


Chapter 21


Food and Supplement Safety Using Data Science and ML Ensuring Quality and Compliance

Pawan Whig

 <https://orcid.org/0000-0003-1863-1591>

VIPS, India

Balaji Dhamodharan

 <https://orcid.org/0009-0009-0728-7757>


Independent Researcher, USA

Vijaya Lakshmi Pavani Molli

 <https://orcid.org/0000-0002-7166-3480>

Independent Researcher, USA

Pushan Kumar Dutta

 <https://orcid.org/0000-0002-4765-3864>

Amity University, Kolkata, India

ABSTRACT

Data science is playing a crucial role in enhancing food and supplement safety, ensuring that products meet regulatory standards and are safe for consumption. This chapter explores the application of data science techniques in monitoring and ensuring the safety and quality of food and dietary supplements. The authors examine the methodologies used for data collection, analysis, and predictive modeling to detect contaminants, adulteration, and compliance with safety regulations. The chapter also covers the integration of big data sources, such as laboratory results,

DOI: 10.4018/979-8-3693-5528-2.ch021

consumer feedback, and supply chain data, to provide comprehensive safety assessments. Case studies and real-world applications illustrate how data science can preemptively identify potential safety issues and improve regulatory compliance. This chapter aims to provide a detailed understanding of how leveraging data science can enhance food and supplement safety, thereby protecting public health.

1. INTRODUCTION TO FOOD AND SUPPLEMENT SAFETY

Ensuring the safety of food and dietary supplements is a critical public health concern. Food safety involves the handling, preparation, and storage of food in ways that prevent foodborne illness and contamination. Supplement safety encompasses the purity, quality, and accurate labeling of dietary supplements to avoid harmful ingredients and ensure they deliver their intended health benefits.

Food and supplement safety is regulated by various national and international bodies, such as the Food and Drug Administration (FDA) in the United States and the European Food Safety Authority (EFSA) in Europe. These regulatory agencies establish guidelines and standards to protect consumers from hazards related to food and supplements, such as microbial contamination, chemical toxins, and nutritional deficiencies or excesses.

Importance of Data Science in Safety Management

Data science is revolutionizing food and supplement safety by providing advanced tools and methodologies for collecting, analyzing, and interpreting vast amounts of data. The integration of data science into safety management practices offers numerous benefits, including:

- **Enhanced Detection of Contaminants and Adulterants:** Data science techniques, such as machine learning and predictive analytics, can identify patterns and anomalies in data that may indicate the presence of contaminants or adulterants in food and supplements.
- **Improved Quality Control:** By analyzing production data, data science helps ensure that food and supplements meet quality standards throughout the manufacturing process.
- **Regulatory Compliance:** Data science tools can streamline the process of ensuring compliance with safety regulations, reducing the risk of non-compliance and associated penalties.

23 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/food-and-supplement-safety-using-data-science-and-ml-ensuring-quality-and-compliance/353808

Related Content

Functional Products for Specialized Nutrition of People Leading an Active Lifestyle

Venelin Terziev, Teodora Petrova and Marin Georgiev (2025). *Evaluating the Effectiveness of Functional Ingredients in Sports Nutrition* (pp. 343-372).

www.irma-international.org/chapter/functional-products-for-specialized-nutrition-of-people-leading-an-active-lifestyle/376436

The Power of Micro-Yoga in the Workplace

Himel Mondal, Shaikat Mondal, Chayan Baidya and Ayesha Juhi (2025). *Impact of Yoga and Proper Diet on Cardiopulmonary Function* (pp. 33-68).

www.irma-international.org/chapter/the-power-of-micro-yoga-in-the-workplace/366555

New Approaches to Agricultural Production Management in the Arctic: Organic Farming and Food Security

Mykhailo Guz (2021). *Research Anthology on Food Waste Reduction and Alternative Diets for Food and Nutrition Security* (pp. 903-925).

www.irma-international.org/chapter/new-approaches-to-agricultural-production-management-in-the-arctic/268178

Female Athletes and Energy Requirements

Shatakshia and Priya Mishra (2025). *Examining Physiology, Nutrition, and Body Composition in Sports Science* (pp. 217-236).

www.irma-international.org/chapter/female-athletes-and-energy-requirements/359167

Food Grade Microorganisms for Nutraceutical Production for Industrial Applications

Hemansi, Raj Kamal Vibhuti, Rishikesh Shukla, Rishi Gupta and Jitendra Kumar Saini (2018). *Nutraceuticals and Innovative Food Products for Healthy Living and Preventive Care* (pp. 342-367).

www.irma-international.org/chapter/food-grade-microorganisms-for-nutraceutical-production-for-industrial-applications/191465