per microgram.

Lysine, Ornithine and phenylalanine also generate carbolines, respectively Lys-P1, Orn-P1 and Ph-P1

3) Interactions between several proteins

which are joined by covalent bonds

4) Interactions between proteins and reducing sugars

These are the famous Maillard reactions discovered by the chemist Maillard in 1916 which gave rise to much subsequent research. They are produced between the amine group of proteins and the carboline group of sugars.

The reactions take place in three stages, leading to increasingly complex structures

- During the first stage, aldosamines are formed (Heyns rearrangement) and ketosamines (Amadori rearrangement), substances with little or no colour.
- During the second stage, the Heyns and Amadori components are transformed into coloured premelanoidines, giving rise to the characteristic "grilled" odour.
- During the third stage, brown polymers are created. These are the melanoidines.

Maillard molecules are large and increasingly difficult to metabolise as they become more complex. The toughest ones are practically impossible to break up. They do not dissolve in water and are resistant to proteolytic enzymes. Even bleach and detergents cannot break them up. The question then arises as to what happens to these large molecules, once they have crossed the intestinal barrier. In my opinion, there are two possible fates:

- Either they accumulate, if not in the cells, at least in the extra cellular space, which can give rise to a clogging pathology,
- Or they are captured by macrophages (Drieu-Gervois 1994), which in my opinion will transport them whole to an emunctory in order to get rid of them, which can result in an elimination pathology.

4. The harmful effects of cooking

What all this boils down to, is that cooking generates a great number of complex molecules which do not exist in nature and whose properties and fate are unknown. Burger (1988) was right to insist on this important point.

It has been shown that some substances produced by cooking are toxic or carcinogenic. While pesticides and colouring agents are a source of concern for many consumers, Dang (1990) rightly believes that they contain far fewer carcinogenic components than cooked foodstuffs. The transformations of two essential amino acids like tryptophan and glutamic acid are a good illustration.

The dangerous effects of cooking can be demonstrated either directly, or indirectly by remarking the beneficial effects of raw foods.

a) Direct arguments

I will give four:

1) During the digestion phase of a meal containing cooked products, leucocytosis can be observed. This does not appear after eating raw foods. This suggests that macromolecules have crossed the intestinal wall and have provoked an immune response.

2) Cooked animal fats, mainly from meat and dairy products, promote the onset of breast cancer and colon cancer. I will come back to this point in my chapter on malignant diseases.

3) Scandinavian and English speaking populations who eat lots of cooked foods such as wheat, corn, milk and animal fats, pay a high price for this in the form of obesity, adult onset diabetes and cardio vascular diseases.

4) Some Maillard molecules that our enzymes cannot break down are lacking in infants but found in relatively large quantity in the aged. It is possible that they play a part in the premature ageing of the brain and blood vessels and senile dementia, increasingly common.

b) Indirect arguments I will take these from other mammals as well as humans.

1) The experiments carried out by Pottenger (described in detail by Comby 1989) on 900 cats studied over a ten year period are instructive. This physician carried out adrenalectomies followed by an administration of hormones. Having by chance to feed some of the animals with raw meat, while the other cats were being fed cooked meat, he noticed several things which were later seen to occur several times. The cats which eat raw meat:

- Withstand the surgery much better.
- Have far fewer infectious , inflammatory and allergic diseases.
- Are a lot less irritable.
- Produce much healthier kittens which the mothers can suckle without difficulty

Furthermore, the degeneration of the cats which eat the cooked meat worsens with each new generation.

2) Chimpanzees are very similar to humans in terms of phylogenic evolution and 99.3% of their genes are the same as ours. Chimpanzees in captivity in zoos or laboratories tolerate cooked products very badly and are given raw products exclusively or almost exclusively. (Comby 1989).

3) Even though we are living in the 20th century (sic), some populations still live or lived very recently in the stone age. They make for interesting studies.

- Eskimos, who don't have any wood available to make fires, have long made fish and reindeer, eaten raw, their main food resources. In spite of the large amounts of animal fats provided by this diet, they have only a tenth of the cardio-vascular disease of Europeans and Americans.

- Pygmies ingest daily, with no adverse health effects, amounts of meat that westerners would find alarming. However, this meat is practically raw. *(Translator's note: the pygmies' meat is bushmeat: mainly monkey and antelope, cut into strips and smoked to preserve it.)*

3) Practical consequences

It's always preferable to eat food raw rather than cooked. If however, cooking is to be used, one essential fact should be born in mind. The higher the temperature and the longer the cooking time, the more the modifications are pronounced. The limit above which foodstuffs undergo substantial transformations is around 110° C (230° F).

Grains and meat are cooked at high temperature. Green vegetables and pulses are often cooked at moderate temperatures. This is one of the reasons that the former are more dangerous than the latter.

When it comes to a choice of cooking methods then, I am of the same school as Kousmine (1989) and Joyeux (1994):

- The standard type domestic oven which can reach 300° C (570° F) must be avoided.
- Pressure cookers, which can reach 140° C (284° F), must be avoided.
- It's best to opt for gentle cooking without liquid in a closed pan or with a steamer.

The microwave oven raises the temperature for a very short time to around 75° C (167° F), well below the 110° C limit. At first sight then, it appears innocuous. However, this device has several properties which give rise to concern. (Debry 1992):

It produces a change of direction of water molecules, 2,45 billion times per second. No-one knows what the consequences of this phenomenon might be.

- If a leak occurs, it emits non ionising types of radiation with very harmful effects on the human organism.
- It transforms some L amino acids into D amino acids. This is the case with proline and hydroxyproline which thus cannot be broken down by our enzymes
- In more than 90% of foodstuffs it causes pronounced disturbances which can be detected by biocrystallisation analysis.
- Products heated in a microwave oven then, undergo subtle modifications which are nonetheless probably formidable.

An experiment carried out by Henri Joyeux favours this hypothesis. Three groups of mice are fed with the same foods prepared in different ways:

- For the first group, heated in a microwave
- For the second group, cooked in a pressure cooker
- For the third group, either raw or cooked in a steam cooker

The mice in the first group refused the food for several days, then, driven by hunger, ended up eating it. All the rodents were then inoculated with cancerous cells. The percentage of the animals who developed cancer was 100% for the first group, 50% for the second group and 0% for the third group. So it is probably best not to use a microwave.

Translation by Chris Parkinson   www.frenchtoenglish.rocks

Bibliography of works quoted in this passage from “L'alimentation ou la troisième Médecine” Jean Seignalet :

JOYEUX H. Changez d'alimentation. 1 vo;., 1994, E.x de Guiber édit. Paris, 298 pages.
BURGER G.C. - La guerre du cru. 1 vol. 198, Faloci, Roger édit. Paris, 221 pages
COMBEY B. - Nature contre SIDA 1 vol., 1989, éditions du Soleil édit. Chene-Bourg/Geneve 278 pages
MENDY F. Corps Gras, acides gras. Nouvelles données, produits nouveaux. Information diététique, 1986, 1, 13-28.
CUQ J.L et LORIENT D. - Cuisson et conservation des aliments. In Alimentation et Nutrition humaines, 1992 esf ÉDIT. Paris, 1183-1234
DRIEU-GERVOIS F. - La réaction de Maillard. Bulletin AMKI, 1994 no. 7, 2-6
DANG. P Quels sont les vrais agents cancérigènes? Presse Med. 1990, 19
KOUSMINE C. Sauvez votre corps. 1 vol., 1987, J'ai Lu édit. Paris, 103 pages
DEBRY G. - Effets des micro-ondes sur la santé des consommateurs et sur la valeur nutritionnelle des aliments. Rev. Prat. Med. Gêner., 1992, 6, 63-66