MINIMISING RISK IN THE SUPPLY CHAIN & OPTIMISING VISIBILITY TO ENSURE FOOD SAFETY, AUTHENTICITY AND TRACEABILITY
RISK IN THE FOOD SUPPLY CHAIN

Shared Concerns

• Globally 1 in 10 people affected and >420,000 die from foodborne illness every year (WHO, 2015\(^1\))
• Food fraud costs UK food industry £12bn \(pa^2\)
• Food recalls increasing\(^3\)
• Food recall processes inefficient\(^4\)
• Learnings rarely shared\(^4\)

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\(^2\) Crowe Clarke Whitehill ‘Minimising Fraud and Maximising Value in the UK Food and Drink Sector’. May 2017 [https://www.croweclarkwhitehill.co.uk/uk-fooddrink-companies-losing-12-billion-annually-fraud/](https://www.croweclarkwhitehill.co.uk/uk-fooddrink-companies-losing-12-billion-annually-fraud/)
\(^3\) RASFF Reports [https://ec.europa.eu/food/safety/rasff/reports_publications_en](https://ec.europa.eu/food/safety/rasff/reports_publications_en)
\(^4\) FSA ‘Review Of The Food Withdrawal And Recall System In The UK Food Retail Sector’ (FSA Board report FSA17/09/13)
RISK IN THE FOOD SUPPLY CHAIN

Shared Challenges

- Increasing dependence on a global supply chain to source raw materials/partially processed product
- Increasing food trade volume/pace
- Complexity of trade borders/barriers
- Varying country food safety standards and capability
- Food chain operators >95% SME
IFST FOOD RISK MANAGEMENT SYSTEMS GROUP

• To examine the current reality and future needs in food risk management
• To identify opportunities, potential solutions, gaps and potential barriers to developing and implementing ‘fit for the future’ approaches to food risk management
KEY QUESTIONS

SCOPE

• Integrity/Authenticity
• Food/Feed Safety
• Quality*

* Understanding that what is a quality issue to one stakeholder may be a food safety issue elsewhere in the supply chain

• How can food industry best leverage existing and new technological opportunities for improved information and data handling and analysis?
• How can the flow of critical information from stakeholder to stakeholder be improved, both up and down the supply chain?
• Can we identify common principles / specifications to facilitate consistent application given the increase/divergence in technological solutions?
FOOD SUPPLY CHAIN INFORMATION

**Food Safety**
Food safety management systems, Safe product design

**Compliance**
Composition, Label, Claims, Source/Site/Batch certification

**Supply**
Availability, Price, Approved suppliers

**Operations**
Capacity, Capability, Audit/Certification status

**Markets**
Demands, Trends, Regulatory requirements

**Traceability**
Name of supplier/business customer, Affected batch/lot identification (quantity, location, status), Date of transaction/delivery

**Primary Production**
Food Business Operator

**Food Business Operator**
Food Business Operator

**Consumer**

Facilitating flow of information between stakeholders
FOOD RISK MANAGEMENT SYSTEMS

**Challenges**
- Complexity of supply chain
- Degradation of trust
- Increased regulatory intervention
- Skills in risk analysis
- Inaccuracy of information
- Poor/slow responsiveness
- Lack of technological capability
- Accessibility restricted
- Risk appetite/uncertainty
- Cost
- Misinterpretation or misuse of data

**Advantages**
- Consumer benefits
- Build trust
- Facilitate meeting legal obligations
- Foster best practice
- Efficiencies (speed, frictionless borders, waste)
- Avoid business disruptions
- Freedom to operate
- Earned recognition
- Accessible
FOOD RISK MANAGEMENT SYSTEM

General Principles

• Global - common best practice standard
• Accessible - to all food chain players, incl. micro & SME’s
• Confidential and Secure
• Permits (open) flow of information
• Relevant to food chain needs/data formats
• Real-time batch/lot location in food chain – quantity, location, status
• Consumer visibility of information
• Build food safety culture
FOOD RISK MANAGEMENT SYSTEM

Technological Principles

• Interoperability across technologies
• Up and down the supply chain
• Security levels of disclosure (different actors)
• Open standard
• Immutable
• Affordable
• Independently verifiable
TECHNOLOGICAL DEVELOPMENTS

- Distributed ledger technology (Blockchain)
- Digital twin/simulation
- Secure cloud
- Smart contracts (payment on evidence of compliance)
- Internet of Things
- Big data analysis/modelling

- Smart manufacturing
- Tagging and tracking, holographic labels
- Sensors - temperature, modified atmosphere, fumigants
- In-line monitoring
- Handheld devices ("lab-on-a-chip")
- Whole genome sequencing and DNA speciation / Stable isotope
OPPORTUNITIES

• Upgraded data access capability
  • ‘Full’ sight to source (traceability, supply mapping) with ‘live’ tracking (status, location)
  • Rapid access to compliance evidence and supply vs. demand status (incl. data held elsewhere)
  • Controlled, permissioned and secure data access
  • Options to independently formally verify data – frictionless borders, site/batch monitoring and approval

• Enhanced ‘sight’ to improve decision making
  • Operations planning and resource utilisation (water, energy, materials, transport, waste reduction and/or revalorisation)
  • Logistics, delivery acceptance and border crossings
  • Hold/release and Withdrawal/recall
WATCH-OUTS / RISKS

• Value Proposition Unclear
  • Lack of understanding of technology capabilities
  • Potential to overlook low technology solutions
  • Cost/Benefit - Who pays? Need now or in future?

• Sufficient Adoption vs. Impact
  • Resistance to change
  • Trust issues - Security; Data sharing
  • Connectivity issues - Bandwidth availability esp. for remote/rural users
  • Barrier to market - For smaller operators

Create Illusion of Control...
Where SME foundations of supply chain remain invisible / outside risk management system
IS FULL SUPPLY CHAIN VISIBILITY POSSIBLE FOR ALL PRODUCTS?
GLUTEN FREE SMOKED HADDOCK FISHCAKE
WITH WEST COUNTRY CHEDDAR CHEESE SAUCE

FISH
Smoked Haddock
Minced Smoked Haddock

WEST COUNTRY CHEDDAR CHEESE SAUCE
Maltodextrin, Modified starch, Yeast extract, Cheddar cheese powder, Salt, Sunflower oil, Milk

COATING
Rice flour, Maize flour, Potato starch, Gram flour, Salt, Raising agents, Rapeseed oil

OTHER INGREDIENTS
Dried potato, Parsley, Black pepper

PROCESS

PACKAGING
Top web & base web, Labels

Extract from STFC Grant ST/S001905/1 Scoping Report
Dr. Rachel Ward at r.ward consultancy limited & Andy Kerridge at Wyvern Food Solutions Ltd.
## EXAMPLES ASSOCIATED DATA/EVIDENCE

<table>
<thead>
<tr>
<th>FISH</th>
<th>CHEDDAR CHEESE SAUCE</th>
<th>COATING</th>
<th>OTHER INGREDIENTS</th>
<th>PROCESS</th>
<th>PACKAGING</th>
<th>FINISHED PRODUCT</th>
</tr>
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<tbody>
<tr>
<td>Supplier certification</td>
<td>Supplier certification</td>
<td>Supplier certification</td>
<td>Supplier certification</td>
<td>Site certification</td>
<td>Supplier certification</td>
<td>Ingredient declaration</td>
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<tr>
<td>Source – Geography</td>
<td>Recipe - % cheese</td>
<td>Bulk ingredients</td>
<td>Traceability</td>
<td>Temperatures</td>
<td>Food contact/migration</td>
<td>Gluten free claim</td>
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<tr>
<td>Haddock – Species</td>
<td>Source, traceability</td>
<td>Gluten free claim</td>
<td>Purity / Authenticity</td>
<td>Process time</td>
<td>Right label</td>
<td>Visual</td>
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<tr>
<td>Traceability esp. minced fish</td>
<td>Substitution / Dilution</td>
<td>Substitution / Dilution</td>
<td>Origin</td>
<td>Cooking</td>
<td>Sealed</td>
<td>Taste</td>
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<td>Sustainability status (MSC certification)</td>
<td>Fat content</td>
<td>Traceability</td>
<td>Contaminants e.g. mycotoxins, pesticides</td>
<td>Cleaning</td>
<td>Gluten cross-contamination – shared line/equipment</td>
<td>Shelf life</td>
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<tr>
<td>Time from catch to smoking?</td>
<td>Veterinary residues</td>
<td>Contaminants e.g. mycotoxins, pesticides</td>
<td>Microbiology esp. Salmonella</td>
<td>Gluten cross-contamination – shared line/equipment</td>
<td>Microbiology</td>
<td></td>
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<tr>
<td>Contaminants e.g. heavy metals, dioxins, PAHs</td>
<td>Microbiology</td>
<td>Microbiology esp. Salmonella</td>
<td>Size of herb flakes</td>
<td>Recipe</td>
<td>Effect of freezing</td>
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</table>
### EXAMPLES INTERESTED PARTIES

<table>
<thead>
<tr>
<th>FISH</th>
<th>CHEDDAR CHEESE SAUCE</th>
<th>COATING</th>
<th>OTHER INGREDIENTS</th>
<th>PROCESS</th>
<th>PACKAGING</th>
<th>FINISHED PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishermen</td>
<td>Growers</td>
<td>Farmers</td>
<td>Growers</td>
<td>Equip. manufacturers</td>
<td>Manufacturers</td>
<td>Consumers</td>
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<td>Vets</td>
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<td>Driers</td>
<td>Laboratories</td>
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<td>Retailers</td>
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<td>Fish smokers</td>
<td>Brokers</td>
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<td>Processors</td>
<td>Laboratory supplies</td>
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<td>Wholesalers</td>
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<td>Manufacturers</td>
<td>Lab. equipment</td>
<td>Lab. equipment</td>
<td>Foodservice</td>
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<td>Agents</td>
<td>Trade Associations¹</td>
<td>Transport</td>
<td>Distributors</td>
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<td>Certification Bodies²</td>
<td>Storage</td>
<td>Transport</td>
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<td>Temp. monitoring equipment</td>
<td>Storage</td>
<td>Oil refiners</td>
<td>Wholesalers</td>
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<td>Trade Associations¹</td>
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<td>Refrigeration engineers</td>
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<td>Certification Bodies²</td>
<td>Temp. monitoring equipment</td>
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<td>Transport (fish)</td>
<td>Certification Bodies²</td>
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<td>DEFRA &amp; FSA</td>
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</table>

¹ Trade associations exist representing the interests of each actor in the food supply chain as well as the affiliated industries.
² Certification Bodies certify primary producers, manufacturers, transport/distribution/storage organisations, calibration organisations and analytical testing laboratories.
IS FULL SUPPLY CHAIN VISIBILITY POSSIBLE FOR ALL PRODUCTS?

• In principle – Yes
• In reality requires:
  • Cooperation across interested parties and stakeholders
  • Secure permissioned systems
  • Interoperable technology
IMPLEMENTATION

• Technology to improve food risk management systems is available now

• Effective implementation needs:
  • Collaboration - Multisector, multidisciplinary
  • Coordination - To ensure interoperability, harmonization, standardization
  • Development - Methods for validation, review and scrutiny; Data standards
  • Support for Adoption - Tools; SME accessibility
  • Independent Governance - To support transparency and trust
IFST FOOD RISK MANAGEMENT SYSTEMS GROUP

IFST Role
• Independent charity with members from across the food sector.
• Can play a role in trusted governance, as well as provide ‘guiding’ insights and recommendations

Next Steps
• Prepare and publish peer-reviewed articles to build upon thinking and provide recommendations
• Any IFST member is welcome to contribute
• Contact info@ifst.org
THANK YOU FOR YOUR ATTENTION!