Recommandations pour la formation des chimistes pour l'industrie alimentaire

La division « Chimie des aliments » de la Fédération des Sociétés Chimiques Européennes (FECS) a proposé des recommandations pour la formation des chimistes alimentaires en Europe. Nous présentons ici cette réflexion sur l'« Eurocurriculum in Food Chemistry ».

From the food chemist in Europe to the European food chemist

A proposal by the Food Chemistry Division of the Federation of European Chemical Societies

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In every country across Europe and beyond scientists in industry, university and official laboratories are busy with the discipline they call food chemistry. A number of scientific publications and journals help to publish the findings in food chemistry. Almost the whole food industry across the world is busy with developing statutary analytical methods for a broad spectrum of constituents, additives and contaminants in food in order to guarantee its safety and compliance with the various legal systems. An international body, under the auspices of WHO and FAO, namely the Codex Alimentarius has been assigned a central function in the context of the GATT/WTO treaty for the discussion and decision on food chemical standards, applicable throughout the world.

In spite of these worldwide coordinated activities, there is no accepted standard for the education of the scientists playing such a central role in the food aerea. A food chemist is a different human being altogether almost in every country ! In some countries, food chemistry is an university degree, in other countries it is equivalent to a charted chemist and in other countries again it just simply does not exist. As a result of this situation, anyone declaring himself a food chemist can not be compared with any other scientist, also claiming to be a food chemist. The consequences can be quite severe in so far as the free mobility of food chemists is greatly hindered, because no one has an idea of what to expect of a person, introducing him or herself as a food chemist. The contrast to other professions, such as medical doctors, civil engineers, physicists, etc. is extraordinary.

In view of this heterogeneity on the one hand and the importance of the activity of food chemistry on a broad worldwide basis, emphasised by council directives such as n° 93/99 (additional measures), the Food Chemistry Division of the Federation of European Chemical Societies has decided to define a curriculum for food chemists to be recommended to all universities accross Europe and, possibly, beyond. It is to be hoped, that these minimum requirements for an education in food chemistry will be taken up by universities, implemented and thus helping to raise the standard of university graduates in this discipline internationally. As a consequence, the implementation of the food standards and food control within the EC and beyond will be greatly facilitated.

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The minimum requirements for a food chemist

The first two years - basic studies

1. A food chemist is a chemist

The basis of all food chemistry is chemistry. The Food Chemistry Division has the firm opinion that a food chemist must have a sound knowledge of the basic principals of organic and inorganic chemistry. A focus on the chemistry of natural products should help to understand the formation of natural plant and animal constituents and this knowledge is also the basis for the understanding of processes observed in nature. The understanding of these mechanisms is a fundamental prerequisite for all food chemical work in universities, industries and food control.

A prime requirement for any education in food chemistry is therefore, that the first two years in the studies of food chemistry will be shared with the curriculum for chemistry.

Years three and four

2. A food chemist is knowledgeable in agriculture and food technology

The understanding of the climatic influence on the possible occurence and formation of insect-damage, mould growth and other pests in foodplant cultures may help, to design quality assurance systems sensibly and effectively. The biosynthesis and degradation of food constituents and the degradation and metabolism of pesticide residues and also natural toxins may depend greatly on the agricultural conditions and also again on the climate.

The processing technologies on the other hand may lead to the formation or degradation of compounds, which may be desired or undesirable. The knowledge of the technology may help the food chemist greatly in designing the control mechanisms for the resulting food. On the other hand he can help, by giving informed council to the agronomist and technologist to design the processes which help to obtain safe food.

3. A food chemist is knowledgable in toxicology and nutrition

There are no chemicals, which do not exert a certain effect in the human body ! And again, every effect, in a certain intensity in certain organs may be positive, in other concentrations and in other organs it can be destructive or at least not beneficial at all. The intensity of the effects usually depends on the dose of the agent. Toxicological science teaches us to understand these processes and enables us to interpret and translate results of animal and in vitro experiments for their meaning for humans. The dialogue between food chemists and toxicologists is of utmost importance. The interpretation of toxicological knowledge on chronic and acute effects of certain compounds as to their importance in the nutrition of man is very often complex and involves the sciences of both disciplines. A sound knowledge of nutritional science prevents for instance the banning of very important food constituents because of misinterpreted toxicological experiments. On the other hand, nutritional science will suggest to be prudent in recommending the consumption of compounds which seem to be beneficial in animal experiments. Very often, if not always, it is the food chemist who can efficiently amalgamate the information of toxicology and nutritional sciences in order to pass an informed opinion.

4. A food chemist is knowledgeable in microbiology

Whithout any doubt, most negative health effects for which food is made responsible can be traced back to microbiological spoilage of food. The knowledge of the behaviour and living conditions of microorganisms is a basic requirement for the production and control of safe food. The microbiologist is the closest partner of the food chemist in all questions concerning food safety.

5. The food chemist is knowledgeable in analytical chemistry and statistics

Chemical and analysis of food leads to results giving information on concentrations of food constituents, based on which the food chemist may take decisions and implement measures. Very often analytical chemistry gives the answer to the question whether the food is safe, complies with the law or internal guidelines of a food processor. However, in order to take the right decisions, the food chemist must know about the uncertainties of analytical measurements. Detailed knowledge of the precision of the whole analytical system, starting from sampling and ending perhaps with the calibration of the employed measuring instruments will help to take the right measures and decisions. Wrong decisions may lead to the destruction of perfectly safe food or, worse, the consumption of unsafe food.

6. A food chemist is knowledgeable in the legislative mechanisms

The legislators have the job to define the safety of food. They obtain their information mainly from the various mentioned specialists : toxicologists and nutritionists inform about exposure to and action of compounds, microbiologists about the occurence and effect of microorganisms and the analysts give information about occurence and concentration of compounds of all kinds, which in turn again form the objects of further toxicological research. Quite clearly, this is where the food chemist plays a decisive role as an integration figure. It is up to the food chemist to collect all these informations and synthesise them into such a context as to enable legislative action. The food chemist has the knowledge to translate this information into a message, which has food safety and health in its centre and enables the legislator to form an opinion which is free of economical and trade interests. The food chemist has the ability and knowledge to prepare legislators for the decision to set for instance a legal limit for a toxin. The central question, whether the risk for the population should be one case per million and year, or ten cases per million a year can only be answered with the help of an informed dialogue between the politician and the food chemist. And only the food chemist is able to estimate the consequences of such a decision ; whether it is at all possible to implement it, or whether there are certain risks, which one has to live with. He is also in a position to inform the politician on the economical and trade political consequences of such decisions.

The final half year of the studies

It is the opinion of the Food Chemistry Division, that after this four year basic course, a diploma or MSc degree should be obtained by carrying out a research project, lasting ca. 6 months. The research project should be in one of the special fields and disciplines, studied in the second half of the curriculum.

The overall curriculum is summarised as follows :

- **Two years organic and inorganic chemistry**
- **Two years lectures and practical courses in**
  - food chemistry, biochemistry,

analytical chemistry, sensory analysis...
- food microbiology
- food toxicology
- nutrition
- food technology
- food legislation

• **MSc thesis** in one of the above fields (6 months)

Perspectives

The Food Chemistry Division of FECS is convinced, that the uniform education of food chemists across Europe and beyond along the curriculum outlined in this paper will greatly help to increase the reliability of food safety measures implemented all over Europe. It will enable legislators to harmonise food legislation much quicker than before and it will also help the food law enforcement agencies across Europe to reach a common standard and a comparable level of expertise. All these are requirements for a smooth implementation of the GATT/WTO agreements, resulting in free trade and safe food on an international level. The time for individual solutions for every university is over. The free movement of goods and people is a prerequisite for the further growth of the economy. The international investments will only be encouraged if the right people maybe employed in or sent to the right place where they are needed. A common curriculum in food chemistry will help this greatly.

Literature

Ruiter A., Thier H.-P., Recommendations for higher education in food chemistry, Z. *Lebensm Unters Forsch A*, **1997,** *204*, F3-F6.