

# Chapter: 14

## PERSPECTIVES ON FOOD PACKAGING AND HEALTH

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## **ABSTRACT**

*Contemporary food packaging is composed of a wide range of synthetic and manmade materials. Ceramics, glass, metal, paper, cardboard, paperboard, wax, wood, and – increasingly – plastics are some of these materials. Although a wide range of materials are utilized, it's interesting to note that glass and rigid plastics are closely followed by paper and paperboard as the most popular options for food packaging. In today's packaging environment, these materials are essential to the preservation, protection, and display of our food goods. This chapter's goal is to examine the effects of food packaging and how it relates to the human health system.*

## **1. INTRODUCTION**

The societal significance of food packaging is profound, primarily driven by its indispensable role in preserving and safeguarding food, enhancing its portability, and providing vital information to consumers. Beyond its utilitarian functions, food packaging occupies a pivotal position in the realm of marketing, contributing substantially to economic activities. It is imperative to recognize the expansive scope of food contact articles, encompassing not only packaging materials but also incorporating storage containers, processing equipment, and filling lines. These components stand as integral elements within food production and the broader food supply chain. Typically fashioned from diverse food contact materials, these articles feature a complex composition of food contact chemicals, underscoring their critical importance in maintaining the safety and integrity of the food products we rely on daily [1]. However, it is imperative to recognize that these food contact chemicals have the potential to migrate from diverse types of food contact materials and articles into the packaged food itself, subsequently becoming part of our dietary intake and it has significant implications for human health. An examination of Food Contact Chemical (FCC) lists issued by legislatures, industry bodies, and non-governmental organizations (NGOs) across the globe reveals that there are approximately 12,000 unique chemicals that potentially find application in the production of food contact materials and articles [2].

In this context, highlighting the imperative nature of shedding light on pivotal concerns emanating from scientific investigations, it is crucial to underscore that food contact materials and articles serve as a significant avenue for exposure to a myriad of well-established hazardous substances. Moreover, this exposure pathway encompasses a multitude of chemicals that lack comprehensive toxicological characterization, encompassing both those deliberately integrated into food contact materials and those inadvertently introduced. It is essential to bring attention to the fact that scientific research has unveiled critical issues surrounding the safety of food contact materials, emphasizing their role as conduits for exposure to various known harmful substances.

This exposure pathway extends beyond substances with established toxicological profiles to include a diverse array of chemicals, some intentionally designed for use in these materials and others introduced unintentionally. Recognizing and addressing these concerns is paramount for ensuring the safety and well-being of consumers in the realm of food safety. These concerns emphasize the need for rigorous scrutiny, comprehensive risk assessment, and continuous monitoring to ensure the safety of our food supply and, consequently, the well-being of consumers.

## **2. IMPACT OF FOOD PACKAGING ON HEALTH**

Food packaging plays a significant and multifaceted role in determining the health outcomes of consumers. One of its most fundamental functions is to protect food from contamination and spoilage, which is crucial in preventing foodborne illnesses. Packaging acts as a barrier between the external environment and the food product, safeguarding it from physical damage, pathogens, and harmful microorganisms [3]. This protective role directly contributes to the overall health and safety of consumers by reducing the risk of consuming contaminated or spoiled food items. Additionally, some technologies and materials used in food packaging are made to prolong the shelf life of food, which lowers food waste and makes sure that consumers have access to wholesome food options for longer. But the connection between food packaging and health goes beyond just safety; it also includes possible health hazards from chemicals that could seep into food from packaging materials. To guarantee consumer safety, this issue needs to be carefully considered and regulated.

### **2.1 Chemical Migration**

**Food Contact Materials and Their Potential Hazards:** Food packaging materials, including plastics, coatings, and adhesives, can sometimes release or leach chemicals into the food they come into contact with. These chemicals may include plasticizers, antioxidants, colorants, and other additives. Some of these substances have been linked to health concerns, such as endocrine disruption or carcinogenicity. For example, phthalates and bisphenol A (BPA) are known to migrate from certain plastics into food, and they have raised concerns due to their potential health risks. Regulatory agencies and researchers continually assess the safety of these materials and chemicals, taking into account exposure levels, toxicity, and potential health effects.

**Regulatory Measures and Safety Standards:** All across the world, safety standards and regulatory procedures are in place to reduce the risks related to chemical migration. Certain chemicals are only allowed to be used in materials that come into contact with food under the strict guidelines set by government organizations like the

EFSA in Europe and the FDA in the United States. These limits are designed to ensure that exposure levels are below established safety thresholds. Additionally, industry standards and guidelines, such as those set by the Food Packaging Forum or the Plastics Regulation in the European Union, contribute to safer food packaging practices. These measures are aimed at safeguarding consumer health by reducing the likelihood of harmful chemicals migrating into food.

## **2.2 Foodborne Illnesses**

Food packaging is a critical barrier between the external environment and the food product. It serves as a protective shield, preventing physical contamination, exposure to pathogens, and other harmful microorganisms that can lead to foodborne illnesses. During storage and transit, microbial growth is inhibited and food cleanliness is preserved with the use of well-designed and sealed packaging materials. Even while packaging serves as a barrier, there have been cases where elements connected to packaging have exacerbated foodborne infections. Such cases mostly result from packaging defects or improper handling during food production, distribution, or storage. For example, packaging that is damaged, compromised, or improperly sealed can allow pathogens to enter the food. In some instances, packaging materials themselves may introduce contaminants if they are not appropriately tested and approved for food contact. Studying such case studies is essential for identifying weaknesses in food packaging systems, improving industry practices, and developing more robust packaging solutions that minimize the risk of packaging-related foodborne outbreaks. It underscores the importance of continuous monitoring, adherence to quality control standards, and rigorous food safety protocols throughout the supply chain.

In continuation, food product use often leads to a significant volume of packaging waste, a considerable portion of which escapes formal collection and recycling systems, contributing to environmental pollution. This critical issue underscores the urgent need for innovations in packaging that not only minimize food loss and waste but also optimize material usage. The integration of active, intelligent, and sustainable packaging solutions represents a promising avenue for addressing these challenges. One facet of innovation involves active packaging, incorporating substances that interact with the internal environment to extend the shelf life of products and reduce food waste. Intelligent packaging, leveraging technology for real-time monitoring of food conditions, enhances both safety and consumer awareness, helping make informed choices. The emphasis on sustainability in packaging innovation includes eco-friendly materials, recyclability, and minimalist designs, aligning with global efforts to achieve the Sustainable Development Goals by 2030. As the packaging

industry evolves, addressing the challenges posed by conventional materials, particularly single-use plastics, becomes paramount. Shifting towards sustainable alternatives and adopting circular economy principles can significantly contribute to mitigating environmental impact. Additionally, innovative packaging should not only prioritize functionality but also consider the social implications of consumer choices, resonating with the values of sustainability-conscious individuals. By embracing these innovations, the packaging sector can play a pivotal role in achieving a balanced approach that considers economic, environmental, and social dimensions.

### **3. HEALTH IMPLICATIONS AND CHALLENGES OF FOOD PACKAGING**

Developing comprehensive solutions to enhance the safety of food contact chemicals and effectively address the principles of a circular economy necessitates a foundation rooted in current scientific understanding. The current methodologies employed for the safety assessment of food contact chemicals are proving inadequate in safeguarding human health. Simultaneously, our society is fervently pursuing waste reduction strategies, with a particular emphasis on reevaluating the role of food packaging. This has led to the development of initiatives geared towards promoting reuse, recycling, and the exploration of alternative, non-plastic materials in packaging design. Nevertheless, amidst this transformative shift, a crucial facet often remains overlooked: the safety of chemicals used in food contact materials and articles. This oversight is unsustainable and must be rectified. A holistic approach is imperative, one that engages the expertise and perspectives of all relevant stakeholders and experts in the field. It is within this context that we present an overarching view of the areas of concern and associated endeavors that are poised to enhance the safety of food contact articles while simultaneously championing the principles of a circular economy.

While food packaging serves a vital role in preserving food safety, it is not without its challenges and potential health implications. Chemical migration is one of the most critical concerns. Some packaging materials, particularly plastics, can release harmful substances into the food under certain conditions, such as high temperatures or prolonged storage. These chemicals may include phthalates, bisphenol A (BPA), and other potentially hazardous compounds, which can have adverse health effects when ingested. Regulatory agencies worldwide have set limits and safety standards for these substances in food contact materials to mitigate these risks. However, ensuring compliance and monitoring for emerging hazards remains an ongoing challenge. Additionally, the environmental impact of food packaging, especially when non-biodegradable materials are used, indirectly affects public health through pollution and resource depletion. As such, the relationship between food packaging and health

involves a delicate balance between protection, convenience, and the potential risks posed by certain packaging materials and chemicals, necessitating continuous research, innovation, and regulatory oversight to ensure consumer well-being [2,4]. The Disease Biophysics Group's latest innovation, an antimicrobial and biodegradable food packaging system, represents their ongoing commitment to advancing sustainability within our food supply chain [5]. This initiative builds upon the group's previous endeavors aimed at enhancing the sustainability of our food production and distribution systems.

#### 4. CONCLUSION

In conclusion, this chapter underscores the pivotal role of food packaging in contemporary society, serving as a linchpin for preserving food safety, enhancing transportability, and communicating critical information to consumers. While food packaging plays a crucial role in safeguarding the food supply and preventing foodborne illnesses, it also raises concerns related to chemical migration. Bridging the gap between scientific research, regulatory measures, and public awareness is essential in achieving both food safety and environmental sustainability. As we pursue sustainable packaging solutions and reduce waste, we must maintain a holistic perspective, ensuring the safety of materials and chemicals used in food packaging. The future of food packaging and its impact on health relies on continuous research, innovation, and a collective commitment to balancing human well-being and ecological responsibility, as discussed in this work.

#### REFERENCES

1. Biedermann M, Grob K (2010) Is recycled newspaper suitable for food contact materials? Technical grade mineral oils from printing inks. *Eur Food Res Technol* 230(5):785–796
2. Groh, K.J., Geueke, B., Martin, O., Maffini, M. and Muncke, J., 2021. Overview of intentionally used food contact chemicals and their hazards. *Environment International*, 150, p.106225.
3. Biedermann-Brem S, Biedermann M, Grob K (2016) Part A: required barrier efficiency of internal bags against the migration from recycled paperboard packaging into food: a benchmark. *Food Addit Contam* 33(4):725–740
4. Bradley EL, Stratton JS, Leak J, Lister L, Castle L (2013) Part B: printing ink compounds in foods: UK survey results. *Food Addit Contam* 6(2):73–83
5. Versino, F., Ortega, F., Monroy, Y., Rivero, S., López, O.V. and García, M.A., 2023. Sustainable and bio-based food packaging: a review on past and current design innovations. *Foods*, 12(5), p.1057.