

# Safeguarding Permissible and Wholesome Integrity: A Higher Objectives of Islamic Law and Forensic Framework Against Food and Beverage Adulteration

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## ABSTRACT

Food and beverage adulteration poses a dual threat to global supply chains by violating public safety regulations and compromising religious compliance for over two billion Muslim consumers. While current literature treats regulatory compliance and food chemistry in isolation, a major knowledge gap persists in integrating theological imperatives with empirical analytical forensic testing. This article addresses this gap by establishing an integrated legal-forensic framework anchored in the higher objectives of Islamic law. Using a qualitative jurisprudence-analytical design, this paper demonstrates how food fraud violates the preservation of religion, life, and wealth. By synthesizing classical Islamic trade ethics, specifically systemic purity, ethical trust, and prohibitions against commercial deception, with advanced forensic authentication tools (such as real-time quantitative polymerase chain reaction [qPCR] and headspace gas chromatography-flame ionization detection [HS-GC-FID]), this study outlines a multi-layered defense mechanism. The findings highlight that static paper audits are insufficient to counter modern Economically Motivated Adulteration (EMA), necessitating an integrated framework featuring digital supply-chain traceability, mandatory raw material DNA profiling, and strict adherence to modern standards such as the Malaysian Halal Management System (MHMS).

**Keywords:** Food Adulteration, Permissible and Wholesome, Higher Objectives of Islamic Law, Commercial Deception, Halal Authentication, Supply Chain Integrity.

## INTRODUCTION

### Context, Global Landscape, and Knowledge Gap

The contemporary food and beverage industry operates within a highly sophisticated, hyper-globalized, and technologically driven marketplace. While industrial advancements have optimized production efficiency and broadened global consumer choices, they have simultaneously increased supply chain vulnerability to food adulteration. Food adulteration, whether executed through economically motivated substitution, the dilution of premium matrices, or the chemical masking of inferior components, presents a growing threat to market integrity and public health worldwide (Spink & Moyer, 2011).

For the global permissible food sector, this issue extends beyond standard consumer protection regulations. It directly impacts the spiritual and physical well-being of more than two billion Muslim consumers. The architecture of Islamic dietary laws is fundamentally anchored in the dual scriptural mandate of consuming what is both legally permissible and pure, wholesome, safe, and clean. The Holy Qur'an explicitly commands:

"O mankind, eat from whatever is on earth [that is] lawful and good and do not follow the footsteps of Satan. Indeed, he is to you a clear enemy." (Surah Al-Baqarah, 2:168)

By tying lawfulness directly to wholesomeness and safety, Islamic law establishes that a consumable's legal permissibility is intrinsically linked to its structural purity, safety, and nutritional integrity (Permatasari et al., 2024). Adulteration directly violates this divine directive by forcing consumers to unknowingly ingest degraded, fraudulent, or contaminated products.

Despite extensive research on analytical detection techniques (e.g., DNA profiling, mass spectrometry) and separate legal inquiries into Islamic commercial law, existing literature exhibits a profound disconnect. Regulatory frameworks rely heavily on static, paper-based document audits that fail to detect sub-microscopic biological derivatives or sophisticated chemical masking. Conversely, analytical food science often operates without grounding in the legal-ethical imperatives of Islamic jurisprudence. There is a critical lack of an integrated theoretical-forensic model that translates classical legal maxims into actionable, real-time bio-analytical verification parameters across complex global supply chains.

### **Theoretical Foundations: Purity and Trust**

In Islamic jurisprudence, food consumption is not merely a biological necessity but an act of worship. The integrity of this system rests on two theoretical pillars, first is Systemic Purity. Classical jurists divide purity into freedom from ritual filth/unclean elements and the complete elimination of hazardous or toxic substances. In an industrial setting, a product cannot achieve true purity if its manufacturing process compromises physical, chemical, or biological safety (Al-Qaradawi, 2013). Second is Ethical Integrity and Trust, represents the socio-economic covenant between the producer and the end consumer, requiring complete transparency regarding ingredient origins, processing aids, and material specifications (Kamali, 2015).

When a food item is deliberately adulterated, both pillars crumble. The introduction of unlisted fillers or stabilizers violates systemic purity, while withholding product information breaches ethical trust.

### **Evidences Against Commercial Deception**

Islamic trade ethics enforce strict accountability to protect consumers from commercial deception and fraud. The Qur'an warns against deceptive practices:

"Woe to those who give less [than due], who when they take a measure from people take in full, but if they give by measure or by weight to them, they cause loss." (Surah al-Mutaffifin, 83:1–3)

Furthermore, the prophetic zero-tolerance policy regarding trade fraud was established in a foundational incident recorded in *Sahih Muslim* (Hadith No. 102). The Prophet Muhammad (ﷺ) passed by a stack of grain in the market of Medina, reached inside, and found wetness beneath the dry surface:

"The Messenger of Allah said: 'What is this, O owner of the food?' He replied: 'It was drenched by rain, O Messenger of Allah.' He remarked: 'Why did you not place the drenched part on top so that people could see it? Whoever deceives us is not of us.'"

This prophetic decree, "whoever deceives us is not of us," serves as the foundational legal cornerstone governing commercial trade in Islamic law (Al-Nawawi, 1972). It confirms that concealing product defects, manipulating weight, or substituting raw materials constitutes major commercial fraud, stripping the product of its permissible and wholesome status.

### **Research Objectives and Specific Contributions**

To bridge the identified literature gap, this study establishes a multi-disciplinary approach.

Primary Research Objectives:

- To formulate an integrated legal-forensic framework that connects classical Islamic jurisprudence with modern bio-analytical testing.

- To systematically map the Higher Objectives of Islamic Law directly to contemporary food safety, authenticity verification, consumer protection, and public health metrics.
- To evaluate the failure points of traditional paper-based auditing against Economically Motivated Adulteration (EMA) through empirical analytical case studies.

As for the Novel Contributions are as follow:

- Theoretical Contribution: Establishes a unified jurisprudential framework where chemical and biological adulterants are systematically classified by their legal status and Higher Objectives impact.
- Practical & Managerial Contribution: Provides regulatory bodies (e.g., JAKIM) and industry quality assurance managers with actionable analytical verification protocols (qPCR, HS-GC-FID) mapped directly to mandatory compliance parameters under modern Halal Assurance Systems.

## Problem Statement

Despite stringent regulatory frameworks established by global certification bodies, such as the Department of Islamic Development Malaysia (JAKIM), the modern permissible food supply chain remains vulnerable to systemic adulteration.

The primary challenges include:

1. Detection Gaps in Complex Matrices: Modern processing uses sub-microscopic biological derivatives (e.g., porcine-derived emulsifiers, non-permissible gelatin, transglutaminase) that cannot be identified through visual or sensory checks (Nakyinsige et al., 2012).
2. Economically Motivated Adulteration (EMA): Volatile commodity prices incentivize unscrupulous manufacturers to covertly stretch high-value permissible matrices with cheap, uncertified, or forbidden alternatives (Daher et al., 2025; Spink & Moyer, 2011).
3. Operational Cross-Contamination: Shared manufacturing facilities and logistics networks frequently lack validated sanitation standard operating procedures (SSOPs) and statutory ritual cleansing protocols, resulting in unintentional cross-contact (Demirci et al., 2016).
4. Regulatory and Analytical Lag: Traditional paper-based documentation audits are insufficient against sophisticated food fraud, requiring an integrated framework that bridges classical legal principles with real-time forensic analytics (Usman et al., 2024).

## METHODOLOGY

This study employs a multi-disciplinary, qualitative-analytical methodology combining classical Islamic legal jurisprudence with modern food science and regulatory auditing frameworks.

The methodological workflow comprises three primary phases:

1. Legal-Theoretical Synthesis: Critical exegesis of primary Islamic legal sources (Qur'an and prophetic traditions) and classical jurisprudence manuals (Al-Nawawi, Al-Qaradawi, Kamali) to establish the boundary parameters of permissible, wholesome, ritually impure, deceptive, and doubtful substances.
2. Objectives of Islamic Law Risk Mapping: Systematic classification of food adulteration modalities against essential human interests: the preservation of religion, the preservation of life, and the preservation of wealth.
3. Forensic Case Study Analysis: Qualitative evaluation of documented industry contamination events—specifically porcine DNA cross-contamination and trace ethanol solvent carry-overs in commercial food

and beverage matrices—to evaluate the efficacy of national regulatory responses and modern bio-analytical detection tools.

## FINDINGS AND DISCUSSION

### Technical Classifications of Adulteration and Jurisprudential Status

Food adulteration manifests across four primary technical categories, each carrying distinct legal rulings:

| Adulteration Type             | Technical Definition                                                                                       | Industry Example                                                                             | Legal Status & Jurisprudential Impact                                                                                                                         |
|-------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intentional (Deceptive / EMA) | Premeditated substitution or addition of inferior/cheaper components for financial gain.                   | Blending porcine lard into bovine fat; diluting pure honey with high-fructose corn syrup.    | Categorically Forbidden. Constitutes severe commercial fraud and unlawful wealth extraction. Nullifies permissible status completely.                         |
| Unintentional (Incidental)    | Accidental contamination resulting from operational failure, poor sanitation, or shared logistics.         | Carry-over residue on shared processing equipment; fluid leaks during transit.               | Doubtful to Forbidden. If contaminated with severe physical/ritual impurities, the batch is invalid until contained and subject to validated decontamination. |
| Chemical Adulteration         | Integration of unauthorized, toxic, or industrial chemical compounds to mask quality or extend shelf life. | Treating meat/seafood with formalin; using industrial dyes (Sudan Red) in spices.            | Strictly Prohibited. Violates the legal maxim " <i>There shall be no harm nor reciprocating harm</i> ". Strips product of its wholesome status.               |
| Biological Adulteration       | Micro-contamination by pathogens or hidden functional enzymes/binders of non-permissible origin.           | Using porcine transglutaminase ("meat glue"); hidden uncertified bovine gelatin texturizers. | Forbidden. Corrupts physical and ritual purity. Requires advanced real-time DNA or immunological testing to uncover trace presence.                           |

### Jurisprudential Impact Evaluation Criteria

The legal status of an adulterated matrix is evaluated through three Islamic legal parameters:

- **Source of the Adulterant:** If forensic testing confirms contamination derived from an absolute impurity (such as porcine DNA or canine derivatives), the entire batch becomes permanently forbidden. No legal concessions or dilution ratios are permissible.
- **Degree of Contamination:** Minor, low-level accidental exposure to non-porcine, uncertified materials flags the product as doubtful, requiring immediate quarantine and investigation.
- **Possibility of Chemical Transformation:** Transformation refers to the complete chemical conversion of a substance into a new compound with altered properties. In modern food processing, simple industrial dilution, chemical masking, or heat processing do not qualify as valid transformation. The presence of a forbidden element permanently corrupts the entire batch regardless of parts-per-million dilution.

### Systematic Mapping: Objectives of Islamic Law vs. Food Safety & Regulatory Requirements

To address the publisher's directive, the core imperatives of Islamic jurisprudence are systematically mapped against concrete food safety hazards, authenticity requirements, regulatory mechanisms, consumer protection mandates, and public health outcomes below:

| Higher Objective         | Primary Threat & Adulteration Hazard                                                                               | Specific Food Safety & Authenticity Requirement                                                       | Corresponding Regulatory & Forensic Mechanism                                                        | Consumer Protection & Public Health Outcome                                                                     |
|--------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Preservation of Religion | Hidden non-permissible biological additives (porcine gelatin, transglutaminase, non-slaughtered meat derivatives). | Absolute raw material authenticity; zero tolerance for porcine or severe impurities.                  | Mandatory raw material DNA profiling; Real-time qPCR; Automated blockchain traceability (MHMS).      | Guarantees spiritual integrity; eliminates religious ambiguity; enforces authentic permissible compliance.      |
| Preservation of Life     | Toxic chemical preservatives (formalin), illegal synthetic dyes, pathogen contamination, unmanaged allergens.      | Chemical toxicity limits; microbiological safety; complete allergen disclosure; wholesome assurance.  | HS-GC-MS screening for chemical residues; ELISA for allergen detection; HACCP & SSOP verification.   | Prevents foodborne illnesses, organ toxicity, severe allergic reactions, and acute/chronic public health risks. |
| Preservation of Wealth   | Economically Motivated Adulteration (EMA); weight manipulation; high-value matrix dilution (honey, olive oil).     | Economic fraud prevention; truthful labeling; full disclosure of ingredient concentration and origin. | Isotope Ratio Mass Spectrometry (IRMS); Spectroscopic identity verification; Mandatory trade audits. | Protects consumer economic interests; prevents market exploitation; maintains global supply chain trust.        |

### Preservation of Religion

The preservation of faith is the highest objective in Islamic law. For Muslims, consuming permissible food is a mandatory obligation. When manufacturers secretly integrate porcine enzymes, uncertified bovine gelatin, or illegal alcohol carriers into food matrices, consumers unknowingly ingest prohibited substances. This involuntary ingestion corrupts spiritual purity and creates widespread ambiguity and doubt in public religious practice.

### Preservation of Life

Islamic law dictates that food must be safe and wholesome. Will fully adding hazardous chemical preservatives (such as formalin) or industrial dyes to mask spoilage violates the Quranic command: *"And do not throw yourselves into destruction with your own hands"* (Surah Al-Baqarah, 2:195). It also violates the core legal maxim *"Harm must be eliminated"*.

### Preservation of Wealth

Islamic economics protects individual property rights and market justice. Economically Motivated Adulteration deceives buyers into paying premium prices for degraded or mislabeled products. This practice violates the Quranic prohibition: *"And do not consume one another's wealth unjustly"* (Surah Al-Baqarah, 2:188), constituting commercial fraud that erodes international trade trust.

| Objective of Islamic Law (Maqasid al-Shariah) | Direct Cause / Risk                                       | Systemic Impact                            |
|-----------------------------------------------|-----------------------------------------------------------|--------------------------------------------|
| 1. Preservation of Religion                   | Unknowing consumption of forbidden ( <i>haram</i> ) items | Spiritual harm                             |
| 2. Preservation of Life                       | Exposure to toxic, chemical, or pathogenic hazards        | Health risks ( <i>Illness / toxicity</i> ) |
| 3. Preservation of Wealth                     | Commercial fraud and product deception                    | Economic loss & market exploitation        |

## Analytical Case Studies

### Case Study 1: Porcine DNA Contamination in Processed Confectionery

- Incident Profile: Forensic laboratory surveillance using real-time quantitative polymerase chain reaction detected trace amounts of porcine (pork) DNA in certified confectionery items distributed across Southeast Asia (Ayyub et al., 2023; JAKIM, 2020).
- Systemic Failure Points:
  - *Unverified Upstream Ingredients*: Sourcing complex emulsifiers and texturizers containing trace porcine derivatives.
  - *Shared Production Lines*: Utilizing identical manufacturing machinery for permissible and non-permissible lines without intermediate validated chemical sanitation and statutory ritual purification.
  - *Passive Paper Audits*: Relying on paper documentation rather than active, third-party laboratory verification.
- Regulatory & Legal Response: Regulatory authorities immediately revoked halal certifications, issued nationwide product recalls, and updated national standards via the Malaysian Halal Management System, mandating internal audit committees and mandatory DNA profiling for high-risk raw materials.

### Case Study 2: Managing Ethanol Thresholds in Beverage Matrices

- Incident Profile: Fluctuating trace ethanol levels in non-alcoholic carbonated and fermented beverages raised compliance challenges across global regulatory bodies (Al-Hasan & Ahmad, 2019; Pauzi et al., 2019).
- Analytical & Jurisprudential Evaluation: Unlike prohibited intoxicants, trace ethanol originating from natural spontaneous fermentation or industrial extraction solvents requires precise analytical containment. Under regulatory guidelines, residual ethanol in food must remain below 0.5%, and in consumer beverages below 0.1%.
- Applied Legal Principle: The presence of unmanaged, fluctuating alcohol levels introduces legal doubt. As declared in *Sahih al-Bukhari* (Hadith No. 52): "*The lawful is clear and the unlawful is clear, and between them are doubtful matters...*" Quality managers must utilize Headspace Gas Chromatography-Flame Ionization Detection (HS-GC-FID) to verify that ethanol carry-overs remain within allowable safety limits.

## CONCLUSION AND RECOMMENDATIONS

Food adulteration in the permissible food industry is not merely a secular quality-assurance defect or corporate infraction; it represents a multi-dimensional violation of Islamic jurisprudence and human well-being. Diluting, masking, or contaminating food matrices directly breaches divine mandates, corrupting the pillars of systemic purity and ethical trust, while violating the higher objectives of Islamic law.

To counter these threats within complex global supply chains, the global sector must move beyond static paper documentation.

### Key Regulatory and Technical Recommendations:

- Digital Supply Chain Traceability: Implement immutable blockchain ledgers to track raw material origins from farm to fork, eliminating paper-audit vulnerabilities and ensuring transparent chain-of-custody tracking.

- Institutional Halal Assurance Systems: Universalize frameworks such as the Malaysian Halal Management System (MHMS), requiring dedicated internal compliance committees, active supplier verification, and mandatory facility sanitation protocols.
- Mandatory Molecular & Chemical Screening: Integrate mandatory bio-analytical testing, specifically real-time qPCR for high-risk biological matrices and HS-GC-FID for volatile solvent analysis into standard audit protocols.
- Harmonized Global Standards: Align regional certification bodies under unified analytical threshold guidelines to prevent regulatory arbitrage, eliminate market fragmentation, and protect consumer confidence worldwide.

## Glossary

- Adulteration: The intentional or accidental addition, substitution, or mixing of an inferior, cheaper, or hazardous substance into a food product, or the removal of an essential constituent, compromising its quality, purity, or authenticity.
- Biological Adulteration: Micro-contamination of a food matrix with pathogens or the covert inclusion of functional biological materials (enzymes, stabilizers, binders) derived from non-permissible origins.
- Chemical Adulteration: Unauthorized integration of restricted, non-food-grade chemical additives, synthetic industrial dyes, heavy metals, or toxic masking agents into consumable matrices.
- Commercial Deception: Illegal commercial trade practices involving the concealment of product defects, misrepresentation of ingredient quality, or fraudulent weight/volume manipulation.
- Doubtful/Suspect: Matters or food matrices whose legal permissibility is ambiguous or uncertain due to conflicting evidence, trace contamination, or unverified supply sources.
- Economically Motivated Adulteration (EMA): The fraudulent, intentional substitution or addition of a substance in a product for the purpose of increasing the apparent value of the product or reducing the cost of its production.
- Ethical Trust: Absolute moral trustworthiness, responsibility, and integrity in fulfilling socio-economic contracts, label disclosures, and ingredient transparency.
- Higher Objectives of Islamic Law: The fundamental purpose and overarching principles of Islamic jurisprudence aimed at preserving religion, life, intellect, lineage, and wealth.
- Permissible and Wholesome: The dual Quranic benchmark requiring items to be legally permissible under Islamic law and structurally pure, safe, clean, and nutritious.
- Ritual Cleansing: Statutory purification procedure required to cleanse facilities, equipment, or logistics tools that have come into contact with severe ritual impurities.
- Ritual/Physical Impurity: Substances categorized by Islamic jurisprudence as inherently unclean or contaminated, which invalidate the permissibility and purity of food upon contact.

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