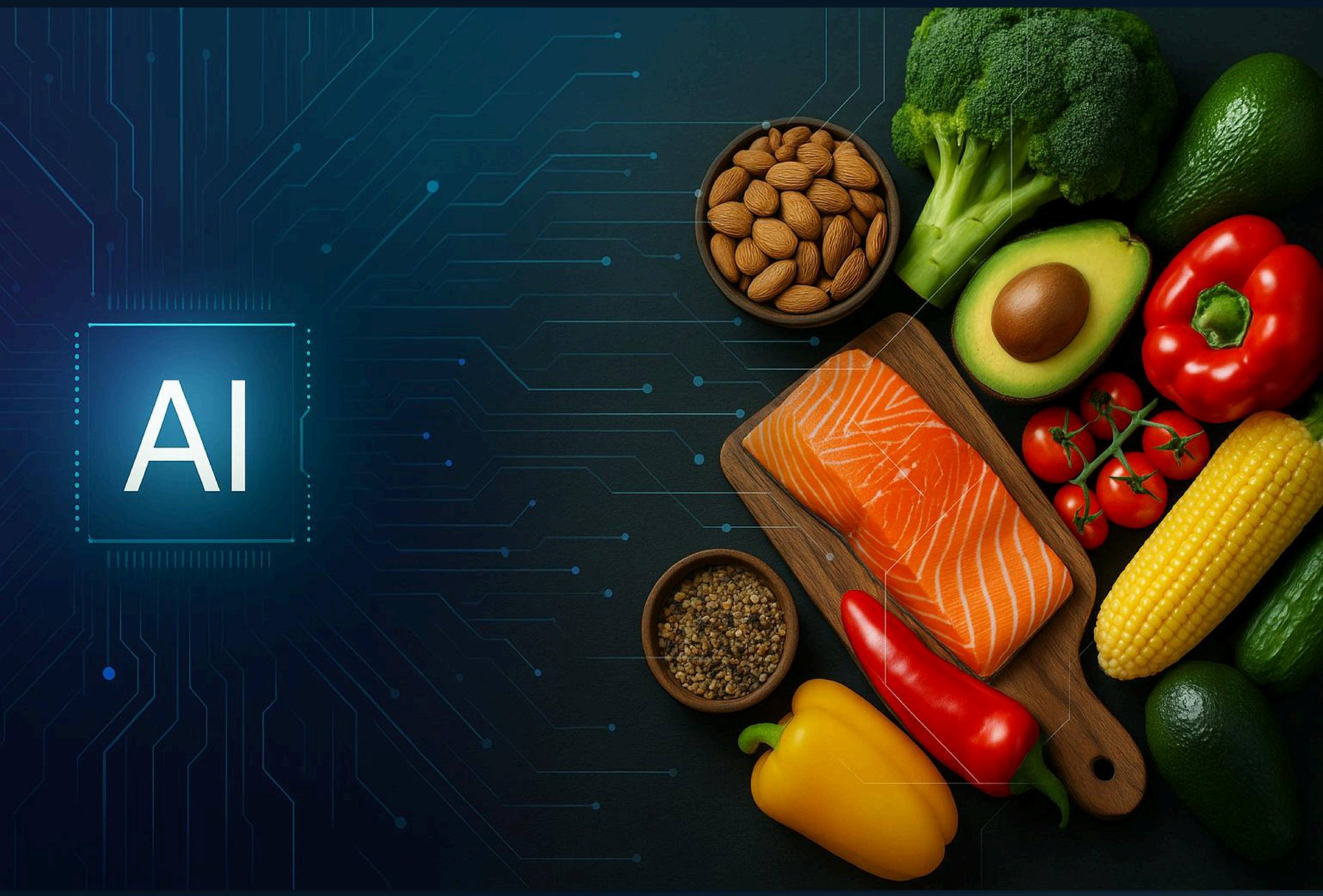
SGS DIGICOMPLY



INTEGRATING AI INTO FOOD SAFETY WORKFLOWS

Sectoral Data & Prediction Report
Prepared By SGS Digicomply Within The EFRA Project.
August, 2025

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What Do We Know About Current Situation Within Food Safety?

Current Food Safety Landscape

Foodborne Outbreaks 2023

In 2023 Europe reported 5,691 foodborne outbreaks. While outbreaks slightly decreased by 1.2% compared to 2022, the number of illness cases (52,127), hospitalizations (2,894), and deaths (65) increased by 7.2%, 4%, and 1.6% respectively. Notably, the number of deaths from foodborne outbreaks in 2023 was the highest of the last 10 years.

- PLS: The European Union One Health 2023 Zoonoses Report

Current Food Safety Landscape

Climate Change Impact

Climate change is increasingly impacting food safety, quality, and yield from a microbiological perspective, creating an urgent need for advanced technologies like AI to develop holistic, predictive models across the entire food system: from production to consumption. This will help to address future climate-related food safety risks.

TEMPERATURE IMPACT ON FOOD SAFETY

+1.5°C

MINIMUM SCENARIO

Increased pathogen survival, altered food handling

+3.0°C

LIKELY SCENARIO

Cold chain disruption, bacterial growth acceleration

+4.5°C

HIGH RISK SCENARIO

Food stability compromised, spoilage bacteria thriving

MICROBIOLOGICAL RISKS

- → Enhanced Salmonella growth (prefers 25-37°C, some survive 45°C)
- → E.coli contamination via precipitation & runoff
- → Vibrio species in warmer ocean waters
- → Mycotoxin production under temperature stress

SYSTEM VULNERABILITIES

- → Reduced cold chain storage duration
- → Wildlife migration increasing pathogen exposure
- → Sewage runoff contaminating irrigation water
- → Thermophilic spore-forming bacteria growth

- Science Direct Climate-Food Safety Review

Current Food Safety Landscape

Lessons From Past Crises

With help of AI, could we predict food incidents like the 2008 Chinese milk scandal or the 2011 European E. coli outbreak? These major crises demonstrate the urgent need for predictive systems that can identify patterns and prevent catastrophic food safety failures.

2008

Chinese Milk Scandal

300,000 affected children
54,000 hospitalized
6 deaths confirmed
22 companies involved

Melamine contamination to artificially increase protein content. Warning signs existed months before public disclosure.

2011

German E. coli Outbreak

3,842 total cases
855 HUS cases
53 deaths
16 countries affected

Contaminated fenugreek sprouts from Egypt. Novel EHEC O104:H4 strain with unique characteristics.

- 2008 Chinese Milk Scandal: Wikipedia Documentation
- 2011 E. coli Outbreak: NCBI Health Analysis

Current Food Safety Landscape

Lessons From Past Crises

So... Could AI-powered early warning systems have detected these crises months earlier and prevented thousands of casualties?

AI Prediction Potential

EARLY WARNING SIGNALS

- Consumer complaints patterns
- Hospital admission anomalies
- Supply chain irregularities
- Quality control test failures

DATA INTEGRATION POINTS

- Social media health mentions
- Laboratory test databases
- Regulatory inspection records
- Economic pressure indicators

RISK FACTORS

- Price volatility & cost pressures
- Regulatory gaps or delays
- Complex supply chains
- Novel pathogen emergence

PREDICTION CAPABILITIES

- Pattern recognition in health data
- Supply chain risk modeling
- Anomaly detection systems
- Cross-border data correlation

What Are The Challenges In The Supply Chain?

Supply Chain Challenges

What Are The Key Concerns In Supply Chain?

1

Regulatory Complexity

Overwhelming volume and variability of regulations leading to penalties and recalls across different markets and jurisdictions.

2

Supply Chain Opacity

Lack of transparency in supply chain - not all food incidents mention suppliers and market of origin, creating blind spots in risk assessment.

3

Regulatory Complexity

Lack of harmonized reporting in food safety incidents and the emergence of new regulations complicating data integration and analysis.

4

Regulatory Complexity

Producing safe food while reducing environmental impact, waste, and ensuring resources for the future amid growing consumer and climate demands.

Supply Chain Challenges

- **What Losses Do We Get From Non-Transparent Food Chain?**

Food safety failures create cascading impacts across multiple dimensions of society, economy, and environment. Understanding these systemic consequences is crucial for building resilient and transparent food supply chains that protect both public health and business sustainability.

KEY IMPACT AREAS

HEALTH RISKS

Human and animal health risks due to consumption of **contaminated** and **adulterated foods**

PRODUCT LOSS

Food waste and product loss results in disposal of **unsafe products** at any stage of supply chain

FINANCIAL LOSSES

Businesses suffer from **recalls**, market withdrawals, and lost revenue

REPUTATIONAL DAMAGE

Businesses suffer from **food safety concerns** leading to loss of consumer trust

ENVIRONMENTAL IMPACT

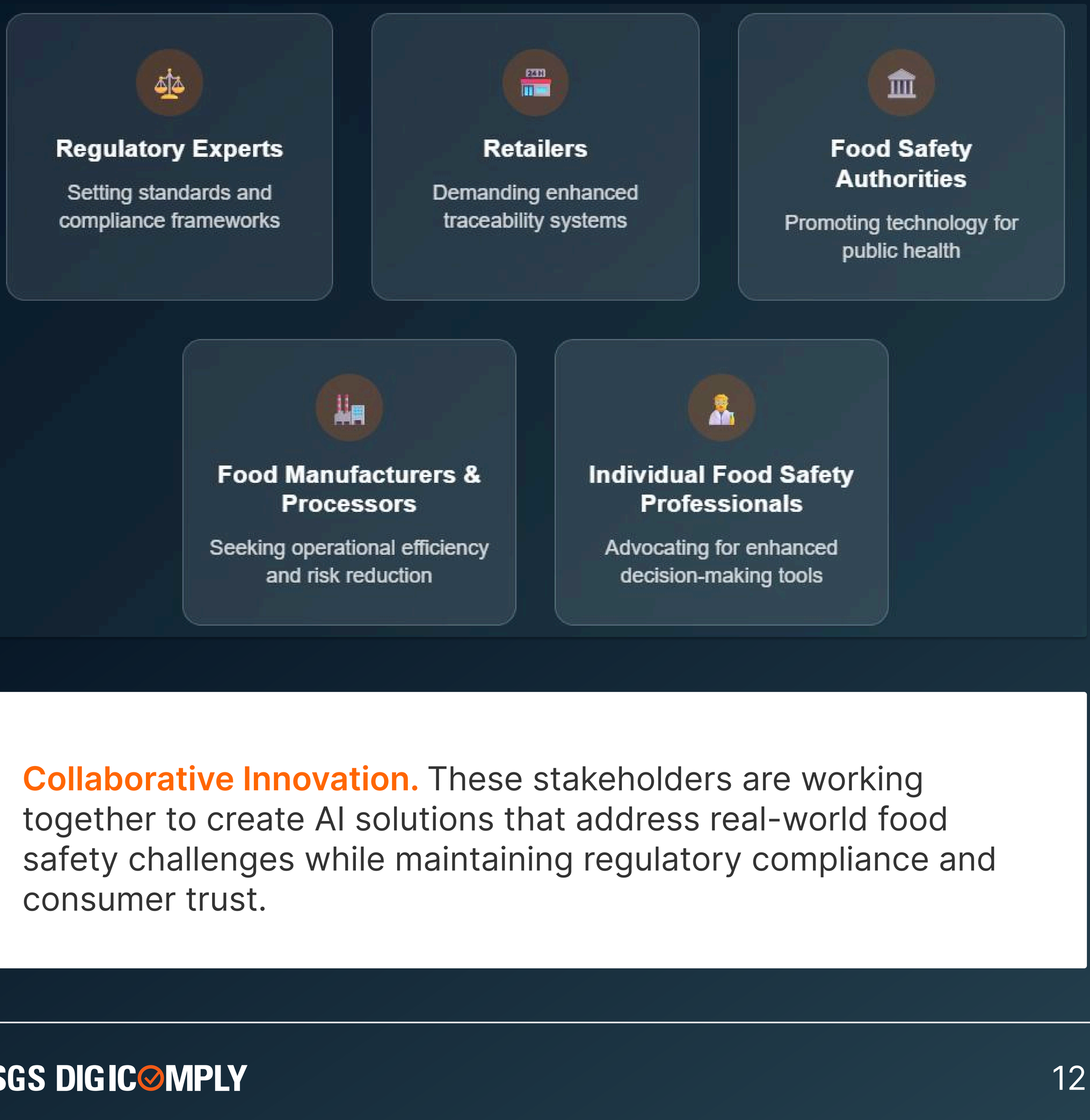
Waste of **raw food materials**, ready products and food packaging in case of non-compliance and recalls, contributing to environmental burden

AI In Action: How Is It Used In Food Safety Today?

AI In Action

Who Are The Key Stakeholders Pushing AI Adoption In Food Safety?

The integration of AI into food safety workflows is being driven by a diverse coalition of stakeholders across the food industry ecosystem. Each group brings unique perspectives and requirements, collectively pushing for smarter, more efficient food safety solutions that can enhance consumer protection and operational efficiency.



Collaborative Innovation. These stakeholders are working together to create AI solutions that address real-world food safety challenges while maintaining regulatory compliance and consumer trust.

AI In Action

How AI Is Used In Food Safety?

Large Language Models (LLMs) are transforming food safety through structured operational pipelines that process vast amounts of incident data, enabling predictive analytics and real-time risk assessment across the food supply chain.

LLM Operational Pipeline

1. **Dataset Curation**
   Compile and preprocess incident data from designated sources
2. **Model Fine-Tuning & Validation**
   Fine-tune the base LLM and validate its performance against key metrics
3. **Live Inference**
   Deploy the model for continuous processing of new data streams
4. **Historical Backfilling (Optional)**
   Re-run inference on historical archives for periodic data updates
5. **Performance Monitoring**
   Implement continuous monitoring with Human-in-the-Loop review for quality assurance

What Do The Data Tell Us About Food Safety?

Data-Driven Insights

Statistics On Regulations

The platform currently stores food regulations from 189 countries, providing extensive global coverage. The total number of regulations recorded has more than doubled over the past decade, reflecting significant growth in regulatory activity and clearly indicating the increasing complexity and evolution of food regulations worldwide.

Regulatory Growth Overview

10,784
Regulations recorded up to 2014

20,751
Additional regulations 2015-2025

189
Countries covered globally

3x
Volume increase over decade

Top Growth Markets (2014-2025)

Brazil
+192%
250 → 730 regulations

China
+303%
110 → 554 regulations

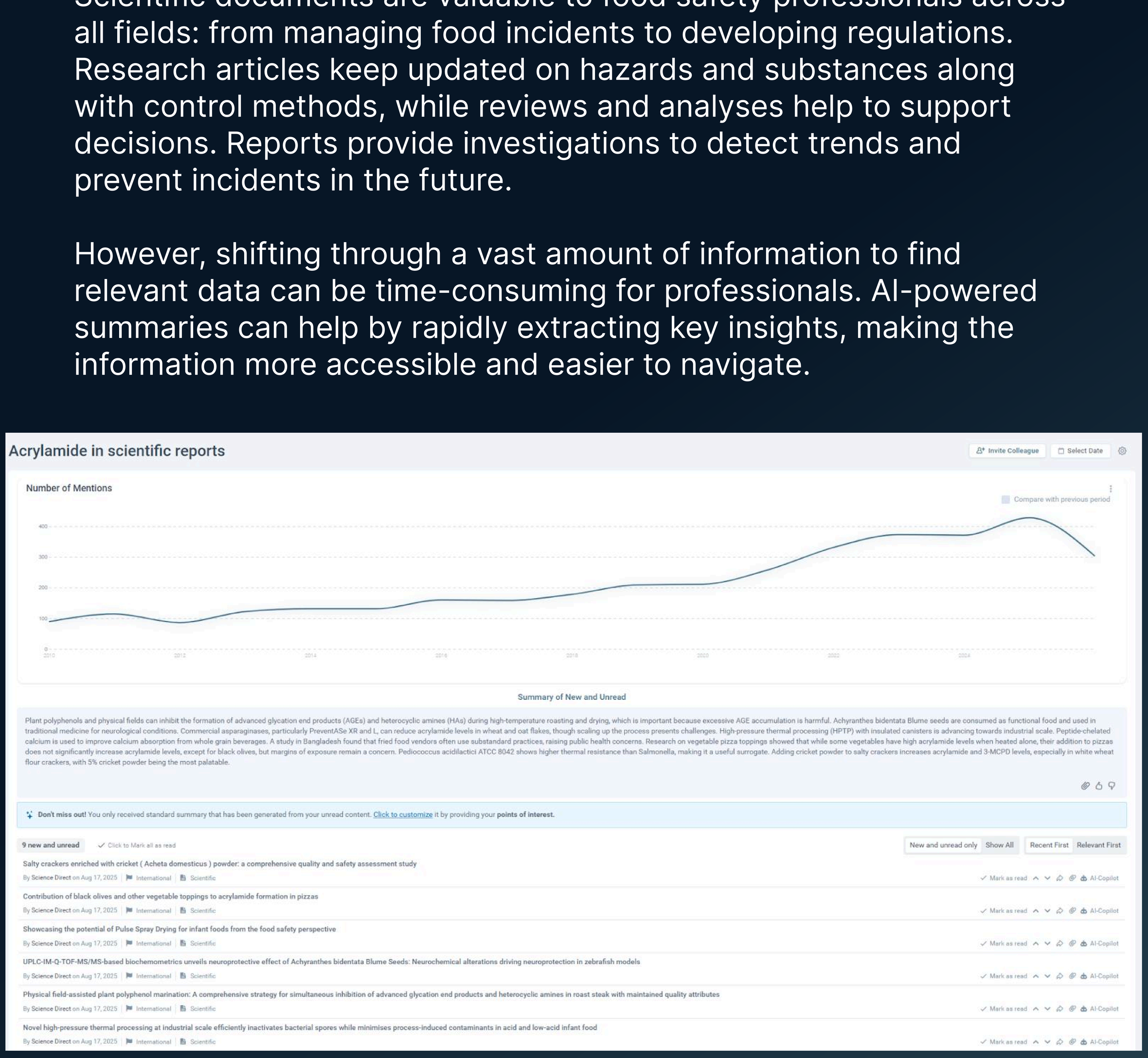
Kyrgyzstan
+292%
126 → 495 regulations

Data-Driven Insights

- **How Scientific Documents Support Food Safety Decision-Making?**

Scientific documents are valuable to food safety professionals across all fields: from managing food incidents to developing regulations. Research articles keep updated on hazards and substances along with control methods, while reviews and analyses help to support decisions. Reports provide investigations to detect trends and prevent incidents in the future.

However, shifting through a vast amount of information to find relevant data can be time-consuming for professionals. AI-powered summaries can help by rapidly extracting key insights, making the information more accessible and easier to navigate.



Data-Driven Insights

Food Safety Trends And Statistics

Food safety intelligence contains data on incidents from roughly 400 sources - authorities and governmental bodies all over the world.

Here is a closer look at one of the high-risk hazards with serious consequences - bacteria. Between August 24 and August 25 authorities worldwide reported 3,969 incidents related to bacterial contamination. This is where the experts can perform the horizon scanning, dive deep into specific food categories and analyze the risks associated with particular commodity or hazard.

3,969

Bacterial Contamination Incidents

August 24-25, 2025

Food Categories Most Affected

Meat and Meat Products	30%
Fruits and Vegetables	13%
Dairy Products and Analogues	11%

Top Market by Incidents

FR

France

323 incidents
(8% of total)

INTELLIGENCE CAPABILITIES

Experts can perform horizon scanning, dive deep into specific food categories, and analyze risks associated with particular commodities or hazards

Data-Driven Insights

Data Processing Pipeline For Food Safety Intelligence

The Food Safety Intelligence (FSI) pipeline leverages LLM technology across 5 specialized stages to transform raw incident data into structured, searchable knowledge points that enable real-time risk assessment and horizon scanning for food safety professionals.

FSI Data Processing Pipeline

1 Data Ingestion

Ingest data from multiple sources. Upstream pipeline classifies as "News" and "Alerts and Recalls"

2 Relation Extraction

Extract relevant information (hazard, commodity, market, supplier) using LLM in CSV format. LLM-as-a-judge monitors data completeness

3 Clustering

Identify and cluster similar terms. Weekly model updates cluster new terms into hundreds of relevant clusters. Monitored by term coverage percentage

4 Grouping into Ontology

Classify clusters into manually maintained expert categories, ensuring proper allocation into our ontology structure

5 Knowledge Point (KP) Creation

Transform ontology entries into indexed knowledge points. Map model extractions into database relations for user accessibility

Data-Driven Insights

- **How Can AI Help Navigate The Complexity Of Food Safety News?**

News data is crucial, yet often complicated to work with: it is fast changing and messy. In food safety alone, around 400,000 posts have been collected just in the past year, covering a wide range of topics from food recalls to standards.

For individual experts, manual navigation is both time consuming and error-prone. This is where AI-powered tools are bringing the most value and make news easy to use resources and avoid chaos.

400,000

Posts Collected Past Year

Key Challenges

Information Overload

Hard to track what truly matters in vast data streams

Duplication & Redundancy

Stories reported by multiple sources, rephrased and reposted

Misleading Information

Circulation of unverified claims and fake news

Lack of Relevance

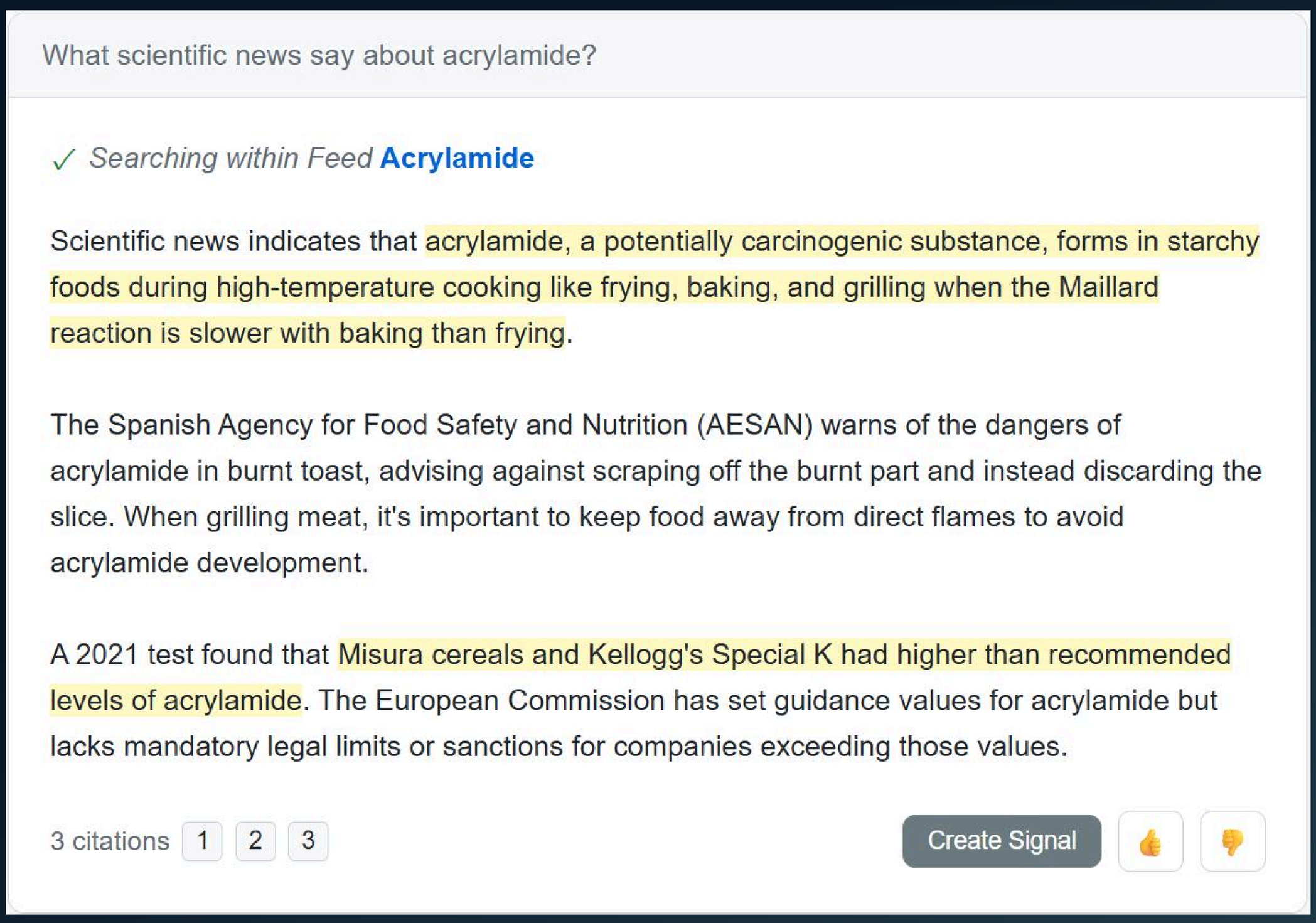
Identifying relevant sources requires expertise and time

Data-Driven Insights

- **How Can AI Copilot Help Experts Navigate Food Safety News?**

This is where the chatbot serves as great help. The expert can save news posts of interest and navigate through them using AI copilot.

This helps to understand trends when it comes to specific market, hazard, substance or commodity and easily navigate through any types of news reducing the noise and covering a broad spectrum of sources.

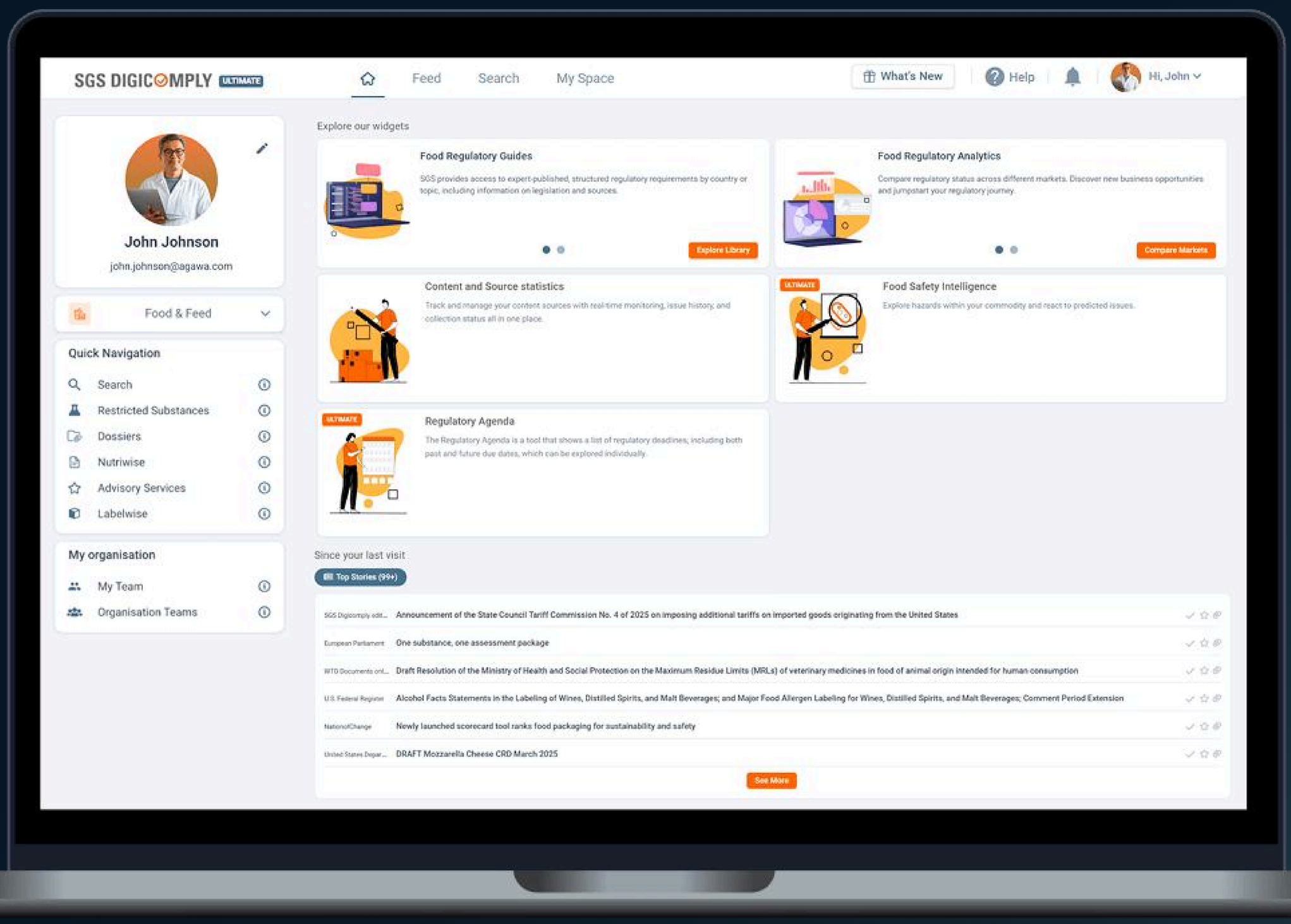


What Is SGS Digicomply?

This Is SGS Digicomply

- All-In-One Food Safety & Regulatory Compliance Platform

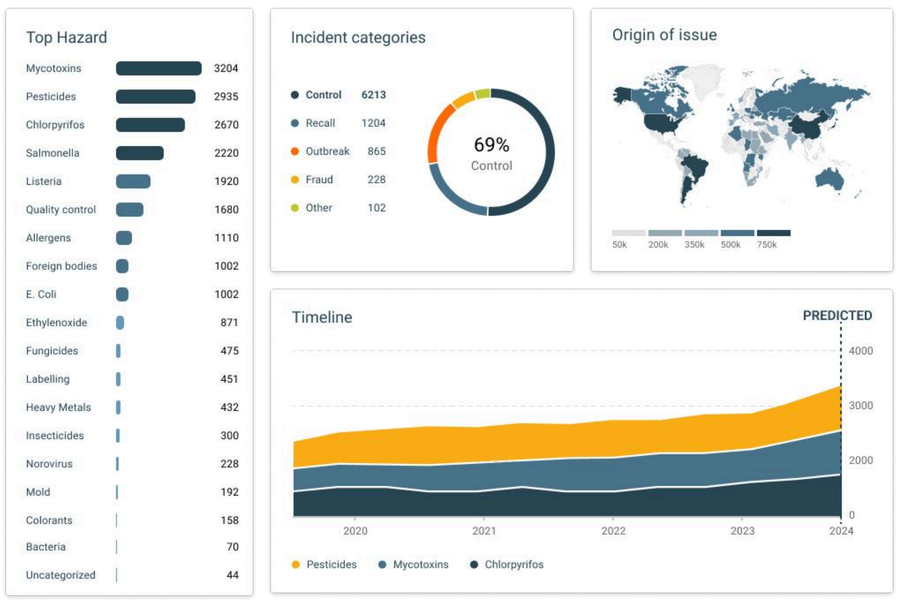
Collaborative AI-Platform providing real-time monitoring, predictive risk management, and regulatory compliance for streamlined market entry and quicker time to market



Experience Firsthand! See SGS Digicomply in action: identify risks, analyze incidents, track food fraud, manage regulations, optimize supply chains, and anticipate food safety challenges.

digicomply.com/explore-platform

This Is SGS Digicomply

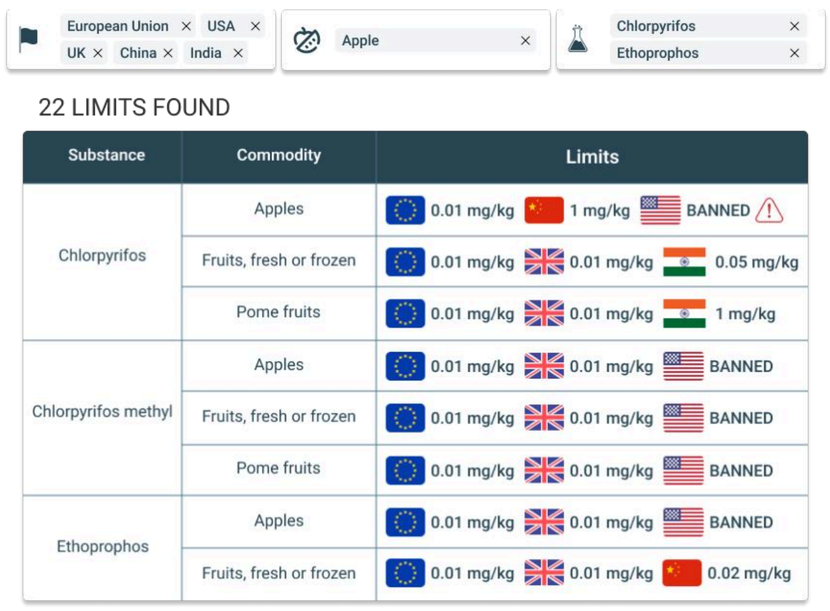


Food Safety Intelligence Hub

Predict, detect, and prevent food safety threats across your global supply chain — powered by real-time monitoring and AI-driven insights.

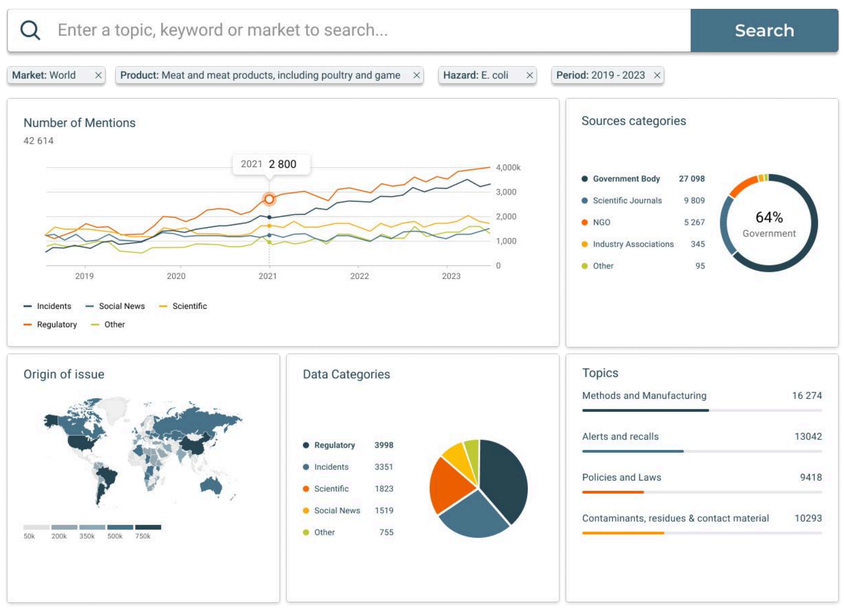
Regulatory Intelligence Hub

Track, analyze, and comply with evolving laws across 160+ jurisdictions — with automated alerts and predictive analytics to keep you one step ahead.



Global Ingredient Monitor

Get instant access to legal limits, banned substances, and ingredient-specific risks worldwide — making compliance faster, smarter, and more efficient.



Horizon Scanning

Anticipate regulatory shifts, supply chain risks, and emerging threats — act with confidence and seize opportunities before others notice.

Experience Firsthand! See SGS Digicomply in action: identify risks, analyze incidents, track food fraud, manage regulations, optimize supply chains, and anticipate food safety challenges.

digicomply.com/explore-platform

This Is SGS Digicomply

- Trusted By 50 Of The Top 100 Global Food Companies

Experience Firsthand! See SGS Digicomply in action: identify risks, analyze incidents, track food fraud, manage regulations, optimize supply chains, and anticipate food safety challenges.

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EFRA Project

EFRA

EXTREME FOOD RISK ANALYTICS

Leading Europe's Transition To AI-Enabled Food Risk Prevention

The first operational data and analytics platform dedicated to food safety risk prevention in Europe.

EFRA aspires to develop the first analytics-enabled, secure-by-design, green data space for AI-enabled food risk prevention.

Our mission is to support EU's global leadership in the digital-led industry transition from reaction to food risk prevention.

Learn More

3 Year Program	**7** European Countries
9 Partners	**4** Real-World Use Cases

Thank You

We appreciate your time and interest in exploring how AI is shaping the future of food safety. Together, with EFRA, SGS Digicomply is committed to driving innovation, transparency, and trust across the global food supply chain.

Learn More

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