


Chapter 1

Emerging Food Contaminants:

An Overview of the Growing Threat to Human Health

Vivek Pazhamalai

 <https://orcid.org/0000-0003-2088-7545>

*Department of Bio-Engineering,
School of Engineering, Vels Institute
of Science, Technology and Advanced
Studies (VISTAS), Chennai, India*

Amjath Ahamed W.


*Department of Bio-Engineering,
School of Engineering, Vels Institute
of Science, Technology and Advanced
Studies (VISTAS), Chennai, India*

Manideepa Govindarajan

 <https://orcid.org/0009-0007-7312-9875>

*Department of Bio-Engineering,
School of Engineering, Vels Institute
of Science, Technology and Advanced
Studies (VISTAS), Chennai, India*

Ivo Romauld S.

 <https://orcid.org/0000-0003-0610-0646>

*Department of Bio-Engineering,
School of Engineering, Vels Institute
of Science, Technology and Advanced
Studies (VISTAS), Chennai, India*

Meenambiga S. S.

 <https://orcid.org/0000-0002-5445-525X>

*Department of Bio-Engineering,
School of Engineering, Vels Institute
of Science, Technology and Advanced
Studies (VISTAS), Chennai, India*

G. Abirami

*Department of Biotechnology, School of
Life Sciences, Vels Institute of Science,
Technology and Advanced Studies
(VISTAS), Chennai, India*

ABSTRACT

Food safety has traditionally focused on visible contaminants like bacteria, pesticides, and heavy metals. However, as food systems evolve and the use of industrial chemicals increases, new, often invisible risks have emerged. These risks, which can be characterized as ghost molecules or emerging contaminants, that may be present in trace amounts, often undetectable by traditional food safety protocols,

DOI: 10.4018/979-8-3373-3982-5.ch001

yet potentially hazardous. Microplastics, PFAS and pharmaceutical residues are leading examples of such contaminants that have infiltrated the modern food supply. The implications of their presence in food ranging from endocrine disruption to carcinogenic effects are still being explored. With increasing consumer awareness and regulatory concerns, the need to address these invisible contaminants is more urgent than ever. This chapter focuses on source, occurrence, detection methods and toxicity of these emerging contaminants in the food chain.

1. INTRODUCTION

Emerging contaminants (ECs) represent a wide range of chemical substances that have recently become a focus of environmental concern. These pollutants, although increasingly detected in various ecosystems, are not yet comprehensively included in standard regulatory frameworks or environmental monitoring programs. ECs typically consist of compounds such as pharmaceuticals, components of personal care products, synthetic industrial chemicals, nanomaterials, and other newly developed substances associated with modern human activity. What distinguishes these contaminants from conventional pollutants is their resistance to degradation, ability to accumulate in living organisms, and potential to pose unknown or long-term health and ecological risks. Since many ECs are not efficiently removed by conventional wastewater treatment facilities, they often find their way into natural water bodies, sediments, and even the food web, leading to ongoing environmental exposure. These substances enter the environment through multiple pathways, including runoff from agricultural fields, effluents from industrial processes, household wastewater, leachate from solid waste disposal sites, and urban drainage systems. In many cases, these chemicals were not originally considered hazardous, which is why they were neither closely studied nor regulated until recent technological advances made their detection possible.

Urbanization, industrial development, and the widespread use of chemicals in agriculture and manufacturing are accelerating the release of ECs into the environment. For example, heavy metals such as arsenic are naturally present in the Earth's crust but have become more prevalent due to mining activities, use in agrochemicals, and industrial applications. Arsenic, a metalloid with significant industrial value, is used in the production of semiconductors, pesticides, paints, glass products, and even cosmetics. Despite its utility, arsenic is a known human carcinogen and toxicant. In its inorganic form, it is classified as a Group 1 carcinogen by the International Agency for Research on Cancer. Chronic exposure to arsenic can lead to serious health issues including cancer, neurotoxicity, and developmental problems (Singh, Yadav, Sharma, & Singh, 2023).

28 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/emerging-food-contaminants/389905

Related Content

Project Approach in the Process of Reforming the Water Management System of Ukraine

Nadiia Frolenkova, Anatoliy Rokochinskiy and Vasyl Stashuk (2025). *Balancing Water-Energy-Food Security in the Era of Environmental Change* (pp. 83-110). www.irma-international.org/chapter/project-approach-in-the-process-of-reforming-the-water-management-system-of-ukraine/362225

Sustainable Water Management for Integrating Solutions in Urban and Agricultural Spaces: Balancing Water Needs for Urban and Agricultural Solutions

Wiktor Halecki (2025). *Balancing Water-Energy-Food Security in the Era of Environmental Change* (pp. 147-168). www.irma-international.org/chapter/sustainable-water-management-for-integrating-solutions-in-urban-and-agricultural-spaces/362227

Transformative Biopsychosocial Interactions of Yoga and Augmenting Health Behaviors and Extenuating Depression

Bhupinder Singh, Hind Hammouchand Saurabh Chandra (2025). *Impact of Yoga and Proper Diet on Cardiopulmonary Function* (pp. 161-186). www.irma-international.org/chapter/transformative-biopsychosocial-interactions-of-yoga-and-augmenting-health-behaviors-and-extenuating-depression/366558

Phytochemistry and Ethanopharmacology of *Illicium verum* (Staranise)

Priyanka Singh, Neha Mishra and Ena Gupta (2020). *Ethnopharmacological Investigation of Indian Spices* (pp. 93-105). www.irma-international.org/chapter/phytochemistry-and-ethanopharmacology-of-illicium-verum-staranise/252450

Farm Security for Food Security: Dealing with Farm theft in the Caribbean Region

Wendy-Ann Isaac, Wayne Ganpat and Michael Joseph (2021). *Research Anthology on Food Waste Reduction and Alternative Diets for Food and Nutrition Security* (pp. 972-991). www.irma-international.org/chapter/farm-security-for-food-security/268181