SCIENCE UPDATE 2021

Report by Rick Mumford

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1. Summary

1.1 This paper gives an annual update on FSA's science, including:

a) The role of science in the FSA
b) The benefits of FSA science
c) A description of our science capability
d) A review of the work undertaken since the last update
e) A summary the top priorities for the next 12 months and beyond.

1.2 The Board is asked to:

a) note the progress made in developing the FSA's science capability and capacity; and
b) comment on future priorities and direction.

2. Introduction

2.1 Science is integral to the work of the FSA, and we continue to put science at the heart of everything we do, to ensure that the decisions made by the organisation are informed by robust evidence.

2.2 This annual update sets out the progress made in improving the FSA's science capability and capacity and discusses the potential future trends and priorities.

2.3 Whilst this paper provides an overview of science activities within the FSA, it should be considered alongside other relevant science updates delivered throughout the year, including but not limited to:

a) The annual report of the CSA[1]
b) The annual report of the Science Council[2]
c) The annual report of the Advisory Committee for Social Science[3]
d) The annual update on horizon scanning[4].

[1] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-06-04-annual-science-update-from-the-fsas-chief-scientific-adviser.pdf
[2] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-03-04-science-council-chairs-annual-report-to-the-fsa-board.pdf
[3] FSA 21/12/07 Advisory Committee for Social Science Update 2021
[4] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-06-06-annual-report-on-horizon-scanning.pdf

3. The Role of Science in the FSA

3.1 Science in the FSA is comprised of evidence to support regulatory decisions and research to support policy development and organisational transformation. Whilst there is some direct impact from the science the FSA conducts, most of the impact of FSA science is realised through more robust policies and the impact of policies and interventions that are informed by the science and evidence.

3.2 As part of ensuring that the UK has effective, post-EU food regulation in place, we have invested in a new 'best in class' risk analysis process. Essential to this is an expanded and enhanced risk assessment capability, designed to replace the one currently provided via EFSA (the European Food Safety Authority).

3.3 The risk assessment capability previously provided by EFSA was both extensive and well-established. Hence, its replacement has taken significant investment in both time and resources. It has been the main science-focus over the last 3-4 years and as a result, our science to support our regulation accounts for a large proportion of our overall investment in capacity and capability

3.4 Our research to support our business as usual functions and transformation programmes and capability building following EU Exit include:

a) Operational Transformation: as the FSA aims to change the way it delivers operational services (such as meat hygiene inspections) we are looking to deliver innovative digital and analytical solutions to support this transformation. This will be underpinned by strategic and applied research (for example the 21st Century Abattoir project looking at new technologies in the meat processing sector).

b) Food hypersensitivity: the FSA has an ongoing programme to better protect consumers living with food allergies and hypersensitivity. We are developing a refreshed and enhanced research and evidence programme which will drive new policy and operational activities.

3.5 We also have a substantive involvement in wider government programmes. Key examples of cross-government activities which are supported by the FSA's science delivery include:

a) our research and surveillance programme on antimicrobial resistance (AMR), which aligns with the UK's 20 Year AMR Vision and the cross-government AMR National Action Plan (NAP);

b) working with FSS and Defra to deliver new surveillance work on food standards, which will support UK trade; and

c) working with other funders and government departments, taking a joined-up approach to strengthening national agri-food biosecurity, ensuring that food safety priorities are well aligned to those in animal and plant health, and that we take a wider 'One Health' approach. For example, we are ensuring better linking of work on foodborne pathogens/AMR in food to work on animal/zoonotic pathogens/antimicrobial usage in agricultural production systems. Also, the pilots being run under the Shared Outcomes Fund PATH-SAFE project are perfect examples of this approach (see section 6.31 below).

3.6 By increasing the number of science staff based in York, Belfast and Cardiff, and by ensuring research spending is targeted at excellent regional laboratories and academic experts, not just the South East, we are aligned to the Government's levelling up priority. Of the current Research and Evidence budget, 69% is spent outside of London and the southeast and this is split between a diversity of research institutes (including the universities of Newcastle, Manchester, Liverpool, Exeter and Swansea) and private companies (including SMEs).

3.7 We also wish to engage with the innovation and productivity agenda, by ensuring our regulatory science can better support those innovating in areas such as novel foods or sustainable packaging, through early engagement and co-design. To date, this has included discussions with Innovate UK (as the government's main innovation funding body) to understand how best to engage and deliver impact in this space.

4. The Benefits of FSA Science

4.1 The science, evidence and research delivered by the FSA serves two core purposes:

a) The provision of new evidence to fill knowledge gaps and provide insight, in support of risk analysis, policy making, operational delivery and the wider delivery of the FSA's objectives.

b) The maintenance of existing/building of new scientific capabilities (e.g., skills, expertise, methods, tools) that support the work of the FSA and the wider national food safety/standards system.

4.2 As a result of this, the most significant benefits from FSA science are reflected indirectly in the work that the science helps inform or support, rather than in the impact of the original science itself. Therefore, measuring the real benefits of FSA science is challenging and hence the need for further work (currently under development) to help us be able to properly evaluate the impact of our science, evidence and research activities.

4.3 Part of this will be understanding how our science contributes to national strategic priorities. Examples of where FSA science delivers these types of benefits includes:

a) Our research contributes to strengthening UK science excellence supporting the UK's drive to increase its R&D spending to 2.4% of GDP. This is through building partnerships and contributing to growing national science capability; investing in our universities and Public Sector Research Establishments (PSRE), which are based across the UK. We invest in human capital, promote innovation and strengthen the UK's reputation as a world-leader in science; grow the research talent pipeline, ensure a resilient future food safety capability; and support the FSA's role as a modern regulator, working proactively with innovators to co-design the regulatory science frameworks required to support innovative new products (e.g., alternative protein, gene edited crops), which will drive increased productivity and economic growth.

b) Recent estimates have demonstrated the societal burden of foodborne disease (pathogens) to be £9.1bn a year, based upon an estimated 2.4 million cases. We provide benefits to public health by understanding and reducing this burden. For example, the FSA's Campylobacter Reduction Strategy (underpinned by effective surveillance) yielded a reduction of 100,000 cases by 2016 (equating to potential annual savings of £263m to UK PLC).

c) Having an effective and functioning food safety regulatory system, underpinned by robust science and evidence, not only maintains public health but also trust in the food system. This trust has significant value to consumers and industry as it stimulates demand for British food products.

d) Major foodborne disease outbreaks can cause direct losses and reduced sales. Missed, slow or inaccurate diagnoses of outbreak causes can further exacerbate these substantial economic losses. Our science (e.g., the PATH-SAFE programme described in section 6) improves the UK's diagnostic capability which in turn improves its efficacy and reduces losses to society.

e) Improving the underlying evidence base increases confidence in the regulatory system. This in turn facilitates trade by establishing and maintaining food standards which are globally recognized, which play a key role in demonstrating the integrity of UK brands and securing global demand for UK products.

f) Stimulating private sector research, through project funding, supports innovation and addresses potential market failures.

5. Our Science Capability

5.1 Since the last update[5] we have continued to deliver science in line with the four-part strategic plan presented in 2019[6] which is outlined in Figure 1.

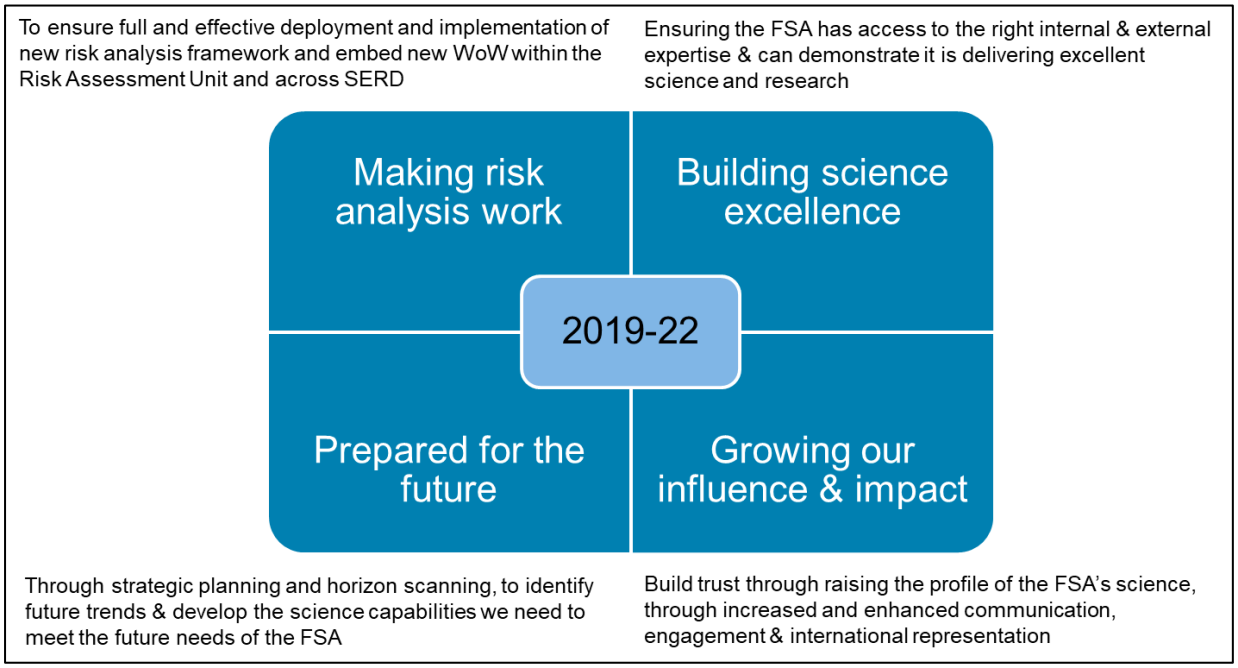

Figure 1 The strategic plan for the Science, Evidence and Research Division (SERD)

5.2 To achieve this, we have strengthened both out capacity and capability. The size of the Science, Evidence and Research Division (SERD) in the FSA has increased from 94 FTE posts in summer 2020 to an approved headcount of 134 in Autumn 2021. The largest single area of investment was risk analysis (as explained in sections 3.2 and 3.3).

5.3 In addition to investing in staff resource, we have continued to invest in research and evidence, with current projected year end external spend on science of £10.2m in FY2021/22. Combined with other spend (e.g., staffing) this is forecast to result in a final year total science spend of £17.4m, compared to £12.8m in FY2020/21.

5.4 The increased investment in our capability has primarily enabled us to deliver the additional responsibilities that were previously delivered by EFSA but has also enabled us to understand the impact of the Covid-19 pandemic on the food system (including increased surveillance) and gain greater insights into consumer's views, in order that the FSA can deliver a more efficient, and relevant, regulatory function.

[5] https://www.food.gov.uk/sites/default/files/media/document/fsa-20-09-13-annual-science-update.pdf
[6] https://webarchive.nationalarchives.gov.uk/ukgwa/20200803154309/https://www.food.gov.uk/sites/default/files/media/document/fsa-19-09-19-science-update-2019-final_0.pdf

6. Recent Progress

6.1 Whilst the science strategy is based around 4 key priorities, it is delivered through our business plan, aligned to the five core functions that SERD supports, and our progress in the last 12 months against each of these is described below.

Risk Analysis

6.2 We provide this function so that we can fully support the FSA's Risk Analysis Process, by having a fully functioning system to provide risk assessment and other legitimate factor evidence. Through the provision of expert risk assessment and other evidence, we maintain the UK's requirements in ensuring the safety of food and feed, as the competent authority.

6.3 We have continued to build capacity and capability in the regulated product service and embed it in our delivery, undertaking continuous improvement exercises. At the current time, 63 dossiers have completed the suitability check (with 310 undergoing suitability checks) and we have welcomed 20 new staff into the agency with associated induction and specialist training. We have also worked with colleagues from other Government Departments who need to use the risk analysis process to develop appropriate procedures.

6.4 We have established a new "Exposure Assessment & Trade" team to deliver the imported food and feed public health risk assessments on behalf of the UK Office of SPS Trade Assurance. This is another essential function repatriated from the EU.

6.5 Two major risk assessments for high profile non-routine issues have been delivered through the process.

a) The first on chilled and frozen meats was discussed at the UK-EU SPS Committee where the risk associated with imported chilled and frozen meat preparations has been estimated qualitatively for six EU countries. Discussions are now taking place on sharing the assessment with the EU.

b) The radiological risk assessment on Japanese food imports in relation to the Fukushima nuclear accident is about to be published. The Japanese food import risk assessment estimated that removing the 100 becquerels per kilogram (Bq/Kg) maximum level of radiocaesium (radioactive forms of caesium) for food imported from Japan to the UK would result in a negligible increase in risk to UK consumers.

6.6 We published our Risk Communication toolkit, a new product co-created with practitioners and the public, incorporating the latest academic thinking to ensure risk communication is considered throughout the risk analysis process to increase the understanding of the reasoning behind our decisions (and thus increasing the confidence in the FSA). Risk communication sits as the third

essential pillar of the risk analysis process, sitting alongside risk assessment and risk management.

6.7 The Advisory Committee for Social Sciences (ACSS) provided guidance on evidence on other legitimate factors which has been incorporated into our policy playbook. This means that the FSA is now able to consider all relevant information when making risk management decisions.

Provision of expert analysis for FSA and wider food policy

6.8 By providing quality, impactful socio-economic and statistical expert analysis, we ensure that the FSA has access to the right data, analysis, and evidence, in a timely and prioritised way. This is a core enabling role for other FSA teams, to ensure they can make decisions informed by robust evidence and offer effective services. Examples are given below.

a) We have been tracking consumer attitudes and behaviours throughout the pandemic, in as close to real time as possible, looking closely at household food insecurity, handwashing practices and social attitudes. Although measures of household food insecurity have fluctuated throughout the pandemic, recent data indicates that levels of household food insecurity are similar to the level recorded during the first UK national lockdown (April 2020). Our consumer research also shows that the pandemic led to significant changes in consumer's usual handwashing habits; particularly an increase in the amount of time spent and frequency of handwashing. Despite this, there has been a decline in the proportion of participants who wash their hands for the recommended 20-24 seconds, a trend we will continue to monitor[7].

b) We have also conducted research with consumers to understand their risk perceptions to support risk management, including on gene editing. This information has been used to inform our wider policy response, so that the FSA continues to be responsive to emerging priorities and views of consumers.

6.9 We reviewed our flagship Official Statistics survey, Food and You, changing the methodology to provide more frequent, timely and flexible analysis on a broad range of topics. We have also brought in innovative observed techniques to close the 'say-do gap' in reported behaviour, observing actual food safety behaviours in 100 commercial and domestic kitchens through a new project, Kitchen Life 2. Full fieldwork is underway, but the pilot study suggests that actual food safety behaviours (especially around leftovers and handwashing) are at odds with attitudes and knowledge. This informs not just our risk assessment modelling but also identifies possible behavioural interventions to trial.

[7] https://www.food.gov.uk/research/research-projects/consumer-handwashing-research-handwashing-in-a-pandemic

6.10 We have provided analytical support to all FSA's main change programmes. For example, for the Achieving Business Compliance (ABC) programme we have conducted a thorough review of all current relevant research to identify evidence gaps and future analytical requirements and supported Local Authorities to develop a Food Standards Pilot which will inform the national roll-out.

6.11 We have further developed our Cost of Foodborne Disease research programme, to look at costing all elements of food hazards, from foodborne pathogens to food hypersensitivity and to chemical contaminants. Recent successes include completion of a report looking at the additional costs faced by those that suffer food allergies and intolerances. Overall, this is a multi-year programme of research to understand the burden different foodborne diseases place on society and consumers and thus strengthen the evidence base for why the FSA should take prioritised action against different food hazards. For example, the average cost to society of one case of foodborne disease is £4,000 and the total foodborne disease puts a burden on the UK of £9.1bn per year[8].

6.12 We delivered an expert opinion elicitation exercise to estimate the relative public health risk associated with imported Products of Animal Origin. The outputs from this informed the levels of checks at Border Control Posts in Great Britain to help facilitate trade.

6.13 We have undertaken a Multi Criteria Decision Analysis (MCDA) with EMT to rank thirteen foodborne pathogens in order of their detrimental effect on UK society. This overall approach to prioritisation uses a series of foodborne disease-related estimates produced by the FSA's Analytics Unit including cases, deaths, cost of Illness and QALYS, and well as two additional criteria of public concern and scientific confidence. The results show that Norovirus, Listeria Monocytogenes, Campylobacter, Salmonella and Cl. Perfringens all ranked high in their detriment to society, with Norovirus the highest[9].

Delivering our External Research & Evidence Programmes

6.14 We have established and embedded effective research and evidence programmes to promote the prioritised, efficient, and transparent delivery of quality science and evidence. These programmes are strategically aligned to the needs of the FSA so that outputs are readily adopted and used. This also enables an effective pipeline of research that maximises delivery of quality science in a manner that is efficient, and which offers genuine value for money.

6.15 In the previous report, we indicted that we had published the FSA Areas of Research Interest (ARI), which publicly outline our research priorities, in order to enhance collaboration. We have now created a research programme for

[8] https://www.food.gov.uk/sites/default/files/media/document/the-burden-of-foodborne-disease-in-the-uk_0.pdf
[9] https://www.food.gov.uk/research/foodborne-diseases/prioritising-foodborne-disease-with-multi-criteria-decision-analysis

each of the ARI questions and have established various systems and processes to increase our efficiency. This includes identifying an FSA technical lead for each programme, establishing steering groups to discuss and prioritise evidence needs and employing some dedicated resource to help coordinate the programmes (these are all in line with the recommendations of Working Group 5 of the Science Council [10]). This increased efficiency ensures that when we deliver the essential research to support other FSA functions, it is providing the UK taxpayer with the most value for money.

6.16 Whilst there may still be some minor fluctuations across the remainder of the 2021/22 financial year, the approximate distribution of research spend across each programme is indicated in Figure 2.

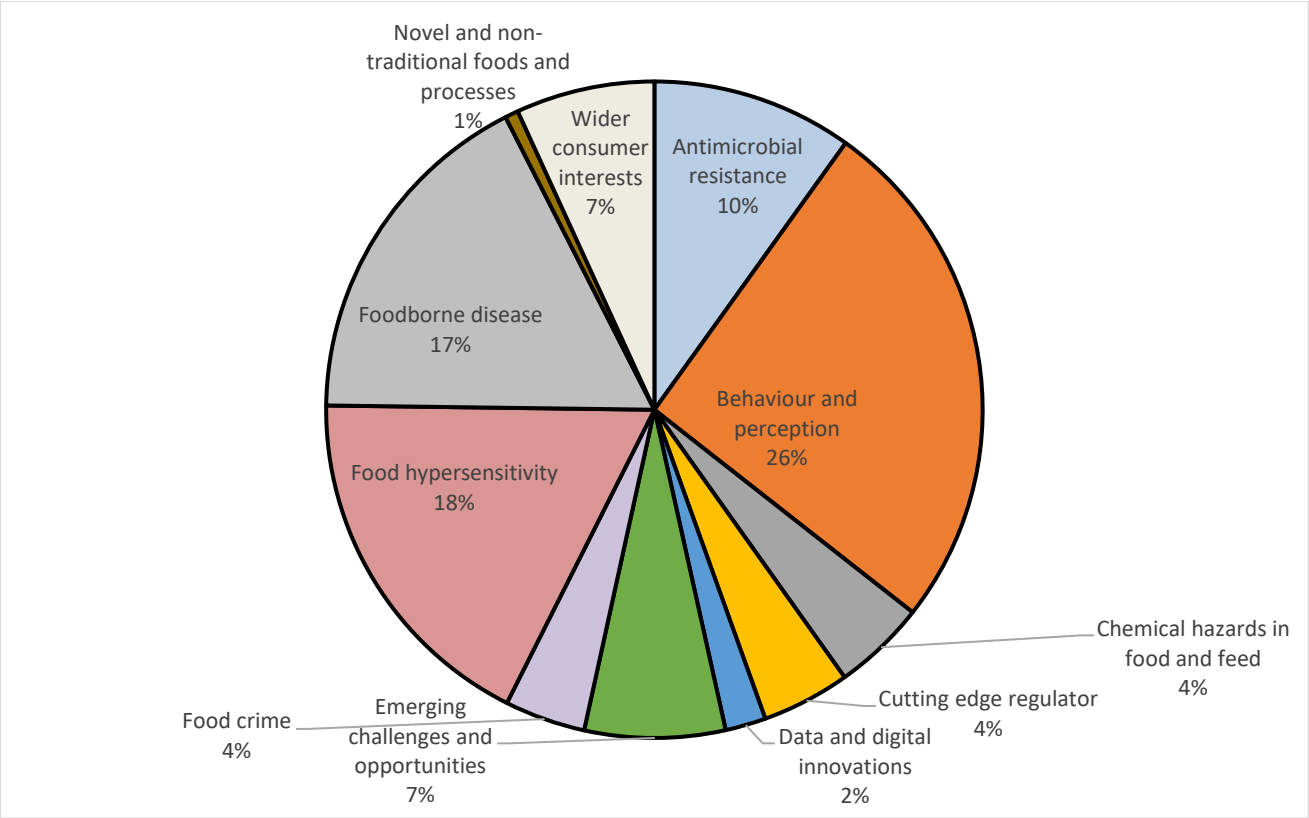

Figure 2 Anticipated end of year distribution of spend across the FSA Research and Evidence Programmes

6.17 Throughout the year we published approximately 60 scientific reports produced as part of our research programmes including 6 peer-reviewed papers, published by SERD staff as authors and reflects a wider push to increase the range of our science outputs to increase their impact. A full list of our publications is contained in the annex to this report.

[10] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-06-09-final-report-of-science-council-working-group-5-on-food-hypersensitivity.pdf

6.18 To help us understand the use of FSA science, unique Digital Object Identifiers are now assigned to all FSA science publications. Whilst it is too early to analyse the information, in future this will enable us to reflect which research is used most and understand how that work is being used. This will inform our impact workstream, which will help us to demonstrate impact across our entire science portfolio, to ensure we are prioritising the right science and the work we are doing is providing the greatest benefits.

6.19 A key aspect required to enable the delivery of our research and evidence programmes, is increasing our engagement and working in partnership with others to maximise the return on our investment in science. One of the biggest successes in this regard in the last year has been our joint initiative with UK Research and Innovation (UKRI) to jointly fund six projects to bring the public and researchers together to investigate food standards challenges. Covering topics including antimicrobial resistance (AMR), food hypersensitivity and food safety and hygiene in the home, in addition to providing invaluable data, these Citizen Science[11] projects will allow the communities we serve to help build the evidence on which policy decisions are made.

Science Governance & Assurance

6.20 Science remains core to everything the FSA does and should be trusted. By providing a governance and assurance function, we ensure that the FSA Board and senior management team are assured by the quality of the science that is produced. Implementing and maintaining effective assurance reduces the risk to the organisation that decisions will be challenged.

6.21 Access to independent scientific expertise, is part of this overall assurance. We ran a further recruitment campaign for the FSA's Science Council and Science Advisory Committees (SACs) resulting in the reappointment of 8 members and the appointment of 12 new members. This has continued to strengthen our committees provide additional assurance to our risk analysis function.

6.22 Following work to refresh them, all of the SAC websites were audited by the Digital Accessibility Centre of the Cabinet Office, and all have been deemed to pass, demonstrating the FSA continued commitment to accessibility.

6.23 Details about the work of the Science Council was contained in the annual report on its work in March 2021[12]. More will be provided the next report of the Science Council Chair in 2022 but three key pieces of work for the last 12 months have been:

a) A rapid evidence review to establish principles and guidelines for assessing the quality of evidence and to provide assurance that the FSA

[11] Citizen Science is where members of the general public, typically as part of a collaborative project with professional scientists, participate in research to increase scientific knowledge outside of normal participation methods.
[12] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-03-04-science-council-chairs-annual-report-to-the-fsa-board.pdf

has in place clear, robust and defensible processes for the objective and critical appraisal of third-party evidence that is submitted[13].

b) Completion of Working Group 5 on food hypersensitivity (FHS) which was established to consider and advise on future research priorities and direction in respect to FHS and conduct a review of the science and evidence base for addressing FHS, and the part the FSA and others should play in enhancing knowledge.[14] This has confirmed that our approach to the delivery of the research and evidence programmes described above is appropriate. It has also provided confidence that our FHS research to date has been impactful and enabled prioritisation of future FHS research to deliver the most impact.

c) The establishment of Working Group 6 to consider how changes to achieve net zero carbon could affect the safety of the food system over the next decade. Whilst it is too early to understand the impact of this work it is likely to help the FSA plan for the future and be proactive in protecting the public, as we see sustainability become a major driver for change in the food system.

6.24 The Science Advisory Committees have continued to provide assurance to the decisions of the organisations reducing the risk of challenge with the work of the Advisory Committee for Social Science is described in a separate report.[15]

Surveillance & National Capability

6.25 We continue to work towards the delivery of an integrated surveillance sampling system and a more effective and sustainable national capability model. This includes addressing our vision for the future for UK official food and feed laboratories[16], our future approach to sampling[17] and the development of a programme of work to develop our foresight capability. This allows data from a multitude of diverse sources (from physical sampling to horizon scanning) to be collated and reviewed, so effective and co-ordinated actions can be taken, in a timely manner. This helps the organisation to be strategic, rather than reactive, regarding emerging threats and opportunities. This includes having sufficient laboratory capacity to deal with a major foodborne incident or other surge in demand.

6.26 Through the FSA's cross-government sampling group, we have taken forward the deliverables outlined in the November 2020 Board paper, including developing internal processes for prioritisation leading to targeted surveillance sampling programmes for retail and import sampling. The first of these

[13] https://doi.org/10.46756/sci.fsa.elm525
[14] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-06-09-final-report-of-science-council-working-group-5-on-food-hypersensitivity.pdf
[15] FSA 21/12/07 Advisory Committee for Social Science Update 2021
[16] https://www.food.gov.uk/sites/default/files/media/document/fsa-19-09-06-lab-review.pdf
[17] https://www.food.gov.uk/sites/default/files/media/document/fsa-20-11-05-fsa-sampling-framework-our-future-approach-to-sampling-final.pdf

sampling programmes was in late 2020 and the second is currently underway. These targeted programmes are designed to provide assurance in the food system, by providing evidence on levels of non-compliance. The 2020 programme was particularly useful in demonstrating that despite reductions in local authority sampling, as a result of Covid-19, the majority of non-compliances did not indicate a food safety risk.

6.27 In addition, we have delivered a range of other sampling-related activities. We have undertaken research on the approaches taken by other countries to sampling, published internal guidelines on delivering sampling, drafted internal data standards for recording sampling outcomes and developed metrics for annually reporting on the outcomes of sampling activities, with the first summary being presented in the FSA Board Performance and Resources report Q4 2020/21[18]. Collectively, these projects have allowed us to review our current approach to sampling, better define the impact it is having and make improvements as required to reflect best practice.

6.28 We provided a Horizon Scanning Annual Update to the FSA Board in June 2020[19]. Since then, have developed our internal processes associated with horizon scanning by systematising our intelligence flows and assurance processes. This has enabled us to provide strategic insight to help develop the FSA priorities and by being more proactive, our strategy. New insights are discussed by a cross-cutting team of senior leaders, led by the FSA's Strategy Unit on a regular basis and actions and decisions taken to implement activities across operations, policy, regulatory compliance and communications in response.

6.29 This includes analysis of:

a) The political, economic, social, technological, legal and environmental changes likely to impact on the food system in the next 5-10 years
b) the emerging technologies most likely to impact on the food system in the next 5 years
c) the impact of labour shortages on the UK food system on food safety and availability

6.30 Current analysis is looking at:

a) alternative proteins
b) systemic vulnerabilities in the UK food system
c) the future of animal feed
d) the application of early warning systems to the food sector
e) personalised nutrition
f) 3d printed food technology

[18] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-06-14-q4-20-21-performance-and-resources-report.pdf
[19] https://www.food.gov.uk/sites/default/files/media/document/fsa-21-06-06-annual-report-on-horizon-scanning.pdf

6.31 Following a successful bid to the second round of HM Treasury's Shared Outcomes Fund, the Pathogen Surveillance in Agriculture, Food and the Environment (PATH-SAFE) consortium was awarded £19.2 million to develop a new surveillance system, to protect public health. Led by the FSA, the project brings together a cross-government consortium (Food Standards Scotland (FSS), the Department of Environment, Food and Rural Affairs (Defra), the Department of Health and Social Care (DHSC), The UK Health Security Agency (UKHSA) and the Environment Agency) to test the application of genomic technologies in the surveillance of foodborne pathogens and antimicrobial resistant (AMR) microbes in all four nations of the UK.

6.32 The PATH-SAFE funding will support a three-year project to develop a pilot national surveillance network, using the latest DNA-sequencing technology and environmental sampling to improve the detection and tracking of foodborne and antimicrobial resistant pathogens through the whole agri-food system from farm to fork. The heart of this 'virtual' network will be a new data system that will permit the analysis, storage and sharing of pathogen sequence and source data, collected from multiple locations across the UK by both government and public organisations. This work demonstrates the role of the FSA as a leader and facilitator of collaboration across government to provide a coordinated response to a challenge that is not confined to a single department. It also demonstrates the FSA commitment to innovation. This will both increase efficiency and strengthen national agri-food biosecurity.

7. Future Priorities

Development of new science strategy

7.1 The Science, Evidence and Research Division (SERD) has a strategic plan that covers the period 2019-2022. We have conducted an initial review of whether the strategy is still appropriate and have concluded that the 4 strategic priorities (as shown in Figure 1) still apply with the exception that, as a result of significant effort over the last few years, "making risk analysis work" has now been broadly achieved and is part of a wider aspect of "delivering evidence and analysis" which will replace it.

7.2 Over the next few months, we will be further developing the SERD strategic plan. This work will align with the ongoing development of the FSA strategy and ensure that we have the suitable capabilities with which to provide the science required to enable the delivery of FSA strategy in the future.

7.3 Designed to run from 2022, this updated science strategy will build on the four high-level priority areas (as below) but also develop further prioritised goals that will both underpin the science plan but also align to the overall FSA Strategy:

a) Delivering our evidence effectively: focusing on delivering quality outputs, in an effective and efficient manner, and ensuring we have the right skills and talent to do this.

b) Enhancing our science excellence: by developing and embedding new methods and creating strong research partnerships.
c) Building our influence and impact: increasing the visibility and impact of our science, including building our international reputation.
d) Ensuring we are prepared for the future: by improving our forward planning and our capacity to respond to future challenges.

7.4 Progress against the science strategy will be measured through Key Performance Indicators (KPIs). The aim of these KPIs is to measure progress toward achieving our desired outcomes, identifying areas for strategic and operational improvements, creating an analytical basis for decision making and to help focus attention on what matters most. These KPIs have been developed with input from the Science Council and are characterised into 4 themes under each priority creating a total of 16 indicators. The themes are "our people", "our partners", "our delivery" and "our capability". We are in the process of collating the data for each KPI both to create a baseline and to monitor our progress. We will provide updates on KPIs in future reports.

8. Short-term delivery priorities

8.1 In the next 12 months, the delivery priorities for each of the 5 areas of our business plan will be as follows.

8.2 For risk analysis we will continue to embed and review our processes for improvements that can be made to ensure it is robust and applied consistently and that it is fair in terms of the order in which regulated product risk assessments are produced. This will include:

a) Establishing independent risk assessment advice through a committee to focus on animal feeds, our final pillar to the public health assurance pathway for UK food and feed risk assessment.
b) Working with other government departments, to continue to address the challenges of implementing consistent cross-government risk analysis processes and ensure it is fully functional to protect consumers.
c) Supporting risk analysis with evidence on the legitimate factors pertinent to risk management and risk communication, including on e.g., genome edited foods.

8.3 We will continue to provide expert analysis for FSA and wider food policy to ensure that decisions are based on robust evidence by:

a) Supporting FSA change programmes – Operational Transformation, Achieving Business Compliance and Food Hypersensitivities - through provision of impact assessments, modelling and evidence on trade, consumers and business behaviours.
b) Further exploring the Cost of Illness (COI).
c) Monitoring consumer attitudes and behaviours through our flagship Official Statistics survey Food and You 2 and innovative in situ observed studies such as Kitchen Life 2.

d) Understanding the value of Citizen Science, based on the outputs from the current pilot project programme.
e) Undertaking long- and medium-term horizon scanning, including exploration of anticipatory regulation technique.

8.4 We will strengthen our research and evidence programmes to ensure we are increasing our efficiency and enhancing our impact. This will be achieved though:

a) Building on our progress along multiple workstreams looking at various aspects of "impact". This will include a refresh of the science pages of food.gov increasing the visibility of our past research.
b) Completing our science engagement strategy by mapping all our current relationships to identify and fill gaps (with support from the Science Council) to ensure we are obtaining insight from the leading experts across the UK and beyond.
c) Establishing a programme of reviews for each of the research and evidence programmes to ensure they are delivering their desired outcomes. If needed, this will lead to the amalgamation of programmes or the establishment of new lines of research.
d) Continuing to embed innovation in all programmes to align with relevant government priorities.

8.5 We will continue to ensure that the organisation can feel confident in the evidence used to make decisions and how that information has been obtained by enhancing our science governance and assurance, primary by:

a) Working with the Science Council to enable them to continue to provide high-level, expert strategic insight, challenge and advice on the FSA's use of science to deliver FSA objectives.
b) Conducting an independent triennial review of the Science Advisory Committees and Science Council to provide assurance to the FSA, wider Government and consumers that the SAC roles and purposes are appropriate in addressing the future needs, and that the bodies are operating effectively whilst taking account of the requirement for public sector efficiency.

8.6 We will increase our surveillance national capability workstream to ensure we are prepared for the future. This will include:

a) Developing our evidence and analysis of the potential options to deliver a UK official laboratory system that is sustainable and resilient against future challenges, ensuring the UK has laboratory capability to carry out routine and incident testing of food to deliver our vision for the future of official food and feed laboratories[20]. A preferred option for the future laboratory model will be presented to the Board for consideration at a future meeting.

[20] https://www.food.gov.uk/sites/default/files/media/document/fsa-19-09-06-lab-review.pdf

b) Building on the success of last year's programme to deliver further surveillance sampling, including targeted surveillance and a 'basket of foods' survey to provide a baseline of food standards in commonly consumed commodities. This will be used to plan future campaigns and any interventions that may be required.
c) Enhancing our robust systemic approach to horizon scanning to ensure that we have an effective intelligence collection and analysis capability that allows us to undertake targeted collection, as well as a more open approach to detect and analyse weak signals.
d) Further developing a pathway with the Strategy Unit and wider FSA to turn our insights into clear actions for the organisation.
e) Beyond the initial focus of establishing PATH-SAFE (e.g., recruitment of programme team, governance structures in place) and ensuring all four workstreams are starting to deliver, we will maximise the synergies with existing programme of work across the FSA (e.g., IID3 project), and start to build plan for longer-term sustainability of programme, beyond the initial funding window.

9. Conclusions

9.1 The Board is asked to:

- **note the progress made in developing the FSA's science capability and capacity; and,**
- **comment on future priorities and direction.**

ANNEX

Scientific peer-reviewed papers published with FSA co-authors or by FSA funded research fellows since the last update:

- Baseggio Conrado et al (2021). Food anaphylaxis in the United Kingdom: analysis of national data, 1998-2018. BMJ. 372. n251.
- Cairo et al (2021) Bacillus cytotoxicus—A potentially virulent food-associated microbe. Journal of Applied Microbiology
- Janecko et al (2021) Whole genome sequencing reveals great diversity of Vibrio spp in prawns at retail. Microbial genomics. 7(9)
- Jia & Evans (2021) Improving food allergen management in food manufacturing: An incentive-based approach. Food Control. 129
- Patel et al (2021) Using data from food challenges to inform management of consumers with food allergy: A systematic review with individual participant data meta-analysis. Journal of Allergy and Clinical Immunology 147 (6): 2249-2262
- Turner et al (2021) Identifying key priorities for research to protect the consumer with food hypersensitivity: A UK Food Standards Agency Priority Setting Exercise. Clinical & Experimental Allergy. 51(10): 1322-1330.

FSA reports published since the last update:

- A survey on the nutritional content and portion sizes of cheesecake in Northern Ireland
- The cost of food crime
- Eating well choosing better tracking survey - Wave 5-6 (Northern Ireland)
- Food and drink manufacturers views on front of pack nutritional labelling (Northern Ireland)
- Food crime intelligence reporting: barriers and enablers
- NHS (England) hospital food review – FSA evidence package
- Review of antibiotic use in crops, associated risk of antimicrobial resistance and research gaps
- Surveillance of antimicrobial resistance (AMR) in E. coli from retail meats in UK (Year 5, Beef and Pork)
- FSA small and micro food business operator (FBO) tracking survey
- The COVID-19 consumer research
- Research into food sampling policies and approach
- Market and safety analysis of alternatives to plastic food packaging
- TRACE study: The effect of extrinsic factors on food allergy (dataset)
- Meta-analysis of the efficacy of interventions applied during primary processing to reduce microbiological contamination in beef
- Consumers and allergen labelling literature review

- A critical review of the impact of food processing on antimicrobial resistant (AMR) bacteria in meats and meat products
- Assessing the survival of SARS-CoV-2 on food surfaces and food packaging materials
- Consumers' views on EU and food (October 2016 – April 2021)
- Citizen science and food
- Consumers and allergen labelling literature review
- Food and You 2 – Wave 1
- Food allergen communication in businesses feasibility trial
- Food in a pandemic
- Food Data Trust: A framework for information sharing
- The food industry's provision of allergen information to consumers
- Data collection and modelling for food business compliance indicators
- Evaluating the use of remote assessments by local authorities for regulating food businesses
- The FSA risk communication toolkit
- Assessment comparing meat production processes in selected countries
- Food in the platform economy
- FSA National Reference Laboratory Review 2021
- Emerging technologies that will impact on the UK food system
- The cost of a healthy food basket in Northern Ireland in 2020
- A microbiological survey of campylobacter contamination in fresh whole UK-produced chilled chickens at retail sale (Y6)
- Survey of consumer practices with respect to frozen chicken products
- Science Council rapid review on third party evidence: Principles and guidelines
- Valuing FSA research and development
- The effects of consumer freezing on its use-by-date
- Consumer perceptions of genome edited food
- Enhanced molecular-based surveillance and source attribution of campylobacter infections in the UK
- Food and You – Wave 2
- Comparing international approaches to food safety regulation of GM and Novel Foods
- Validation of MultiSpectral Imaging (MSI) technology for food and feed analysis
- Assessing the impact of heat treatment on antimicrobial resistant (AMR) genes and their potential uptake by other 'live' bacteria
- AMR consumer research report
- Qualitative research into the consumption of food with expired 'use by' dates
- FSA consumer segmentation
- FSA consumer research to explore communications on food safety messaging
- Food sensitive study (quality of life) - Wave 1
- Consumer handwashing research: Handwashing in a pandemic