

9th INTERNATIONAL EURASIAN CONFERENCE ON

BIOLOGICAL AND CHEMICAL SCIENCES

19 - 21 October 2026

Ankara / Türkiye

(EurasianBioChem2026)

www.eurasianbiochem.org

PROCEEDING BOOK

(Abstracts and Full-Texts)

EurasianBioChem

ISBN : 978-605-72134-8-8

9th International Eurasian Conference on Biological and Chemical Sciences (EurasianBioChem 2026)

October 19-21, 2026
Ankara, Turkey
www.EurasianBioChem.org

PROCEEDING BOOK

(Abstracts and Full-Texts)

Editor

Prof. Dr. Muhittin DOĞAN

Copyright © 2026

ISBN: 978-605-72134-8-8

Publication Date: October 2026

Organized by

Avrasya Araştırma Geliştirme Bilim ve Teknoloji Merkezi

All rights reserved. The right to publish this book belongs to EurasianBioChem 2026. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without permission. This Proceeding Book has been published as an electronic publication (e-book). Citation can not be shown without the source, reproduced in any way without permission.

Authors are responsible for the contents of their abstracts and full-text papers.

Conference Web Page: www.eurasianbiochem.org
E-mail: info@eurasianbiochem.org

CHAIRMAN OF CONFERENCE

Prof. Dr. Muhittin DOĞAN	Gaziantep University, Turkey

ORGANIZING COMMITTEE

Prof. Dr. Ali Tuncay Özyılmaz	Hatay Mustafa Kemal University, Türkiye
Prof. Dr. Ayten Namlı	Ankara University, Türkiye
Prof. Dr. Erol Atay	Hatay Mustafa Kemal University, Türkiye
Prof. Dr. Gülşen Altuğ	Istanbul University, Türkiye
Prof. Dr. Hasan Küçükbay	İnönü University, Türkiye
Prof. Dr. Hüseyin Zengin	Gaziantep University, Türkiye
Prof. Dr. Maria Daglia	University of Naples Federico II, Italy
Prof. Dr. Miloudi Hlaibi	University of Hassan II Casablanca, Morocco
Prof. Dr. Mustafa Djamgoz	Imperial College London, United Kingdom
Prof. Dr. Mustafa Sevindik	Osmaniye Korkut Ata University, Türkiye
Prof. Dr. Nabeel Ahmad	Dev Bhoomi Uttarakhand University, India
Prof. Dr. Ravichandran Ramasamy	New York University, USA
Prof. Dr. Serap Derman	Yildiz Technical University, Türkiye
Prof. Dr. Serpil Kılıç	Isparta University of Applied Sciences, Türkiye
Prof. Dr. Soumia Kouadri Moustefai	Hassiba Benbouali University of Chlef, Algeria
Prof. Dr. Ümmühan Özdemir Özmen	Gazi University, Türkiye
Prof. Dr. Zeliha Selamoğlu	Niğde Ömer Halisdemir University, Türkiye
Assoc. Prof. Dr. Alevcan Kaplan	Dicle University, Türkiye
Assoc. Prof. Dr. Barkat Ullah	Islamia College Peshawar, Pakistan
Assoc. Prof. Dr. Demet Doğan	Gaziantep University, Türkiye
Assoc. Prof. Dr. Mustafa Pehlivan	Gaziantep University, Türkiye
Assoc. Prof. Dr. Rezarta Shkreli	ALDENT University, Albania
Assoc. Prof. Dr. S.D. Saraswathy	Bharathidasan University, India

INTERNATIONAL SCIENTIFIC COMMITTEE*

Prof. Dr. Adem Önal	Gaziosmanpasa University, Türkiye
Prof. Dr. Adil M. Allahverdiyev	Yıldız Technical University, Türkiye
Prof. Dr. Adnan Ayhancı	Eskişehir Osmangazi University, Türkiye
Prof. Dr. Ahmed Imtiaj	University of Rajshahi, Bangladesh
Prof. Dr. Ahmet Aksoy	Akdeniz University, Türkiye

Prof. Dr. Ahmet Asan	Trakya University, Türkiye
Prof. Dr. Ahmet Karadag	Bartın University, Türkiye
Prof. Dr. Aida Sahmurova	Okan University, Türkiye
Prof. Dr. Ali Bilgili	Ankara University, Türkiye
Prof. Dr. Alime Ebru Aydın	Hatay Mustafa Kemal University, Türkiye
Prof. Dr. Alpaslan Dayangaç	Osmaniye Korkut Ata University, Türkiye
Prof. Dr. Arife Alev Karagözler	Aydın Adnan Menderes University, Türkiye
Prof. Dr. Atila Yıldız	Ankara University, Türkiye
Prof. Dr. Aycan Tosunoğlu	Bursa Uludağ University, Türkiye
Prof. Dr. Aygül Küçükgülmez Yandım	Cukurova University, Türkiye
Prof. Dr. Aysel Güven	Başkent University, Türkiye
Prof. Dr. Ayşe Dilek Özşahin Kireçci	Bitlis Eren University, Türkiye
Prof. Dr. Ayşe Gül Mutlu	Mehmet Akif Ersoy University, Türkiye
Prof. Dr. Başak Hanedan	Atatürk University, Türkiye
Prof. Dr. Belgin Gözmen Sönmez	Mersin University, Türkiye
Prof. Dr. Belma Aslım	Gazi University, Türkiye
Prof. Dr. Berrin Duran	Eskisehir Osmangazi University, Türkiye
Prof. Dr. Bülent Kaya	Akdeniz University, Türkiye
Prof. Dr. Dilek Demirezen Yılmaz	Erciyes University, Türkiye
Prof. Dr. Ebru Aktan	Gazi University, Türkiye
Prof. Dr. Ebru Gül Aslan	Süleyman Demirel University, Türkiye
Prof. Dr. Ebru Gürel-Gürevin	İstanbul University, Türkiye
Prof. Dr. E. Sümer Aras	Ankara University, Türkiye
Prof. Dr. Elif Damla Arısan	Gebze Technical University, Türkiye
Prof. Dr. Elif Öztetik	Eskisehir Technical University, Türkiye
Prof. Dr. Elif Şahin Işgın	Dokuz Eylul University, Türkiye
Prof. Dr. Emin Sarıpınar	Erciyes University, Türkiye
Prof. Dr. Emine Arslan	Selçuk University, Türkiye
Prof. Dr. Emir Baki Denkbaş	Başkent University, Türkiye
Prof. Dr. Engin Tilkat	Batman University, Türkiye
Prof. Dr. Erdal Balcan	Celal Bayar University, Türkiye
Prof. Dr. Erdoğan Çiçek	Nevsehir Hacı Bektaş Veli University, Türkiye
Prof. Dr. Erol Akpınar	Bolu Abant Izzet Baysal University, Türkiye

Prof. Dr. F. Zehra Küçükbay	İnönü University, Türkiye
Prof. Dr. Fatma Jale Gülen	Yıldız Technical University, Türkiye
Prof. Dr. Fatih Yıldırım	Atatürk University, Türkiye
Prof. Dr. Fatma Ünal	Gazi University, Türkiye
Prof. Dr. Ferda Candan	Cumhuriyet University, Türkiye
Prof. Dr. Gamal Badr	Assiut University, Egypt
Prof. Dr. Gizem Dınler Doganay	Istanbul Technical University, Türkiye
Prof. Dr. Gönül Dönmez	Ankara University, Türkiye
Prof. Dr. Gül Özyılmaz	Hatay Mustafa Kemal University, Türkiye
Prof. Dr. Gülay Bayramoğlu	Gazi University, Türkiye
Prof. Dr. Gülay Özcengiz	Middle East Technical University, Türkiye
Prof. Dr. Gülay Zengin	Gaziantep University, Türkiye
Prof. Dr. Güldeniz Selmanoğlu	Hacettepe University, Türkiye
Prof. Dr. Gülsen Asman	Gazi University, Türkiye
Prof. Dr. Güray Uyar	Ankara Hacı Bayram Veli University, Türkiye
Prof. Dr. Handan Uysal	Atatürk University, Türkiye
Prof. Dr. Hasan Basri Ila	Cukurova University, Türkiye
Prof. Dr. Hasan Çabuk	Bülent Ecevit University, Türkiye
Prof. Dr. Hasan Hüseyin Doğan	Selçuk University, Türkiye
Prof. Dr. Hasan Küçükbay	İnönü University, Türkiye
Prof. Dr. Hayati Türkmen	Ege University, Türkiye
Prof. Dr. Hikmet Yeter Çoğun	Cukurova University, Türkiye
Prof. Dr. Hülya Ölçer Footıtt	Dumlupınar University, Türkiye
Prof. Dr. Hüseyin Güher	Trakya University, Türkiye
Prof. Dr. Ilgaz Akata	Ankara University, Türkiye
Prof. Dr. Işık Perçin Demirçelik	Hacettepe University, Türkiye
Prof. Dr. İbrahim Çağatay Karaaslan	Hacettepe University, Türkiye
Prof. Dr. İbrahim Örün	Aksaray University, Türkiye
Prof. Dr. İhsan Akyurt	Giresun University, Türkiye
Prof. Dr. İsmail Aydın	İstanbul University-Cerrahpaşa, Türkiye
Prof. Dr. Jitendra Panwar	Birla Institute of Technology & Science (BITS), India
Prof. Dr. Kadir Yurdakoç	Dokuz Eylül University,Türkiye
Prof. Dr. Kamil Koç	Celal Bayar University,Türkiye

Prof. Dr. Kemal Büyükgüzel	Zonguldak Bülent Ecevit University,Türkiye
Prof. Dr. Maria Daglia	University of Naples Federico II, Italy
Prof. Dr. M. Burcu Irmak Yazıcıoğlu	Istanbul Atlas University, Türkiye
Prof. Dr. Mehmet Gönen	Süleyman Demirel University, Türkiye
Prof. Dr. Mehtap Tekşen	Aksaray University, Türkiye
Prof. Dr. Mikail Akbulut	Erciyes University, Türkiye
Prof. Dr. Miloudi Hlaibi	University of Hassan II Casablanca, Morocco
Prof. Dr. Muhammet Gaffaroğlu	Ahi Evran University, Türkiye
Prof. Dr. Murat Çelik	Atatürk University, Türkiye
Prof. Dr. Mustafa Ateş	Ege University, Türkiye
Prof. Dr. Mustafa Boga	Nigde Omer Halisdemir University, Türkiye
Prof. Dr. Mustafa Djamgoz	Imperial College London, United Kingdom
Prof. Dr. Mustafa Özcan	Istanbul Technical University, Türkiye
Prof. Dr. Mustafa Türkmen	Giresun University, Türkiye
Prof. Dr. Nabeel Ahmad	Dev Bhoomi Uttarakhand University, India
Prof. Dr. Naime Funda Tay	Eskişehir Osmangazi University, Türkiye
Prof. Dr. Nazime Mercan Doğan	Pamukkale University, Türkiye
Prof. Dr. Nazlı Sarıkahya	Ege University, Türkiye
Prof. Dr. Nilgün Özpozan	Erciyes University, Türkiye
Prof. Dr. Noor Hasima Nagoor	University of Malaya, Malaysia
Prof. Dr. Numan Hoda	Akdeniz University, Türkiye
Prof. Dr. Nursel Pekel Bayramgil	Hacettepe University, Türkiye
Prof. Dr. Oktay Arslan	Balıkesir University, Türkiye
Prof. Dr. Osman Duman	Akdeniz University, Türkiye
Prof. Dr. Ömer Işıldak	Gaziosmanpasa University, Türkiye
Prof. Dr. Ömer Koz	Bursa Technical University, Türkiye
Prof. Dr. Ömür Baysal	Mugla Sıtkı Koçman University, Türkiye
Prof. Dr. Önder Yumrutaş	Adıyaman University, Türkiye
Prof. Dr. Özcan Yalçınkaya	Gazi University, Türkiye
Prof. Dr. Özlem Çetin Erdoğan	Trakya University, Türkiye
Prof. Dr. Özlem Özbek	Hitit University, Türkiye
Prof. Dr. Pınar Çamurlu	Akdeniz University, Türkiye
Prof. Dr. Ramazan Erenler	Gaziosmanpasa University, Türkiye

Prof. Dr. Ramazan Solmaz	Bingöl University, Türkiye
Prof. Dr. Ravichandran Ramasamy	New York University, USA
Prof. Dr. Remziye Deveci	Ege University, Türkiye
Prof. Dr. Rıdvan Şeşen	Dicle University, Türkiye
Prof. Dr. Pınar Şanlıbaba	Ankara University, Türkiye
Prof. Dr. Sadık Dıncer	Cukurova University, Türkiye
Prof. Dr. Saliha Alyar	Çankırı Karatekin University, Türkiye
Prof. Dr. Sait Aykut Aytaç	Hacettepe University, Türkiye
Prof. Dr. Salih Doğan	Erzincan University, Türkiye
Prof. Dr. Sema Işisağ Üçüncü	Ege University, Türkiye
Prof. Dr. Serap Yalçın Azarkan	Ahi Evran University, Türkiye
Prof. Dr. Serpil Yenisoy	Bolu Abant Izzet Baysal University, Türkiye
Prof. Dr. Sevda Kırbağ	Fırat University, Türkiye
Prof. Dr. Sevgi Sevsay	Erzincan Binali Yıldırım University, Türkiye
Prof. Dr. Sevil Toroglu	Kahramanmaras Sutcu Imam University, Türkiye
Prof. Dr. Sevim Akyüz	İstanbul Kültür University, Türkiye
Prof. Dr. Sibel Akar	Eskişehir Osmangazi University, Türkiye
Prof. Dr. Sinem Göktürk	Marmara University, Türkiye
Prof. Dr. Soumia Kouadrı Moustefaı	Hassiba Benbouali University of Chlef, Algeria
Prof. Dr. Süheyla Kırmızıgül	Ege University, Türkiye
Prof. Dr. Şenay Çetinus	Cumhuriyet University, Türkiye
Prof. Dr. Şengül Alpay Karaoğlu	Recep Tayyip Erdoğan University, Türkiye
Prof. Dr. Şule Baran	Sakarya University, Türkiye
Prof. Dr. Şükran Yıldız	Manisa Celal Bayar University, Türkiye
Prof. Dr. Talat Ozpozan	Erciyes University, Türkiye
Prof. Dr. Tamer Akar	Eskişehir Osmangazi University, Türkiye
Prof. Dr. Tülin Askun	Balıkesir University, Türkiye
Prof. Dr. Tülin Aydemir	Celal Bayar University, Türkiye
Prof. Dr. Ümmühan Özdemir Özmen	Gazi University, Türkiye
Prof. Dr. Yüksel Abalı	Celal Bayar University, Türkiye
Prof. Dr. William A. Coetzee	New York University, USA
Prof. Dr. Zehra Nur Yüksekdağ	Gazi University, Türkiye
Assoc. Prof. Dr. Abdulbari Shah	Al-Farabi Kazakh National University, Kazakhstan

Assoc. Prof. Dr. Adnan Aldemir	Van Yüzüncü Yıl University, Türkiye
Assoc. Prof. Dr. Ahmad Ali	University of Mumbai, India
Assoc. Prof. Dr. Altuğ Mert Sevim	Istanbul Technical University, Türkiye
Assoc. Prof. Dr. Banu Şebnem Önder	Hacettepe University, Türkiye
Assoc. Prof. Dr. Başar Uymaz Tezel	Çanakkale Onsekiz Mart University, Türkiye
Assoc. Prof. Dr. Cumali Çelik	Yalova University, Türkiye
Assoc. Prof. Dr. David Jenkins	University of Plymouth, United Kingdom
Assoc. Prof. Dr. Demet Doğan	Gaziantep University, Türkiye
Assoc. Prof. Dr. Demet Uzun	Gazi University, Türkiye
Assoc. Prof. Dr. İmran Uysal	Osmaniye Korkut Ata University, Türkiye
Assoc. Prof. Dr. Meghane Tare	Birla Institute of Technology & Science (BITS), India
Assoc. Prof. Dr. Mostafa Norızadehtazehkand	Islamic Azad University, Iran
Assoc. Prof. Dr. Nuh Korkmaz	Osmaniye Korkut Ata University, Türkiye
Assoc. Prof. Dr. Ouahida Bensebia	USTHB University, Algeria
Assoc. Prof. Dr. Özge Temiz	Osmaniye Korkut Ata University, Türkiye
Assoc. Prof. Dr. Rezarta Shkreli	ALDENT University, ALBANIA
Assoc. Prof. Dr. Róbert Gyepes	Charles University, Czech Republic
Assoc. Prof. Dr. S.D. Saraswathy	Bharathidasan University, India
Assoc. Prof. Dr. Salih Sönmezdağ	Muğla Sıtkı Koçman University, Türkiye
Assist. Prof. Dr. Celal Bal	Gaziantep University, Türkiye
Assist. Prof. Dr. Muhammad Nauman Khan	University of Chakwall, Pakistan
Assist. Prof. Dr. Samia Oueslati	Center of Biotechnology of Borj Cedria, Tunisia
Dr. Abdul Bari Shah	Korea University, South Korea
Dr. Ahmet İsmail Özkan	Artvin Coruh University, Türkiye
Dr. Aqeel Ahmad	University of Chinese Academy of Sciences, China
Dr. Chong Yee Ling	Universiti Malaysia Sarawak, Malaysia
Dr. Falah Saleh Mohammed	Zakho University, Iraq
Dr. Jana Sobotníková	Karlova University, Czech Republic
Dr. Majid Iqbal	University of Sun Yat-Sen, China
Dr. Nur Airina Muhammad	University of Malaya, Malaysia
Dr. Ryan Baidya	California Takshila University, USA
Dr. Ramin Ekhteiari Salmas	King's College London, United Kingdom
Dr. Sachiyo Aburatani	National Institute of Advanced Industrial Science and

	Technology, Japan
Dr. Sergey Shityakov	University Hospital Würzburg, Germany
Dr. Solomon Habtemariam	University of Greenwich, United Kingdom
Dr. Victorine Lorette Yimgang	University of Douala, Cameroon

* This list is arranged in alphabetical order.

ORAL PRESENTATION

A Conceptual Review of the Compliance-Cognition Disconnect in European Union Food Law and Consumer Safety Literacy

Luana Harizaj[1]*: https://orcid.org/0009-0009-9644-7432
Klodiola Dhamo[2]: https://orcid.org/0009-0004-6422-747
Rozana Troja[3]: https://orcid.org/0009-0009-2274-1823

Qiriazi University College, Higher Vocational College, Department of Food Technology and Tourism, Tirana, Albania [1]
Aldent University, Faculty of Medical and Technical Sciences, Tirana, Albania[2]
University of Tirana, Faculty of Natural Sciences, Department of Industrial Chemistry, Tirana, Albania[3]

Abstract

European Union (EU) food labeling frameworks assume that comprehensive ingredient disclosure empowers consumers. However, this review demonstrates that strict statutory compliance often undermines practical food safety literacy, creating a "compliance-cognition disconnect". By evaluating the intersection of EU mandates and consumer perception, this study highlights a critical paradox. The legally mandated use of biochemical nomenclature and E-numbers on back-of-pack ingredient panels often triggers chemophobia, leading consumers to misinterpret rigorously evaluated, microbiologically essential preservatives as toxicological threats. At the same time, ambiguous "clean label" and "natural" front-of-pack marketing claims creates a misleading "health halo". This heuristic leads consumers to blindly trust products that, having been stripped of functional synthetic preservatives, are significantly more susceptible to temperature abuse and pathogenic proliferation, effectively masking underlying cold-chain vulnerabilities. Ultimately, current European food labeling relies on the legal fiction that taxonomic transparency inherently ensures safety. To genuinely protect public health, regulatory frameworks must shift from mere statutory disclosure to functional food safety literacy, ensuring that mandatory information aligns with actual consumer comprehension.

Keywords: Food safety literacy, Chemophobia, Clean label trend, Regulatory compliance, Risk perception, Compliance-cognition disconnect

INTRODUCTION

European Union (EU) food law, specifically Regulation (EU) No 1169/2011, assumes that comprehensive ingredient disclosure empowers consumers (European Parliament and Council, 2011). While transparency is a cornerstone of modern legislation (Meiselles, 2021), these frameworks rely on the concept of an "average, reasonably well-informed" consumer (Gokani, 2024). In practice, there is a critical gap between the statutory disclosure of information by manufacturers and the public's actual cognitive comprehension. Providing technical data does not inherently translate into actionable food safety literacy (Balachandran, 2026). This disconnect is most evident regarding food biotechnology and additives. To meet safety standards, food business operators must utilize highly specific biochemical nomenclature or standardized regulatory codes on back-of-pack ingredient panels. While scientifically accurate, this technical language frequently induces "chemophobia", an irrational fear of safe, regulated chemicals, among consumers who lack formal food science education (Rollini, Falciola, & Tortorella, 2022). In contrast, front-of-pack marketing heavily utilizes unregulated terms like "clean label" and "natural," creating a "health halo effect" (Chen, Kayrala, Trapeau, Aoun, & Bordenave, 2022). Consumers frequently conflate these terms with guaranteed microbiological safety. This creates a dangerous paradox: buyers may reject a safely preserved product out of fear of a chemical name, while blindly trusting a "natural" product highly susceptible to microbial spoilage (Chen et al., 2022). While nutritional literacy is well-researched, functional food safety literacy remains significantly under-studied (De Salvo et al., 2026). Consumers often struggle to decode ingredient lists or differentiate between quality indicators ("best before") and true hazards ("use by"), representing a fundamental vulnerability (European Parliament and Council, 2011;

Meiselles, 2021). Therefore, this paper establishes a conceptual framework defining actionable food safety literacy, outlining theoretical parameters for future empirical assessments and advocating for a shift from passive disclosure to active risk communication.

MATERIALS AND METHODS

To construct the theoretical foundation for this study, a systematic conceptual review of the literature was conducted. The methodology followed the principles of purposeful sampling and thematic synthesis for qualitative and conceptual framework development (Patton, 2015). The primary objective was to identify and operationalize the cognitive and regulatory friction points where legally compliant food labels fail to communicate practical food safety to consumers, thereby establishing the variables for future empirical survey instruments. An extensive literature search was executed across major academic databases, including Scopus, Web of Science, and Google Scholar, targeting peer-reviewed journal articles published primarily between 2020 and 2026. To ensure a comprehensive capture of the interdisciplinary intersection between food law, behavioral psychology, and consumer literacy, a combination of targeted keyword queries and structured Boolean search strings was employed. The primary search parameters utilized were: "food labelling" AND ("informed consumer" OR "information overload"); "Regulation (EU) No 1169/2011" AND "consumer comprehension"; "chemophobia" AND "food additives" AND "risk perception"; ("clean label" OR "naturalness bias") AND "health halo effect"; and "consumer trust" AND "synthetic". These were supplemented by targeted standalone concepts, specifically: "food safety literacy", "food label literacy", and "E-numbers". Retrieved articles were imported into a reference management system and subjected to a two-stage screening process. Initial screening evaluated the abstracts for relevance to the core themes of European regulatory compliance, consumer misinterpretation of biochemical nomenclature, and psychometric measurements of safety literacy. Following established criteria for conceptual synthesis and literature categorization (Yin, 2018), the selected full-text articles were then grouped into three distinct analytical domains: (1) legal expectations versus actual consumer understanding, (2) the prevalence of chemophobia and marketing-induced confusion, and (3) the differentiation between general nutritional literacy and microbiological food safety literacy. This structured categorization allowed the distillation of abstract regulatory and psychological concepts into measurable variables.

RESULTS AND DISCUSSION

The thematic synthesis reveals a persistent operational gap between statutory compliance and actual consumer food safety literacy, driven by three friction points: the cognitive burden of biochemical nomenclature, the masking of microbiological risks via marketing heuristics, and the conflation of organoleptic quality with toxicological safety. Current EU frameworks prioritize legal traceability over accessible public health communication (Meiselles, 2021). Manufacturers must list specific biochemical terms for functional additives (Gokani, 2024), but this precision triggers profound chemophobia among lay consumers (Rollini et al., 2022). Instead of quantitative risk assessment, consumers rely on an affective heuristic, equating synthetic terminology directly with toxicological hazards (Moreira da Silva & Barroca, 2025). This dissonance is perfectly illustrated by "E-numbers", a statutory coding system designed to communicate regulatory safety, which the public paradoxically interprets as a marker of artificial risk (Haen, 2014). In contrast, "clean label" and "bio" front-of-pack marketing cues create a misleading "health halo" where consumers systematically equate "naturalness" with biological safety (Chen et al., 2022). However, removing synthetic preservatives to achieve a "clean label" often decreases a food matrix's thermodynamic and microbiological stability (Moreira da Silva & Barroca, 2025). The health halo masks underlying cold-chain vulnerabilities, rendering products more susceptible to pathogenic proliferation. Furthermore, there is a critical deficit in functional microbiological literacy compared to general nutritional awareness (De Salvo et al., 2026). While regulators focus on statutory conformity, a legally flawless label fails its public health function if the end-user cannot decode it. For example, consumers widely fail to differentiate between organoleptic degradation ("best before") and immediate microbiological hazards ("use by") (Balachandran, 2026). To systematically categorize these vulnerabilities, Table 1 outlines the theoretical variables of this compliance-cognition disconnect, establishing a structural framework for future measurement.

Table 1. The Compliance-Cognition Disconnect: Statutory Intent versus Consumer Perception

Labeling Element	Statutory / Technical Function	Dominant Cognitive Bias	Consequential Public Health Risk
Biochemical Nomenclature (e.g., Specific E-numbers, chemical names)	Traceability and transparent disclosure of functional preservation agents (European Parliament and Council, 2011).	**Chemophobia:** Heuristic equating synthetic terminology with toxicological hazard (Haen, 2014; Rollini et al., 2022).	Avoidance of microbiologically stabilized food matrices in favor of high-risk perishables (Moreira da Silva & Barroca, 2025).
Voluntary Marketing Claims (e.g., "Bio," "Natural," "Clean Label")	Indicator of agricultural origin or minimal processing; often lacks strict microbiological regulation (Gokani, 2024).	**Health Halo Effect:** Conflating "naturalness" with inherent biological safety and thermodynamic stability (Chen et al., 2022).	Underestimation of cold-chain requirements and susceptibility to microbial spoilage (Moreira da Silva & Barroca, 2025).
Durability Date Marking ("Use by" vs. "Best before")	Delineation between immediate pathogenic hazard ("Use by") and organoleptic decline ("Best before") (European Parliament and Council, 2011).	**Semantic Conflation:** Inability to differentiate between quality indicators and critical safety imperatives (De Salvo et al., 2026).	Exposure to exponential microbial proliferation (safety risk) or unwarranted food waste (economic risk) (Meiselles, 2021).

A fundamental tension also exists between the legal and chemical paradigms of consumer protection. Legal frameworks often define risk through chronic diseases, favoring simplified labeling to empower choices (Delhomme, 2021; Gokani, 2024). However, immediate food safety requires protection against acute pathogenic hazards. By validating consumer preferences for "naturalness," policy frameworks inadvertently encourage chemophobia, pushing consumers to reject the very antimicrobial agents needed to prevent acute microbial growth (Rollini et al., 2022). Additionally, the "consumer" is not a monolithic entity; cognitive vulnerabilities like the health halo or chemophobia are heavily influenced by socio-demographic factors and baseline scientific literacy (Delhomme, 2021). Treating the public uniformly obscures how complex nomenclature disproportionately disenfranchises those with lower educational access. Finally, the primary limitation of this study is its conceptual nature. These theoretically operationalized friction points remain untested hypotheses. Future primary psychometric data collection through targeted field surveys is necessary to quantify this disconnect and move from theoretical diagnosis to evidence-based intervention.

CONCLUSION

The current European food labeling paradigm relies on a legal fiction: that comprehensive biochemical disclosure inherently empowers consumers. This review demonstrates that statutory compliance frequently undermines actionable safety literacy. The mandatory use of complex nomenclature and “E-numbers” triggers

chemophobia, causing consumers to misinterpret essential preservatives as threats. Concurrently, "clean label" marketing creates a health halo that obscures genuine microbiological vulnerabilities, which is further compounded by the widespread inability to distinguish between quality decline ("best before") and pathogenic risk ("use by"). Crucially, the legal focus on mitigating chronic disease through simplified labeling conflicts with the biochemical necessity of preserving foods against acute pathogens. To protect public health, regulatory frameworks must evolve beyond passive data disclosure. The theoretical variables established here provide the psychometric foundation for future empirical surveys, aiming to align legal compliance with practical, science-based risk communication.

REFERENCES

Balachandran, G. (2026). Consumer food-safety literacy in sous-vide practices: From knowledge deficits to safety behaviour. *Natural Resources for Human Health*, 6(11s), 52–67. https://doi.org/10.53365/nrfhh.2089

Chen, A., Kayrala, N., Trapeau, M., Aoun, M., & Bordenave, N. (2022). The clean label trend: An ineffective heuristic that disserves both consumers and the food industry? *Comprehensive Reviews in Food Science and Food Safety*, 21(6), 4921–4938. https://doi.org/10.1111/1541-4337.13031

De Salvo, M., Cannella, S., Giuffrida, A., Ziino, G., Schiopu-Mariean, A., Nalbone, L., & Giarratana, F. (2026). Food safety knowledge, beliefs and myths: Results from an exploratory analysis. *International Journal of Gastronomy and Food Science*, 45, 101634. https://doi.org/10.1016/j.ijgfs.2026.101634

Delhomme, V. (2021). Front-of-pack nutrition labelling in the European Union: A behavioural, legal and political analysis. *European Journal of Risk Regulation*, 12(4), 825–848. https://doi.org/10.1017/err.2021.5

European Parliament and Council. (2011). Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers. *Official Journal of the European Union*, L 304.

Gokani, N. (2024). Healthier food choices: From consumer information to consumer empowerment in EU law. *Journal of Consumer Policy*, 47(2), 271–296. https://doi.org/10.1007/s10603-024-09563-0

Haen, D. (2014). The paradox of E-numbers: Ethical, aesthetic, and cultural concerns in the Dutch discourse on food additives. *Journal of Agricultural and Environmental Ethics*, 27(1), 27–42. https://doi.org/10.1007/s10806-013-9440-4

Meiselles, M. (2021). Food for thought – empowering consumers: A critique of EU food labelling law. *Irish Journal of European Law*, 23. Retrieved from https://derby-repository.worktribe.com/output/791483/food-for-thought-empowering-consumers-a-critique-of-eu-food-labelling-law

Moreira da Silva, A., & Barroca, M. J. (2025). Addressing chemophobia: Bridging misconceptions in food chemistry. *Applied Sciences*, 15(11), 6104. https://doi.org/10.3390/app15116104

Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). Thousand Oaks, California: SAGE Publications, Inc.

Rollini, R., Falciola, L., & Tortorella, S. (2022). Chemophobia: A systematic review. *Tetrahedron*, 113, 132758. https://doi.org/10.1016/j.tet.2022.132758

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Thousand Oaks, California: SAGE Publications.