# 2 The "culture of food safety" as a model to make behaviour safer

This chapter considers the challenges posed by widespread transformation of behaviour to improve safety (particularly in terms of health and epidemic control), seeking to build on the experience of the "culture of food safety" and how it has profoundly transformed practices over the past couple of decades. Difficulties in achieving compliance with COVID-19 safety measures has shown the urgency of going beyond mere rule-setting and formal enforcement, and designing strategies and programmes to promote and achieve safer conduct at work and in social life. Understanding how culture change and safety culture have been systematically built up in the food sector through a combination of methods, systems, management and regulatory attention, can provide an important contribution.

## Introduction

As noted regulation scholar Robert Baldwin once remarked, "rules don't work" (Baldwin, 1990[1]). This need not mean that rules are not useful or important, but that they do not "work" (produce results) in and of themselves. The importance of transforming rules into practice has been emphasised repeatedly, leading to the emergence of the term "regulatory delivery" (Russell, 2019[2]). Increasing attention has been given to how behaviour (and, specifically, behaviour of managers and employees in business organisations) is driven largely by "culture" – and how important it is for regulatory systems to try and understand, harness, and influence corporate culture (Hodges, 2015[3]) (Hodges, 2018[4]). The OECD has looked into the impact of behavioural approaches on safety (OECD, 2020[5]), which is an important part of such work. Here, we look specifically at how regulatory delivery systems can seek to consistently support (and use) cultural change across an entire sector or field, looking at the experience of food safety.

Despite the fact that regulators and food businesses are aware of the existence of food hazards and have (respectively) imposed and adopted many preventive practices, the threat of food borne diseases continues to be a source of concern. This need not, in fact, mean that food safety is quantitatively speaking a major risk at present in developed countries or OECD members, though it still definitely is thus in a number of low-income countries. One of the difficulties in discussing the importance of food safety risks is that risk perception is not necessarily correlated to actual, quantifiable risk, as has been evidenced in a number of studies and cases (Slovic, 1986[6]). Another challenge is that assessing the actual prevalence of food borne diseases is far from easy, even in countries with advanced health systems and robust food safety regulation (Blanc, 2021[7]). This being acknowledged, and in spite of food being predominantly safe in developed economies (and in many transition countries as well), food safety risks remain both objectively significant, and acutely present in public perception.

*In the* United States, it is estimated that over **48 million cases of foodborne illnesses occur annually, with** 128 000 hospitalisations and 3 000 deaths (U.S. FOOD & DRUG ADMINISTRATION, 2018[8]). EFSA estimates that the number of foodborne zoonotic diseases is over 350 000 annually and that the most common causes are *Campylobacter, Salmonella, Yersinia, E. coli* and *Listeria* (European Food Safety Authority, 2021[9]). *Food is exposed to multiple chemical contaminants from the environment or those emerging during its* production, distribution, packaging, or consumption. The accumulated knowledge on hazards **has been leading to the development of preventive programmes aiming to reduce their occurrence in food. However, the effectiveness of such programmes is very much dependent on the structural design and maintenance of facilities along with the human factor, which is responsible for the application of designed practices** (Insfran-Rivarola et al., 2020[10])**.** Behavioural changes to increase the efficiency of hazard analysis and critical control points (HACCP) and other preventive programmes were investigated by multiple experts and findings indicate the need for a further understanding of predispositions and tendencies on the individuals' activities.

The outbreaks of COVID-19 in certain food industries (particularly meat processing), as well as the role of restaurants in outbreaks among consumers, resulting in clusters of the disease, was largely related to management not implementing regulatory requirements (including for profit motives), but also in some cases to workers' poor understanding of safety rules and their logic. Thus, prevention of contamination is dependent on attitudes and behaviour. Conversely, the experience of transforming culture in relation to food safety rules, which the food industry has undergone in the past two to three decades, can be taken as a starting point to think through how "hygiene culture" could be broadly transformed throughout society in order to provide better protection against infectious diseases such as COVID-19. Indeed, the continued prevalence of the disease, and successive infection "waves" in many countries, have been largely correlated to the difficulty in transforming daily practices at work, in transport, in open spaces etc. – and transforming such behaviour, and changing the prevailing culture, is thus a central challenge (Gray et al., 2020[11]) (Howard, 2021[12]) (Mantzari, Rubin and Marteau, 2020[13]).

Successful examples in the food sector show that the effectiveness of change, either when implementing a standard or responding to "invisible threats" such as bioterrorism or a pandemic, is higher in companies which have a strong food safety culture.

Studies of organisational culture show the importance of values, feelings, ideas and socially shared beliefs within one organisation (Robbins and Judge, 2013[14]) and the effect of management structures on organisations´ culture, either through endorsing or neglecting the recommended practices (Alversson M, 2002[15]). In the food area, the food safety culture concept has been introduced through the revised version of the General Principles of Food Hygiene Standard (CAC/RCP 1-1969, version 2020), which further triggered the revision of the Regulation 852/2004 (2020a) and made food safety culture a subject to monitor by control authorities (Lopp, Goebelbecker and Ruff, 2021[16]). The need for these changes in behaviour was obvious for food businesses involved in international trade, and was endorsed by the Global Food Safety Initiative (GFSI)[1] into benchmarked certification programmes (GFSI, 2018[17]).

## How good practices have been implemented by the public and private sector

Rules governing good hygienic and manufacturing practices were published in the first version of the Codex Alimentarius General Principles of Food Hygiene Standard in 1969. HACCP principles became widely applied after the BSE crisis in United Kingdom in the 1980s as well as with the *Escherichia Coli* O157:H7 outbreak in the USA in 1993. Although regulators in many countries reacted promptly, endorsing GMP, GHP and HACCP principles as mandatory and auditing their implementation regularly, the hazards continued to emerge. Control bodies' attention was drawn to the problem of inconsistent implementation of GMPs which threatened the effectiveness of food safety programmes based on HACCP principles. The following step in building a more efficient food safety culture was the introduction of the pre-requisite programmes concept, aimed at increasing the adherence to GMPs through monitoring and verification (Manning, Luning and Wallace, 2019[18]).

Attention of regulators and scientists is permanently focused on the three basic food safety hazards (biological, chemical & physical), which, as per the Campden BRI guide (Robert Gaze, 2015[19]), have been complemented with allergens and with radiological hazards more recently. Messages about hazards and associated risks are usually communicated through regulatory documents. However, to raise awareness among the wider population, other communication means are used. In this sense, the WHO published the "Five Keys to Safer Food", a poster and an accompanying manual, publicising them worldwide to highlight universal food safety problems. These being: keep clean; separate raw and cooked; cook thoroughly; keep food at safe temperatures; and use safe water and raw materials (World Health Organization, 2006[20]). This form of communication, translated into over 40 languages, targeted all, from primary producers to processors, handlers, and consumers across the globe, becoming a powerful tool incentivising changes of habits. Many national food safety agencies recognised its success and started to communicate with businesses and the general public through guides, posters and infographics, raising awareness on good practices and gradually modulating habits and attitudes. The tools for communication of good practices together with the risk-based approach to controls in food safety as well as advices provided by official control bodies helped building a general level of understanding of food hygiene and safety, strengthening trust in national food industries and enforcers. The guides convey recommendations applicable by all (e.g. the Canadian Food Inspection Agency´s Guide to Food Safety or the Food Standards Australia and the New Zealand series of manuals and posters) or recommend good practices in a particular industry (such as the UK Food Standards Agency´s Safer Food Better Business for caterers and retailers).

Private food safety standards (especially ISO 22000 series, FSSC, IFS-Food, BRC, but also standards applied in primary production, such as Global GAP) have a significant influence on the level of implementation of food hygiene and safety practices in food business operators. The establishment and work of the GFSI increased comparability of third-party food safety management system (FSMS) audit

results, while, at the same time, allowing businesses to choose the standards based on market demands. The perspective, as exposed by GFSI (GFSI, 2018[17]), is to apply a holistic approach to all food safety hazards through the assessment of a range of external and internal factors that influence the effectiveness of Food Safety Management Systems (FSMS) in companies. The number of food safety incidents in companies which had implemented the BRC standards represented a catalyst for the standard setting body to introduce food safety culture in their Global Standard for Food Safety Issue 8,[2] based on the GFSI recommendations, and to start using it in auditing from 2019.

The *Codex Alimentarius* response to a global demand for determinants of food safety culture was the revision of the General Principles of Food Hygiene Standard (CAC/RCP 1-1969, version 2020) and expansion of the list of general principles with a demand for management commitment to food safety. Without management commitment, the principles governing food safety (science-based and preventive approach, hazard analysis, implementation of pre-requisite programmes, control measures on CCPs, scientific validation of control measures, monitoring, corrective measures, verification, documentation, and communication along the food chain) are often inconsistently applied due to managers' prioritisation of other business needs. By proclaiming that: "Fundamental to the successful functioning of any food hygiene system is the establishment and maintenance of a positive food safety culture acknowledging the importance of human behaviour in providing safe and suitable food", the global Codex standard opened the channel for regulators to include food safety culture in their rules.

At the EU level, the regulatory framework for food safety has been found to be comprehensive. One of the regulations, Regulation EC 852/2004 embedded the food safety culture requirements adjusted to the nature and the size of the food business and based on the: a) commitment of the management and all employees; b) participative leadership which has a foundation in clear communication about responsibilities within the organisation; c) continuous learning; d) unobstructed communication within the organisation; e) continuous improvement of the FSMS; e) on time and evidence based planning of resources for food safety implementation and f) compliance with regulatory requirements.

The US FDA New Era of Smarter Food Safety initiative to deliver the Food Modernization Act is based on a) technology enabled traceability; b) smarter tools and approaches to combat outbreaks; c) new business models and retail modernisation and d) food safety culture (FDA, 2020[21]). FDA plans to promote food safety culture within the agency, at regulated subjects and to the public (see Figure 2.1).

## Figure 2.1. A modern food safety vision



Source: https://www.fda.gov/media/139868/download.

Food Standards Australia and New Zealand implements activities to promote food safety culture through a set of tools which aid in diagnosing the level of culture and consists of: i) a questionnaire to assess the culture level, ii) a check list to guide the food businesses when implementing food safety culture and iii) a "culture maturity matrix" to be used for self-assessment of strengths and weaknesses and the progress over time.[3] In the province of Victoria, Dairy RegTech, the dairy regulatory body, implements the analytics of data and of culture to monitor food safety compliance, while the Northern Territory Health, an enforcer, helps businesses improve compliance by providing advice on how to strengthen business culture (Food Standards Australia New Zealand, 2017[22]).

## Food safety culture as a part of corporate culture

Changes in corporate culture are usually influenced by some strong external or internal force and the need to secure competitive advantage. They require clear vision, personal involvement of managers and sometimes changes in their own beliefs. This is necessary to be able to secure resources on time and in appropriate quantities, whilst at the same time, motivating employees to be part of the change. Transformational changes, closely connected with learning and innovation, are a long-term process which lasts if the change is needed and has a built-in component of constant adaptation of the company to the external and internal environmental demands (Cummings and Worley, 2009[23]).

External demands, such as regulatory, put a certain degree of pressure on businesses to obey rules. Behavioural studies have shown that people respect rules when they are aligned with their moral values and when rules are enacted and implemented fairly (Hodges C., 2016[24]). Only when the opinions and needs of businesses and the public are addressed in those, such requirements are considered as fair. Relative to the implementation of rules, a consistent and proportionality-based approach on risk ensures fairness. Trust in regulators is achieved when both businesses and regulators share the same ethical values (OECD, 2014[25]).

In corporate settings, internal factors drive the implementation of regulations and their translation into business practices. Food production and handling is burdened with numerous and strict external rules and standards leaving limited space for individuals to show their abilities and creativity. Corporate culture usually found in food businesses is one which favours the top-down approach, thus not empowering workers to participate in development of practices and therefore merely doing what managers have asked for. A critical element is to increase food workers' understanding of requirements depends and how to apply them, and the implementation of private food safety management standards can a huge step towards increasing the participation of workers in the translation of rules and standards into actual work procedures and practices. Will the implementation of rules and standards be effective depends on how the management and workers co-operate, being the management and the standard´s development team aware of habits and cultural norms and what is the business' set of core values. The success of a business depends on the trust of external and internal stakeholders and increasingly became an important competitive advantage.

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### Box 2.1. Food Standards Australia and New Zealand: "ethical business" concept

The ethical business concept15 identifies evidence of trust which businesses shall provide:

- ethical principles at the company level, mandatory for all business units and applied continuously regardless of any management changes;
- consistent implementation of rules and standards as proven by their audits;
- history of no penalties;

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> - numerous loyal and satisfied customers;
> - obtaining regular feedback from customers and staff;
> - having structures enabling decisions to be debated to test ethical compliance, evaluated against external views, and made transparent.
>
> The more evidence can the business provide, the higher is the level of trust.

Many global food companies introduced food safety culture as a part of their corporate culture, and thus defined their attachment to the ethical business concept driven by external demands (e.g., supply chain, socio-political, legal and national factors) or by internal context factors (e.g., product, production, and organisational characteristics).[7] They have developed their food safety culture even before the Codex standard or private standards embedded it. Danone corporate governance method included food safety culture in their corporate governance method already in 2014 in order to secure uniform implementation of its food safety policy across all facilities (Frédéric, 2017[26]). Nestlé Corporate Business Principles, mandatory for all Nestlé employees, are supported by the company´s Code of Business Conduct and other policies and integrated in business planning, activities, operations, performance reviews and auditing (Nestlé - Group Legal and Compliance, 2020[27]). New Zealand dairy producer Fonterra introduced food safety culture after the outbreak of botulism, caused by their products in 2013, to safeguard the brand name and reinforce its FSMS. Differently, the initiative of Cargill was driven by the high turnover level of employees which created the need to train them in food safety in a way to secure the continuum of practices and employees' understanding (Scattergood, 2018[28]).

## RASFF, TRACES and other platforms as drivers of food safety culture

Every year, numerous RASFF alerts are issued about microbiological, chemical (including allergens) and physical contaminants. In 2019, there were 1 175 alerts. In 2017, the fipronil contamination incident spread in over 56 countries and resulted in 109 RASFF notifications for eggs and 8 for other products (European Commission, 2018[29]). In 2018, deliberate physical contamination of strawberries (with needles) in Australia raised a serious concern on the capacities of the HACCP system to defend food safety and undermined the trust in products coming from Australia.

The TRACES system is an EU online platform with the purpose of facilitating communication between different competent authorities and detecting food fraud.[4] It enables fast tracing of consignments and identification of non-conformant ones.

The Administrative Assistance and Cooperation system – Food Fraud is an IT platform created after the 2013 horse meat scandal and used by EU Member States, Switzerland, Norway and Iceland to exchange information on non-compliance and potential intentional violations of the EU agri-food chain legislation. The number of requests is constantly rising, going from 157 in 2016 to 178 in 2017, experiencing a sharp increase in 2018 (234 request) and reaching 292 in 2019 (European Commission, 2020[30]). Mislabelling is the most common non-compliance with an incidence rate of 47.3% while 36% of requests are due to unapproved treatment and/or processes and replacement/dilution of components in the products.

Horsemeat scandal in 2013 and Salmonella in Lactalis baby formulas in 2017 and 2018 were detected and communicated through RASFF and TRACES. Both cases showed the lack of food safety culture at the side of businesses and that of regulators. Inconsistent implementation of EU traceability rules and lack of fairness in the horsemeat scandal triggered the change in approach to fraudulent practices in marketing at EU level. During the Lactalis outbreak (Jourdan-da Silva et al., 2018[31]), traceability issues impaired communication through RASFF. Only ten countries notified the contaminated lots in the first instance, while

problems with tracing of contaminated lots in another 35 countries caused late notifications in the RASFF and impaired the efficiency of the recall.

## Evaluation of food safety culture

In transitional economies, underdeveloped and sometimes outdated food legislation together with weak capacities of enforcement agencies fail to create the supportive external environment for food safety. An investigation into food safety culture elements in Zimbabwe shows the effect of both internal (food safety programme in place, products' risk level and the resilience of the food production system) as well as external environment determinants (national values and food safety governance characteristics) (Nyarugwe, 2020[32]). This research found that inadequate governance and inconsistency in enforcement resulted in reactive food safety business culture, based only on *ex post* (corrective) reactions, no matter the product risk level, particularly in vulnerable food production systems.

An investigation in 470 businesses from ten Central and East European countries (EU Member States and third countries) showed that preventive systems based on certified FSMSs were aligned with higher understanding of food safety. If the level of knowledge of food safety was higher in EU Member States, the attitudes towards hygiene and food safety of managers were the same in MSs and in Third countries, with all managers taking seriously legislative requirements and prioritizing investment in hygiene and food safety over other business needs (Tomasevic et al., 2020[33]).

In the role-based culture, typical of transitional countries, strict hierarchal and bureaucratic approach to food safety is found. It is associated with reactive food safety culture and only *ex post* (corrective) actions. In more task-oriented cultures, with food safety based on the risk paradigm, managers' positions and influence are based on knowledge and experience. The HACCP principles and FSMSs contribution to the task-oriented culture is displayed in the need for all workers to be well trained and informed about hygiene and food safety and in the empowerment of those who are members of the HACCP team or responsible for monitoring, corrective actions and verification. Task-oriented cultures are thus more associated with pro-active and active food safety culture.

With the rising evidence that the elements of culture influence the preventive approach and the effectiveness of food safety programmes, the need for assessment and measurement of food safety culture emerged.

A range of quantitative (data obtained through questionnaires) and qualitative methods (focus groups, interviews, discussion groups) have been used to assess food safety culture in business settings. Often, a combination of the two is used to assess more precisely the culture. The information which can be obtained through the assessment may help a) improve compliance to rules; b) allow comparing the culture between different facilities owned by the same entity and help the management target those where improvements are needed; c) help define training needs; d) increase awareness of food safety; e) support management and employees commitment to food safety and f) identify weaknesses in FSMS and the level of risk for food safety.

### *Evaluation tools for businesses*

The investigation on the *Listeria* outbreak within Maple Leaf Foods Inc. deli products in 2008, when 23 persons died in Canada, identified the insufficient commitment of the management of the company to food safety. This insufficiency caused inappropriate risk assessment. The company failed to recognise and identify the underlying cause of a sporadic but persistent pattern of environmental positive test results for *Listeria spp* since managers had not Listeria as a priority in their HACCP plans. The new management strongly committed to food safety and included sustainable food safety behaviour into the existing company culture. This included a combination of the emphasis on technical conditions for food safety and on behavioural factors which influence managers' attitudes. Several studies (Powell, Jacob and Chapman,

2011[34]) (Jespersen, Griffiths and Wallace, 2017[35]) assessed different food safety culture evaluation models used in food businesses and identified five main dimensions of culture which may provide information about needs for improvements:

- Values and mission – they need to be defined having in mind the long-term effect on food safety with leaders understanding and supporting food safety;
- People – external and internal stakeholders influence and engagement, education, governance, motivation and communication;
- Consistency – of food safety proprieties with people, technology, resources and processes;
- Adaptability – to the ever-changing environment, and
- Risk awareness – including how risks are managed and communicated.

These dimensions clearly show the connection between the corporate and the food safety culture, since only risk awareness is specific for food safety and the other four are common for both cultures. These five dimensions have been adopted i.a. by GFSI and broken down in sub-dimensions to be used to understand better and improve food safety culture, and gradually integrated into leading FSMS standards. The review of 41 published papers on the evaluation of food safety culture demonstrated that the use of more determinants of culture provides a more complete picture (Samuel, Evans and Redmond, n.d.[36]).

Upon defining the culture, GFSI suggests applying a "food safety maturity matrix", a tool based on "attributes" of leadership corresponding to each maturity level (Table 2.1). The maturity is closely connected to leaders' and managers' attitudes towards food safety and hygiene and is reflected in workers´ behaviour and compliance with rules.

### Table 2.1. GFSI maturity level matrix

| | | |
|---|---|---|
| Maturity level | Calculative non-compliers | Managers encourage non-compliance except when there is a risk of enforcement. They do not secure resources for hygiene. |
| | Doubting compliers | Managers themselves do not follow the rules and do not provide feedback to employees when they fail to follow the rules. |
| | Dependent compliers | Inconsistent leadership regarding food hygiene. Following rules from the regulator. Lack of initiative and presence of leaders/managers in food working areas only during official controls. |
| | Proactive compliers | Leaders and managers follow rules and provide good example to employees. Leaders provide feedback to employees regarding compliance with legislative requirements. |
| | Leaders | Active support to employees, frequent encouragement to apply hygiene procedures, recognition of good practices implemented by employees. |

Source: Adapted from (GFSI, 2019[37]).

Simplot Australia, a key wholesaler, introduced its own numerical maturity scale to measure food safety and quality culture in terms of: a) awareness; b) roles and responsibilities associated with food safety and quality; c) cross-functional ownership of food safety and quality outcomes and d) decision-making authority of food safety and quality at all operational levels. Once the level is measured, it is compared to targets and used for strategic planning, to complement other measurable indicators such as financial success and customers´ satisfaction (Food Standards Australia New Zealand, 2017[22]).

It is important to emphasise that having only food safety management systems is not enough protection from food-related incidents. A strong food safety culture extends the responsibility to all those involved in the business process and allows managers to do their work, instead of "extinguishing fire" caused by employees not performing their food safety-related tasks. International food businesses (processors, restaurants, retailers), which are good performers, openly communicate their food safety practices to customers, third party auditors and regulators and this transparency provides a framework to increase trust of external stakeholders (Manning, 2018[38]).

*Evaluation tools for control agencies*

An example of an enforcer using the assessment culture when choosing the approach to a business is the UK Food Standards Agency Food Safety Culture Diagnostic Toolkit for Inspectors, which guides inspectors through: a) the assessment practices b) the use of the food safety culture matrix to categorise the culture in a business and c) the provision of advice to businesses on how to improve the culture (Food Standards Agency, 2012[39]). The Toolkit should help inspectors understand the management´s attitudes to hygiene and food safety and its relation with the company´s compliance. Inspectors may choose to perform a more general or more in-depth assessment of a business based on observations of the food safety elements and behaviour of managers. Behaviour of managers is to be classified into one of the five categories, namely: a) calculative non-compliers; b) doubting compliers; c) dependent compliers; d) proactive compliers and e) leaders. Each category can be further investigated across food safety elements of a business: a) priorities and attitudes towards food safety and hygiene; b) perception and knowledge of food safety hazards; c) confidence in food safety requirements; d) ownership of food safety and hygiene; e) competence, learning and training in food safety and hygiene systems; f) employee engagement in review and development of food hygiene practices and g) communications and trust to engage in food safety and hygiene report issues. The goal of the Toolkit is to: a) increase compliance of businesses by providing them the type of advice which is the most fit for each category of managers ´behaviour; b) provide advice for each food safety element of a business per category of managers´ behaviour; and c) integrate all food safety elements of a business in one matrix.

The value of the FSA Toolkit has been examined in a survey done on a sample of environmental health officers, food and beverage managers and academics. The findings suggest that external assessment helps identify gaps which otherwise would be hidden (mostly in small-scale businesses, where food safety was not a matter of high concern). The survey also highlighted certain attitudes of line managers in food businesses, which may hinder implementation of food safety management systems. Lastly, having the Toolkit, businesses may perform self-audits and correct attitudes on time, thus increasing the efficiency of food safety management systems (Nayak and Waterson, 2017[40]).

Australian dairy regulator RegTech has its own qualitative scheme for assessing maturity. It is based on the Jesperson's five dimensions and classifies maturity in five stages: Doubt, React, Know, Predict, and Internalise. The stages correspond to the GFSI´s levels of maturity and FSA categories and the goal of this scheme is to identify the linkage between behaviours and the five dimensions of culture and to improve food safety by changing behaviours.

## Food safety culture and COVID-19

The US FDA New Era of Smarter Food Safety initiative highlighted the need for new technology. COVID-19 revealed the need to use technological solutions which can store and process food safety big data in many countries. There is not always, however, effective sharing of the data collected respectively by official agencies (regulators) and by private businesses and private certifiers. There is potential for potentially improved food safety management and regulation if data were to be shared more regularly and effectively, in particular regarding food safety culture.

COVID-19, by requiring physical distancing, influenced the communication, training and coaching methods and their frequency. Multiple food testing laboratories offered their services to health authorities and thus their capacities for testing food became limited. This induced the FDA's recommendation to businesses to perform only essential food safety verification tests and implement more stringent control on cleaning and disinfection and control of workers´ habits and health (U.S. Food & Drug Administration, 2021[41]). Such new requirements are better addressed in active and adaptable food safety cultures (pro-active compliers and leaders) where the synergism of attitudes and behaviour along with consistent and structured approach to food safety delivers better results.

Improved knowledge of businesses´ food safety culture could help regulatory agencies perform more accurate risk-based categorisation of businesses and allow to reduce the frequency of physical inspections, reducing the exposure of inspectors and businesses to the virus.[5]

## Conclusions

The evolution of controls in respect of food safety from *ex post* to *ex ante* resulted in a better understanding of hazards and ways to favour their mitigation and elimination. Although HACCP principles are mandatory in many countries and risk-based approach to control is becoming widely spread, the number of food incidents remains high and new hazards emerge. The level of activity and maturity of food safety culture is a significant component of FSMSs and food public agencies' control. Food safety culture is as significant as the implementation of HACCP principles was in due time.

Certification bodies have significantly contributed to the improvement of food safety, but still, food incidents continue to emerge. The dilemma here is not whether to implement food safety culture, but how to do it. The initiative of GFSI to include food safety culture in the standard and to perform the assessment when auditing for certification purposes is a significant step towards having more businesses improving the culture. Having the same elements of culture, identified by control agencies and GFSI, suggests that control agencies may use the maturity level determined by third party auditors to adapt their advice and control activities to certified businesses.

The new era of food safety is food being reformulated: there are new foods, new production methods, and new delivery methods along with an increasingly digitised system.

## Notes

[1] The Global Food Safety Initiative is a business-driven initiative for the continuous improvement of food safety management systems to ensure confidence in the delivery of safe food to consumers worldwide. GFSI provides a platform for collaboration between some of the world's leading food safety experts from retailer, manufacturer and food service companies (…) Key activities within GFSI include the definition of food safety requirements for food safety schemes through a benchmarking process. This process is thought to lead to recognition of existing food safety schemes and enhances confidence, acceptance and implementation of third party certification along the entire food supply chain (source: https://en.wikipedia.org/wiki/global_food_safety_initiative).

[2] https://www.brcgs.com/our-standards/food-safety/.

[3] https://www.foodstandards.gov.au/foodsafety/culture/Pages/default.aspx.

[4] TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union, and the intra-EU trade and EU exports of animals and certain animal products.

5 In this context, it is relevant to mention the European Commission Implementing Regulation (EU) 2020/466, passed as temporary measures to contain risks to human, animal and plant health and animal welfare during certain serious disruptions of Member States' control systems due to COVID-19, https://eur-lex.europa.eu/legal-content/en/txt/?uri=celex%3a32020r0466.

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