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Chemicals in the Food Industry

Toxicological Concerns and Safe Use

 Springer

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To my Mother

You have always been able to transmit to me all the moral and human values that you believe in: justice, perseverance, rigor, self-giving, love. You have always passed our happiness before yours; your courage in difficult times is exemplary.

To my Wife

I draw on your trust and your love my daily motivation; thank you for allowing me to build this wonderful path by your side and all the proofs of affection that you carry me daily.

In memory of my Father

Prof. Rachid Chaib

Preface

Chemicals are essential for the production of a large number of industrial goods. Many industrial sectors use chemicals (cleaning, degreasing, paints, inks, adhesives, foods, photocopiers, cleaning products, etc.). These substances gradually invade the environment and many aspects of our life. It is through these products that millions of people can produce and consume goods necessary for life. Unfortunately, raising concerns about their effects on health and the environment are emerged. Poorly used, without basic or special precautions, many of these chemicals can become dangerous and sometimes cause great accidents and serious diseases. More than 33 % of employees in the general industry, including food and beverage articles, are exposed to at least one chemical product during their work. Rejected into nature without precautions or treatments, chemicals pollute the environment and break the natural balance for the development of life on earth, in water and air.

Some of these substances can have significant adverse effects on the environment and health, even at low doses. Other products also raise concerns because of their persistence in environments, difficulty of measuring them, and the lack of knowledge of their environmental and health impacts on a long-term scale. They can also be emitted as dust, gas, vapors, and their presence can then be unsuspected resulting in more serious injuries and/or material damages. It should also be noted that occupational cancers cause a mortality rate higher than that caused by occupational accidents: The multiplication of used chemicals and the complexity of industrial processes therefore really require increased vigilance regarding the carcinogenic risk they induce. Food industries are not an exception. Cancer is now the leading cause of death in industrialized countries. Respiratory cancers are the most frequent occupational cancers: Cancers attributable to asbestos, benzene, ionising radiations, and wood dust alone account for nearly 90% of work-related cancers. However, these diseases often take several decades to develop after exposure; their link with work is therefore not always easy to establish. Employers and workers must be able to protect themselves from carcinogens. In this respect, chemicals play a central role in health and safety at work. Therefore, the consideration of health issues at work can be an opportunity to change the medium-term performance of all

areas of industries; on the other hand, failure to take these issues into account may penalize companies in future years.

Since 1930s, the global chemical production has increased by a factor of 400. Of the 100,000 chemical substances in the European Union, 30,000 are produced at more than one ton per year. However, less than 3000 products have been thoroughly analyzed for their dangerousness when speaking of toxicity and ecotoxicity. One of the main reasons has been the entry of chemistry into food and beverage production activities.

With the increasing complexity of the industrial enterprise, the constant presence of chemicals, and the rapid evolution of little and medium companies into large enterprises, risk assessment becomes a critical and strategic response when speaking of health and safety. The same thing can be surely affirmed when speaking of industries producing or manipulating foods, beverages, and related intermediates, because chemicals can be:

- (a) Additives and/or
- (b) Components of food-contact materials and objects
- (c) Agents for non-food production such as sanitizers and cleaning substances (and consequently unavoidable in a safe food production environment), and/or
- (d) Compounds used for analytical determinations into laboratories annexed to food plants.

On the one hand, qualified workforce has to be maintained; on the other hand, *'no one should lose his life trying to win it'*. Now, awareness of health and safety issues at work is increasing throughout society as work-related accidents and occupational diseases have a huge impact on workers' health and economic and social benefits. Companies have gradually come to consider these concerns within their organization, and this consciousness has become evident in food environments. It is therefore essential that young managers, future employees, and managers master safety regulations: Safety is a priority of industrial activities. It is a positive cultural element that allows other improvements in the business. A management which cannot manage the safety and health of its workers is not able to manage other functions.

In our experience, health and safety at work does not mean much for some employers, employees, and their representatives. Moreover, with the evolution of the work, even its risks, it becomes more and more insufficient to establish general safety rules, relying solely on compliance with the posters of standards and regulations. It is mandatory to gradually bring companies to consider these concerns within their organization. As a result, susceptibility to health and safety issues at work is increasing throughout the society.

This book is intended for 'Licence–Master–Doctorate' (LMD) students from all sectors, especially those with a predominantly industrial background and, more particularly, students specializing in food hygiene, public safety, and environment. In fact, future graduates and masters will have in their practice within the company to have incorporated good notions in various topics. In this ambit, the food and beverage production is specially considered.

The danger of a chemical product is an intrinsic property of compounds. No direct action can therefore modify this property without changing the nature of the product. Exposure to the product is the set of handling conditions for this product that may cause a target's exposure to the adverse effects of that product. By an action on the modalities of this exposure, it is possible to avoid or mitigate it and thus to act on the probability of an incident or an accident.

As a result, it has become essential to give all future executives a true 'security' spirit that will enable them to plan and act very effectively within our companies.

The role of the professional in industrial hygiene and safety is the recognition and evaluation of the industrial environment when it is compared with the need to control a dangerous exposure. The work of industrial hygiene and safety professionals involves four main functions. These functions are:

- (1) Recognition of potential hazards in the work environment
- (2) Measurement of the work environment with the aim of estimating the presence of a hazard and the subsequent evaluation of measures taken to determine whether a hazard exists
- (3) Identification and recommendation of controls that can be implemented
- (4) Elimination or reduction of exposure to hazards for the worker
- (5) Anticipation/prevention of potential hazards, if possible.

The number and variety of chemicals present in different industries and in laboratories continue to increase. Dangers of these products are not always well known, even by specialists. Irritant, toxic, flammable, carcinogenic, reprotoxic, etc., they must be handled with precaution, so that staff, researchers, doctors, technicians, teachers, and students can work safely for their activity and their health in the best possible conditions of hygiene and safety. Also, chemicals are part of our daily lives. Unfortunately, the use and manufacturing of these synthetic chemicals are causing a growing number of health problems in humans. Finally, let us not forget that the field of health and safety at work is continuously evolving.

Unfortunately, users of chemical products often underestimate their ignorance of the dangerousness of these products and related exposure risks. Health consequences are highly variable, ranging from temporary disability to death to incapacity to work or disability. They can be sudden (burns, asphyxiation), brutal (acute intoxication, fire, explosion), or take shape of illness or chronic intoxication. They can occur gradually or appear several years after exposure.

Health and safety at work must be a value we share.

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