UK Health Security Agency

2022 to 2023 Report of UK National Reference Laboratory for Food Microbiology

Activities for *Listeria monocytogenes*, coagulase-positive staphylococci, *Escherichia coli* (including STEC), *Campylobacter*, *Salmonella* and antimicrobial resistance

April 2022 to March 2023

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Executive summary

UK Health Security Agency (UKHSA) provides the service as the UK's National Reference Laboratory (NRL) for food microbiology for the Food Standards Agency (FSA) and Food Standards Scotland (FSS). This is to comply with the UK Statutory Instrument 2019 No. 665, which retained the Regulation (EU) 2017/625 for Official Control Regulations (OCRs) for food safety. This annual report details the NRL's activities between April 2022 and March 2023 related to *Listeria monocytogenes*, coagulase-positive staphylococci, *Escherichia coli* (including Shiga-toxin producing *E. coli* (STEC)), *Campylobacter*, *Salmonella* and antimicrobial resistance (AMR).

The NRL continues to have reduced liaison opportunities with the European Union Reference Laboratories (EURLs) due to restrictions post EU Exit, but have maintained participation in the offered EURL activities. The Official Laboratory (OL) network, the FSA and other stakeholders have been kept informed with news and information via NRL quarterly newsletters and relevant EURL and EU information. The Annual User Day was held as a half day, with a hybrid arrangement of in-person attendance for some and the use of a Teams link for other attendees. The third OL audit report has been completed and findings are being prepared for publication.

Despite some EU Exit restrictions, the UK-NRL was invited and attended the PT content of 3 of the 6 European Reference Laboratories (EURL) meetings remotely. Throughout the year, the UK NRL gave impartial advice to FSA, OLs and other stakeholders and liaised with FSA concerning UK laboratory capabilities, including responding to extensive queries. The NRL was active in the British Standards Institute (BSI) AW9 food microbiology committee and has continued to be a member of the European Committee for Standardization (CEN) TAG18 expert working group for the revision of the ISO TS 13136 (polymerase chain reaction (PCR) detection of Shiga toxin-producing *Escherichia coli*).

There are 11 relevant methods provided by the NRL to OLs on GOV.UK. However, FSA has agreed for the NRL to simply list the methods available on the website, and for users to request copies of these as needed, to ensure the most current version is provided and to enhance traceability of their destination and use.

The UK NRL supports OLs to participate in the European Food Microbiology Legislation (EFL) Proficiency Testing (PT) scheme. All 14 OLs registered to participate in at least one of the 4 distributions available from the 2022 to 2023 EFL scheme and continue to demonstrate a high proficiency in complying with the microbiological criteria (EC 2073/2005). However, there are particular criteria which cause inconsistent interpretation from the OLs; these are known to the NRL and work is being done to seek clarification. The NRL organised a hybrid workshop for the 'Interpretation of the Microbiological Criteria and the European Microbiology Legislation Scheme' for the OLs, which stimulated useful and timely discussions. Difficult scenarios have been sent to the FSA for further advice and comment.

The NRL participated in 12 EURL proficiency tests (PTs), where satisfactory or good performance was reported for 11 out of 12 PTs. The UK NRL is awaiting performance evaluation results of one EURL PT.

Details of the proposed NRL activities for 2023 to 2024, and a timeline to achieve these complete this report.

Abbreviation list

Abbreviation	Meaning
AFBI	Agri-Food and Biosciences Institute (Northern Ireland)
APHA	Animal and Plant Health Agency
AR/AMR	antimicrobial resistance
BSI	British Standards Institute
BTOM	Border Target Operating Model
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEN	European Committee for Standardization
CPS	coagulase-positive Staphylococci
Defra	Department for Environment, Food and Rural Affairs
ECDC	European Centre for Disease Prevention and Control
EFL	European Food Microbiology Legislation (scheme)
EFSA	European Food Safety Authority
EPIS	Epidemic Intelligence Information System
EQA	External Quality Assurance
EURL	European Union Reference Laboratory
FAO	(UN) Food and Agriculture Organization
FEPTU	Food and Environmental Proficiency Testing Unit
FSA	Food Standards Agency
FSS	Food Standards Scotland
FW&E	Food, Water and Environment
FWEMS	Food, Water and Environment Microbiology Service
GBRU	Gastrointestinal Bacteria Reference Unit
ISO	International Standards Organisation
JEMRA	Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment
MU	measurement uncertainty
MLST	multi-locus sequence typing
NRL	National Reference Laboratory
OL	Official Laboratory (previously OCL, Official Control Laboratory)
OCR	Official Control Regulations
PCR	polymerase chain reaction

Abbreviation	Meaning
PHE	Public Health England
PT	proficiency test
SOP	standard operating procedure
STEC	shiga-toxin producing *E. coli*
UKHSA	UK Health Security Agency
WGS	whole genome sequencing
WHO	World Health Organization

Introduction

UK Health Security Agency (UKHSA) and its predecessors have provided a National Reference Laboratory (NRL) service for food microbiology for the UK since 2011. This is arranged via a contract with the UK's Central Competent Authority, the Food Standards Agency (FSA), to comply with the EU Regulation 2017/625 for Official Controls, which was transferred as a UK Statutory Instrument when the UK left the EU on 31 December 2020. The NRL has specific responsibilities in the 6 following areas: *Listeria monocytogenes*, coagulase-positive staphylococci, *Escherichia coli* (including Shiga-toxin producing *Escherichia coli*, STEC), *Campylobacter*, *Salmonella* and antimicrobial resistance (AMR). The FSA has required these activities to provide food safety and security for the UK, with a public health protection consequence. UKHSA has been recently designated as an NRL for these activities for FSA for a further 4 years, until March 2027.

This report details the secretariat services, advice and representation within the UK and internationally, production of documents, coordination and participation in audits, ring trials and European Union Reference Laboratories (EURLs) initiatives, and communication of results and data between April 2022 and March 2023. Table 1 lists the NRL core functions and the activities described in this annual report.

Table 1. UKHSA NRL Core Functions, April 2022 to March 2023

Core function	Description
1	Secretariat services
1.a	Disseminate information or advice from international organisations to FSA, OLs and other UK laboratories in a timely and effective manner
1.a	Produce and circulate quarterly newsletters to FSA, OLs and other UK laboratories
1.a	Co-ordinate the OL User Day to update UK OLs and other relevant UK laboratories of the NRL core functions
1.a	Assist in the dissemination and advice of EPIS and other alerts from the competent authority
1.b	Analyse and publish the audit results regarding the OL's capabilities and requirements
1.b	Review content of the UK Food Examiner Register
1.b	Continue liaison meetings with APHA for AMR, *Campylobacter* and *Salmonella*
1.c	Liaise with CEFAS for *E.coli* and *Salmonella* in shellfish activities

Core function	Description
1.c	Liaise with FSA in matters implementing the new Official Control Regulation, (EU) 2017/625, EU Exit strategy and the Laboratory Review
1.c	Liaise with Campden BRI to discuss and implement challenge testing activities
1.d	Provide regular updates to the FSA on NRL activities by producing monthly reports and meet on a quarterly basis
1.d	Produce and submit annual report to the FSA on NRL activities for 2022 to 2023
1.e	Maintain and update the NRL web content on the UKHSA website
2	Advice and representation within the UK and internationally
2.a	Provide impartial expert advice to FSA, OLs and other UK laboratories, upon request
2.b	Represent the UK at relevant international meetings and working groups; consult FSA prior to meetings and submit an internal report after attendance of meetings
2.c	Attend training workshop at international organisations, where relevant and after successful applications
2.d	Liaise with FSA in matters concerning testing capabilities post EU Exit
2.e	Keep abreast of methodology developments and advise FSA and OLs (for example, Service Level Agreement for CPS toxin testing)
2.g	Participate in the BSI AW9 microbiology committee
2.g	Participate in Working Group to revise the ISO/TS 13136:2012 (PCR detection of STEC) and other working groups where appropriate
3	Production of standard operating procedures, codes of practice and guidance documents
3.a	Update and expand food methods archive on NRL website
3.a	Produce a poor performance protocol for OL participation in the EFL proficiency test scheme
3.a	Draft a manuscript for peer-review summarising multiple-year of OL performance of the EFL PT scheme
4	Compliance assessment via audits and ring trials
4.a	Ensure consistency and quality of testing approach applied by UK OLs and support where necessary

Core function	Description
4.b	Liaise with FEPTU and monitor OL's comparative testing performance and assist OLs in the implementation of corrective measures
4.b	Evaluate OL's performance using trend analysis and report timely to the FSA
4.c	Coordinate the participation of OLs in international method validation studies and other initiatives and report to FSA
4.d	Participate as UK-NRL in proficiency tests and method validation studies organised by the EURL (where available) and report to FSA
4.e	Organise Teams or classroom-based workshops for UK OLs, dependent on the 2019 audit (1.b) and OL needs
4.e	Organise a practical workshop for UK OLs, dependent on the 2019 audit (1.b) and OL needs
5	Co-ordination within the UK of international initiatives
5.a	Support the food aspect of the EU-wide AR monitoring (Decision (EU) 2020/1729), liaising with FSA, OLs, relevant Reference Laboratories and APHA.
5.a	Liaise with APHA, audit and review strategy for harmonization of existing antimicrobial resistance testing
5.a	Provide information regarding Whole Genome Sequencing when requested from the EURLs, and participate in any related workshops, proficiency testing, training and guidance documentation, where necessary
5.a	Participate in training opportunities provided by international organisations
6	Communication of results and data use

Core Function 1. Secretariat services

Dissemination of information from international organisations

The NRL receives method and legislative updates and other related topics from the 6 EURLs. Additional information is also sourced from other international organisations, such as the EU Commission, World Health Organization, CODEX, European Food Safety Authority (EFSA) and European Centre for Disease Prevention and Control (ECDC). These are then cascaded to the appropriate personnel and stakeholders, for example, OLs, FSA, FSS, UKHSA Food, Water and Environmental Microbiology (FW&E) laboratories, Epidemiology and Reference Units, Scottish Reference Laboratories, Animal and Plant Health Agency (APHA), Agri-Food and Biosciences Institute (AFBI) and Centre for Environment, Fisheries and Aquaculture Science (CEFAS), with any additional information or advice on further steps to be taken. Questionnaires and surveys from the EURLs are also received and these communications are summarised below by work activity, with links to the EURLs' websites in the Annexe. Information concerning meetings, training, proficiency tests (PTs) and ISO standards are incorporated into the relevant sections of this report. Where available, the EURLs' work programmes can be found in the Annexe.

In addition, the NRL has registered to receive the FSA Stakeholder updates, FSA Smarter Communications and PATH-SAFE newsletters, where information, such as import control data, consultations on legislation and research and development reports, is received and, where relevant, disseminated to other colleagues.

General information disseminated

The NRL received monthly CODEX newsletters from DEFRA which were reviewed and circulated to relevant colleagues where necessary. To note, in this reporting year, papers of interest arising from CODEX include the General Principles of Food Hygiene, Guidelines on the Management of Biological Foodborne Outbreaks, Guidelines for the control of Shiga toxin-producing *E.coli*, and Guidelines for the safe use and re-use of water in food production.

Campylobacter

The UK NRL updated contact details on the EURL website at the request of the EURL.
The NRL received an email from the Italian *Campylobacter* NRL in August 2022, offering a PhD opportunity on *Campylobacter* – this was forwarded to relevant laboratories.

The EURL shared the WGS publication entitled 'The efficiency of Nextera XT tagmentation depends on G and C bases in the binding motif leading to uneven coverage in bacterial species

with low and neutral GC-content' (Segerman and colleagues, 2022) in August 2022, which included published data from the 2020 PT in which the UK NRL had participated (see Annexe).

Salmonella

Four quarterly EURL newsletters were received by email, informing NRLs of EURL activities, such as proficiency tests, workshop preparation and literature searches of relevant *Salmonella* scientific papers. These were forwarded to the FSA, the OLs and other relevant laboratories in the UK. The EURL newsletters can be found in the Annexe.

Antimicrobial resistance

The EURL's annual newsletter was downloaded from their website in January 2023 (see Annexe) and included an EU-wide evaluation of commercially available agar for isolating carbapenamase-producing *Enterobacteriaceae*, the postponement to 2025 for the baseline study of MRSA in pigs, ionophore resistance in enterococci from poultry and AMR in retail seafood.

Related to core functions: 1.a, 1.c, 2.d, 2.e, 2.f, 4.c, 5.a.

Production of NRL quarterly newsletters

The NRL produce quarterly newsletters to disseminate information to OLs and other stakeholders regarding NRL activities and aspects of food microbiology that may affect them. The newsletters' main contents are summarised below and these are available in the Annexe:

1. June 2022 included the Spring EURL meetings, results from the OL audit, the EFL FEPTU PT scheme and interpreting the microbiological criteria and a brief document update.
2. September 2022 announced Jim McLauchlin's untimely death, reported the NRL User Day and FSA Smarter Communications.
3. December 2022 described the European proficiency testing samples, a Listeria and STEC public health update, the EU One Health 2021 Zoonotic report summary and a document update.
4. March 2023 reported the NRLs' workshop on the interpretation of the microbiological criteria, the UKHSA public health guidance for STEC and useful dates for the calendar.

Related to core functions: 1.a, 2.d, 2.e, 2.f

Coordination of the 2022 OL User Day

The NRL held the 10th annual User Day, via Microsoft Teams on 26 September (see Annexe for agenda). The meeting was held as a hybrid event to welcome participants face-to-face and to

also support OLs to attend virtually where they were unable to travel. It was organised as a morning meeting, and started with a special tribute made in memory of Dr Jim McLauchlin. The following presentations covered an update from the FSA, the 2020 EU One Health Zoonotic report and EURL activities, the 2021 to 2022 EFL scheme results and the use of WGS in *Listeria* outbreak investigations. Over 40 delegates attended from 12 OLs, UKHSA's Gastrointestinal Bacteria Reference Unit (GBRU) and the Food and Environmental Proficiency Testing Unit (FEPTU), the Antimicrobial Resistance and Healthcare Associated Infections Unit (AMRHAI), FSA and FSS, the Northern Ireland Public Health Laboratory, and Campden BRI. Several discussions arose from the presentations.

A feedback form was distributed to ascertain what attendees thought about the event and how the User Day could be improved; some stated that they miss a face-to-face meeting, so the NRL will ascertain from potential participants whether the meeting should be conducted face-to-face, remotely or as a hybrid event in future. Presentations were also distributed and are available on request.

Related to core functions: 1.a, 1.b, 1.c, 2.a, 2.d, 2.e, 2.f.

Assist in disseminating and responding to EPIS and other alerts

There is a requirement in the OCRs (EU 2017/625) for the EURLs and NRLs to actively assist in the identification of outbreaks in the EU. This is aided by the EpiPulse (previously EPIS) alert system and close collaboration between the EURLs, EFSA and ECDC. Alerts have been received by the EURLs since April 2018. However, since the COVID-19 pandemic and the UK leaving the EU, there has been a downward trend in reporting these events to the UK NRL. In this reporting period, only one query was received from the *Salmonella* EURL regarding monophasic *S*. Typhimurium and whether the strain had been seen in the UK in 2021-22, to which the NRL replied with a null response.

Related to core functions: 1.a, 2.a.

2019 Audit: official laboratories' capabilities and requirements

In 2019, a third audit was undertaken by the UK NRL to ascertain the Official Laboratories' capabilities in England, Scotland, Wales and Northern Ireland. Questions focused on the microbiological testing for food and if the OLs required support concerning the updated EU Official Control Regulations (EU 2017/625). Since 2013, the previous audits have helped identify training and educational gaps, which the NRL organised and delivered to the OLs. These include the establishment of SOPs on the NRL website and arranging STEC and *Campylobacter* practical courses for the OLs.

In 2022, the NRL sent some additional questions to the OLs to evaluate which services changed during the COVID-19 pandemic and after EU Exit, and how the OLs have resolved any issues in disruption to their laboratory activities.

This additional data has been incorporated into the 2019 report and the findings are due to be published shortly.

Related to core functions: 1.b, 2.d, 2.e, 4.a.

Review content of the UK Food Examiner register

The NRL has established and maintained a Food Examiner register since 2014 to assist FSA to rapidly contact the OLs for appropriate local support with incidents and investigations. In January 2023, the register was updated by sending emails to the OLs requesting the relevant information. The updated list was then sent to the FSA. This list is updated annually to reflect the current number and distribution of FEs in the UK. Compared to 2021, there has been an increase in FEs, up 4 to 49 in 2022. In addition, there were 7 trainee FEs recorded for 2022, and it is hoped it will increase the UK's number of FEs further into 2023 and 2024.

Related to core functions: 1.b, 4.a.

Liaise with APHA regarding mutual NRL activities (*Campylobacter*, *Salmonella* and antimicrobial resistance)

The UK NRL for Food Microbiology (UKHSA) has responsibilities for *Salmonella*, *Campylobacter* and antimicrobial resistance (AMR). There are also responsibilities for these subject areas held by the UK NRL for animal microbiology (APHA). Regular liaison meetings have helped strengthen relations, and activities organised by the EURLs have been discussed and agreed upon. EU Exit has impacted on these mutual activities and therefore participation in these meetings has expanded to include AFBI for Northern Ireland. Twice yearly meetings were held remotely in May and November 2022.

Related to core functions: 1.b, 4.c, 5.a.

Liaise with CEFAS for any overlapping NRL activities

The UK NRL has maintained regular correspondence with CEFAS since January 2019, when they became the UK NRL for foodborne viruses and bacteriological contaminants of shellfish. CEFAS liaises with the *E.coli* and *Salmonella* EURLs and shares mutual activities with the

UKHSA and APHA NRLs, especially related to PT participation and meeting attendance. Liaison meetings between CEFAS and UKHSA colleagues are held regularly to share information and collaborate on plans such as delivery of training courses.

Related to core functions: 1.c, 2.a.

Liaise with FSA regarding the new Official Control Regulation, (EU) 2017/625, EU Exit and the Laboratory Review

As part of the OCRs (EU 2017/625), FSA, the UK's competent authority, is responsible for audits in order to designate Official Laboratories (OLs). The UK has adopted the OCRs since leaving the EU and a Memorandum of Understanding between FSA, FSS and UKAS will allow information to be shared in order to audit the OLs of their designation.

Since leaving the EU, the UK has been developing a strategy for border controls on imported products from EU and non-EU countries, including animal products, plants, plant products and high risk food and feed of non-animal origin. The NRL has had several exchanges with the FSA regarding this process in order to clarify sampling arrangements and expected sample numbers. However, delays in the implementation of new sampling requirements for imported foods from the EU have meant that planning for additional testing within the OLs has been similarly delayed. The UK Government published a draft Border Target Operating Model (BTOM) in April 2023, setting out a risk-based, targeted approach to the checks required on different products. Broad categories of high, medium and low risk have been assigned to products, which will determine the level of checks required for these commodities from 31 October 2023. At the time of writing, the final version of the BTOM has not been published, and estimated numbers of samples requiring physical checks (including microbiological testing) from January 2024 have not been shared.

The NRL has answered queries from the FSA regarding laboratory and NRL capability and activities, including extensive questions in September 2022.

The NRL was invited to attend the NRL symposium, arranged by the FSA, to promote engagement between FSA/FSS colleagues and all the UK NRLs. The NRL actively contributed to the one day event in October 2022 via Teams, presented details of how the NRL for Food Microbiology is organised and shared information in a parallel session for microbiology. The meeting also included updates regarding the EU transition from the FSA and DEFRA and the NRL gained a better understanding of how the other NRLs operated and their capability.

The UK NRL has kept the FSA up to date with changes in the EURLs and EU relationships with UKHSA since leaving the EU, including establishing links with the new NRLs for Northern Ireland and providing contact details to the FSA.

Related to core functions: 1.c, 2.a.

Liaise with Campden BRI to discuss and implement challenge testing activities

Yearly meetings are arranged with Campden BRI, as they are active on working groups for relevant ISO Standards as experts in a wide variety of challenge testing approaches. In May 2022, a Teams meeting was held, where the ISO Standard 20976 series on challenge tests in food were discussed, along with EURL shelf life documents, participation in PTs and other relevant guidance. Since UK left the EU, Campden BRI have been unable to attend EURL working group meetings but did participate in the 2022 EURL challenge testing proficiency test scheme.

Related to core functions: 1.c, 2.a.

Provide regular updates to Food Standards Agency

NRL representatives met with FSA quarterly via Microsoft Teams (21 June 2022, 29 September 2022, 15 December 2022, 10 March 2023) to discuss progress made, difficulties met, and future or new activities (see Annexe for minutes). In addition, monthly reports listing NRL activities have been submitted electronically to the FSA (see Annexe).

Related to core function 1.d.

NRL web content

There is unrestricted access to NRL annual reports, 10 standard methods, public health management guidance, and reports of completed OL audits on the GOV.UK website. There is also general information about the NRL, expert witness information, and contact details on the web page. The FSA and NRL have agreed that, in future, the methods will simply be listed on the website and the NRL can be contacted by OLs and other relevant laboratories to obtain these methods. This change will enable the NRL to capture frequency of use and provide the most current versions available. The web page will be updated accordingly to reflect this decision.
For ease of access, OLs and other stakeholders are advised to use a search engine and type ‘fwe nrl’, as the NRL web page is normally the top search result.

Related to core functions: 1.a, 1.b, 1.e, 3.a.

Core Function 2. Advice and representation within the UK and internationally

Provide impartial advice to FSA, OLs and other UK laboratories

The NRL receive requests for expert advice from stakeholders ranging from small business organisations to FSA and European institutes. Requests received between April 2022 and March 2023 are categorised below:

General

- ten separate requests to microbiologically test food or water, which were forwarded to the relevant laboratories
- a Turkish commercial food laboratory requesting to demonstrate new developments in PCR assays for *Salmonella* and *E.coli*, which the NRL declined due to accredited assays already being established at UKHSA
- an OL enquiry into the Food Examiner assessment process, which the NRL provided advice on
- one Freedom of Information enquiry requesting infection data from 2012 to 2022, which was forwarded to the relevant department
- one request for training for WGS and PT sample preparation from the Malaysian National Laboratory; the NRL advised to contact other organisations, including the EURLs
- contacted for advice from BEIS to ascertain appropriate people from UKHSA to join a cross-government working group on accreditation, which the NRL provided advice on
- a request for sampling requirements and validation protocols for porcine virus testing to submit a novel food application to the FSA; the NRL advised to contact APHA
- one microbiologist from Dubai requesting a job opportunity at a food microbiology laboratory in UKHSA, and another based in the UK, for which the NRL passed on details to relevant colleagues
- shipping advice given to a reference laboratory at UKHSA
- one OL enquiry concerning interpretation of environmental swab results, where the NRL shared the relevant UKHSA in-house procedure
- a request for some UKHSA water methods, for which the NRL signposted to relevant sources
- queries regarding Measurement Uncertainty (MU) were received from one OL, and a food laboratory in St Helena, for which the NRL gave advice
- a query concerning colourant testing of commodity at Port Health, where advice was given by NRL to contact the local authority for support

- FSA correspondence regarding:
    - Food Examiner requirements
    - the equivalence of cfu units
    - JEMRA call for experts
    - how measurement of uncertainty is applied on microbiology samples
    - results of the FWEMS STEC in flour study
    - clarifying FSA contacts for non-conformance and incident reporting
    - providing information on legal limits on various pathogens
    - a post implementation review of the Food Safety (Sampling and Qualifications) (England) Regulations
    - request for feedback on the FSA national monitoring plan sampling priorities
    - and *L. monocytogenes* testing and using ELISA
- one query from a laboratory regarding validation of a new method, which the NRL advised
- an internal request for EFL information as part of an internal FWEMS audit

Listeria

- a UK private laboratory requested the EURL *Listeria monocytogenes* strain panel for use in challenge testing, which after thorough questioning, decided to allow laboratory access to panel
- 2 OL enquiries concerning methodology; one regarding molecular (PCR) methods for identification of *Listeria* and the other regarding *Listeria* confirmation methods, which were dealt with by NRL experts
- querying a new method to detect *Listeria* following a UK incident and providing a rapid opinion

Campylobacter

- an OL enquiry on the suitability of *Campylobacter* in a specific matrix for internal quality control purposes, on which the NRL advised

Coagulase-positive staphylococci

- an enquiry regarding staphylococcal enterotoxin detection in a raw milk sample, which did not meet the legislative acceptability limits for further testing

Salmonella

- an OL enquiry concerning *Salmonella* MPN methods, which was dealt with by NRL experts
- the *Salmonella* EURL notified NRLs of the relaunch of the ISO working group for *Salmonella* detection and invited experts to become members, which UKHSA has expressed interest in joining

- advice was sought from an MSc student in Greece regarding their *Salmonella* thesis, which was forwarded to a UKHSA *Salmonella* expert

STEC/*E.coli*

- the NRL disseminated the UKHSA public health guidance for STEC infections to the OLs in February 2023

Antimicrobial resistance

- received questions for a FAO report on antimicrobial resistance monitoring via the FSA in October 2022, on which the NRL advised and clarified points
- a university applying for a FSA AMR project and requesting UKHSA to collaborate in an advisory role, for which lead FWEMS Scientists agreed to hold further discussions
- in March 2023, the AR EURL requested data on linezolid resistance in animals from the network, however, AMR in animals is not data collected by UKHSA

Related to core functions: 2.a, 2.d.

Representation at relevant international meetings and preparing meeting reports

The UK NRL has experienced restrictions concerning attendance to EURL meetings since leaving the EU. As EURLs were only permitted to allow the UK to participate in proficiency testing, this meant the UK NRL could only attend the PT parts of the EURL network annual meetings. Therefore, the UK NRL was only able to remotely attend the Listeria, antimicrobial resistance and *Escherichia coli* (incl. STEC) EURL meetings. In addition, where presentations have been made available, the UK NRL have produced reports for the *Salmonella* and *Campylobacter* meetings (see Table 2). Presentations from the *Listeria* and coagulase positive staphylococci EURL meetings are held on restricted access webpages, which the UK NRL are no longer able to access.

Where available, agendas for the meetings were forwarded to the FSA as they were received (see Annexe). Notes were consolidated from attendance and individual meeting reports were submitted to FSA and relevant expert colleagues (see Annexe).

Table 2. List of international meetings, April 2022 to March 2023

EURL Meeting	Date from:	Date to:	Location	Attendees
Listeria monocytogenes	17 May 2022	18 May 2022	Porto, Portugal and virtual	Shona Neal
Salmonella	24 May 2022	25 May 2022	Virtual	Unable to attend
Coagulase-positive staphylococci	30 May 2022	1 June 2022	Paris, France	Unable to attend
Antimicrobial resistance	26 June 2022	28 June 2022	Kgs. Lyngby, Denmark and virtual	Shona Neal Satheesh Nair
Campylobacter	26 September 2022	28 September 2022	Sigtuna, Sweden	Unable to attend
E. coli	10 October 2022	11 October 2022	Rome, Italy and virtual	Shona Neal Amisha Vibhakar Heather Aird Agostina Puppo

Related to core functions: 1.a, 2.b.

Attend training workshops at international organisations

Due to the UK leaving the EU and the limited EURL activities that the UK are allowed to participate in, the UK were not invited to any of the EURL training for this reporting period. However, the UK NRL was invited to submit Expressions of Interest for training performed by the STEC EURL in the 2023 to 2024 financial year. The NRL submitted 4 applications and all were accepted, with one to attend an online course on WGS in July 2023 and 3 for STEC detection in food matrices in November 2023.

Related to core functions: 2.c, 2.e.

Liaise with FSA concerning testing capabilities post EU Exit

This was described above, under ‘Liaise with FSA regarding the new Official Control Regulation, (EU) 2017/625, EU Exit and the Laboratory Review’ and ‘Provide impartial advice to FSA, OLs and other UK laboratories’. Results from the additional questions for the 2019 audit

were also shared and discussed with FSA, which included testing capabilities (under ’2019 Audit: Official Laboratories’ capabilities and requirements’).
Related to core functions: 2.d.

Keep abreast of methodology developments

The NRL has been involved with FW&E methods, training and quality working groups to advise, support and facilitate relevant implementation from international method changes and training events. The NRL participation in meetings, proficiency trials and external working groups equips the NRL team with information to keep abreast of methodology. In addition, the NRL has advised on improvements to the design of the European Food Legislation (EFL) proficiency scheme based on a continual assessment of OL performance data.

EURL websites are also reviewed periodically for any new methods, which will complement the ISO Standards, and activity is described below. These additional methods and developments are shared to relevant colleagues to evaluate whether they should be integrated in the UK microbiology testing portfolio.

In January 2022, the FSA requested the NRL to perform 2 literature reviews. One was accepted as it aligned with the specific work area of the UK NRL and UKHSA: AMR in *Listeria monocytogenes* and other *Listeria spp*. in food. Following the capture of relevant publications, the NRL is undertaking this review and hopes to submit it in Q1 of 2023 to 2024.

Related to core functions: 2.e, 2.f.

Participation in the BSI AW9 microbiology committee and other working groups

The UK NRL attended both BSI AW9 committee meetings remotely, in May and September 2022. The status of the related ISO Standards were reviewed at these meetings. The UK NRL representative was asked to invite appropriate experts from UKHSA to join the committee and to also query what impact ISO 16140-3 has had on the OLs.

The NRL representative receives draft and final draft ISOs (for example, NP, DIS and FDIS) from the BSI AW9 portal throughout the year. Consequently, the NRL submitted comments for the following draft Standards:

- ISO 13136 Parts 1 and 2 (STEC detection)
- ISO 7218 (General requirements for microbiological examinations)
- ISO 22174 (General requirements for PCR)
- part 3 of the ISO 16140 series (Method validation)

In addition, comments on proposed text from DG Sante to modify Article 5 of the EC No 2073/2005 Regulation microbiological criteria for foodstuffs were submitted via the BSI committee in May 2022. However, at the time of writing this report and to the NRL's knowledge, the proposed text has not been approved and incorporated into the Regulation by the EU.

A representative of the UK NRL is an active member of the CEN TAG18 expert working group for the revision of the ISO TS 13136 standard (PCR detection of Shiga toxin-producing *Escherichia coli*).

Related to core functions: 2.e, 2.f, 2.g.

Core Function 3. Production of standard operating procedures, codes of practice and guidance documents

Update and expand food methods archive on NRL website

There are currently 11 Standard Methods and/or guidance documents available on the NRL website (Table 3). These methods are based on UKHSA in-house methods and ISO standards, and assist OLs to comply with the requirements of the EU Microbiological Criteria Regulations. The NRL is currently looking to update the web page in order to obtain a record of laboratories who request the methods and to ensure the most current version is available. This has been agreed with the FSA and will be updated accordingly. In addition, other UKHSA Standard Operating Procedures (SOPs) are available to OLs upon request.

Table 3. List of standard methods archived on the NRL website, March 2023

Document number	Title
FNES63	Determination of pH in food and water samples
FNES67	Determination of water activity in food
FNES8 [F12]	Enumeration of coagulase positive staphylococci (*Staphylococcus aureus* and other species)
FNES26 [F2]	Preparation of samples and dilutions, plating and sub-culture
FNES3 [F8]	Enumeration of β-glucuronidase positive *Escherichia coli*: Pour plate method
FNES22 [F19]	Detection and enumeration of *Listeria monocytogenes* and other *Listeria* species
FNES28 [F22]	Enumeration of β-glucuronidase positive *Escherichia coli* – most probable number technique
FNES16 [F13]	Detection of *Salmonella* species
FNES15 [F21]	Detection and enumeration of *Campylobacter* species
FNES4 [E1]	Detection and enumeration of bacteria in swabs and other environmental samples

Document number	Title
FNES18 [Q4]	Guidance on Public Health response: involvement of PHE Food Water and Environmental Microbiology laboratory staff in the investigation of outbreaks of food or waterborne disease

Related to core functions: 1.a, 1.e, 3.a, 4.a.

Prepare specific guidance protocols for OLs and the FSA

The UK NRL is responsible for the authorship and review of 2 general methods for the Food, Water and Environment Microbiology Service (FWEMS); the Verification and Validation of Methods (FNES61) and Measurement Uncertainty in Testing (FNES66). An update of an external document related to the latter method was released by UKAS (M3003, the expression of uncertainty and confidence in measurement) and an impact assessment was performed to ensure no significant changes were necessary.

Related to core functions: 2.a, 2.d, 3.a, 4.a.

Report of multi-year OL performance of the EFL scheme

This activity has been transferred to the 2023 to 2024 NRL work programme since it is not yet complete due to other work priorities. Linked to this report is a poor performance protocol of the EFL PT Scheme. This is required if any OLs generate repeated poor results, however, there has previously been no consistent poor performance from participant results, until this reporting year (see next Core Function 4).

Related to core functions: 3.a, 4.b.

Core Function 4. Compliance assessment via audits and ring trials

OL participation in the European Food Microbiology Legislation Proficiency Testing Scheme

The National Reference Laboratory is required by the retained European Regulation (EC) 2017/625 to organise and assess performance of official laboratories through relevant comparative testing such as interlaboratory studies.

In February 2022, the UK OLs for Food Microbiology were invited to register for the 2022 to 2023 European Food Microbiology Legislation (EFL) External Quality Assessment Scheme, as provided by the UKHSA Food Environmental Proficiency Testing Unit (FEPTU). Based on the requirements of Commission Regulation (EC) 2073/2005 (as amended) for the microbiological criteria for foodstuffs, the scheme enables the performance assessment on the identification, examination and interpretation of microbiological results of samples tested against these legislative criteria. A full scheme comprises of 12 coded samples from 4 distributions based on food categories within the regulation and results are submitted on a web-based form. Further details on the food legislation scheme can be found on GOV.UK.

The NRL supports OL participation of this scheme, which allows direct performance comparison across the OL network, whilst acting independently from the scheme organisers. Results are anonymised, and reports do not disclose the identity of any laboratory. However, the NRL does monitor the performance of each laboratory, and invite laboratories to seek assistance from the NRL when experiencing difficulties.

The NRL received registrations from all of the 14 OLs to receive samples for at least one distribution, with 13 laboratories registering to receive all 4 distributions. Table 4 summarises the samples for 2022 to 2023 and the performance of laboratories that carried out the examinations. On average, 13 laboratories registered for each distribution and 12 laboratories participated for each distribution (that is, one registered laboratory was not able to participate in practice).

All participating laboratories have continued to demonstrate high proficiency for achieving the correct results to comply with EC 2073/2005 (as amended). The fields ‘food categories’ and ‘testing parameters’ were all correctly identified by the submitting laboratories for 10 out of the 12 samples distributed. This is an improvement from the 2021 to 2022 scheme, where 8 out of 12 samples were correctly identified for compliance.

The reporting of microbiological results remains stable compared to 2021 to 2022; 94% of all microbiological results submitted (n = 245) were reported correctly and awarded the maximum

allocation of marks (3 marks). Of the 15 results reported incorrectly, 9 were outliers for enumeration tests for *Listeria monocytogenes*, *E. coli*, coagulase-positive staphylococci, and aerobic colony counts. A range of laboratories reported these on either 1 or 2 occasions. One laboratory reported an outlying result on 4 occasions and this laboratory will be followed up by the NRL. Sample EFL182 contained a non-hydrogen sulphide producing and lactose fermenting strain of *Salmonella* Indiana; 5 laboratories reported 'not detected' for this examination. ISO 6579-1: 2017; A1: 2020 for the detection of *Salmonella* spp. states that a second selective plating medium should be chosen which is complementary to the mandatory agar; laboratories using BGA media will have struggled to recognise that the *Salmonella* Indiana was in the sample. The scheme organiser advised those laboratories reporting a false negative result for this examination to request a repeat sample for their own investigation. This examination was scored to raise awareness with OLs they should be aware of the limitation of media used and the impact on public health when false negative results are reported.

An improvement has been observed in the identification of the 'number of samples in batch required for compliance'; 4 incorrect sample (or missing) responses were submitted regarding numbers of samples this year compared to 8 in 2021 to 2022. A separate score is given for the selection of a 'conclusion' (overall categorisation of the batch as satisfactory or unsatisfactory) based on the interpretation of the results according to the microbiological criteria, and this is where the greatest number of marks were lost by participants. Eight incorrect conclusions were provided this year, and no improvement is seen from last year. For the first time, the 'name of examination' saw a downward trend in performance; 6 incorrect entries were made for this compared to only one incorrect entry in 2021 to 2022. These have been related to either not correctly selecting the test for *Listeria monocytogenes* (4) or coagulase-positive staphylococci (2).

To gain all available marks for an examination, it is important for laboratories to make themselves aware of the marking scheme when completing the form and check through entries to confirm their selections and ensure score fields are not overlooked.

Sample EFL177 required *Campylobacter* enumeration (Table 4). Eight labs performed microbiological examination and is an improvement from a similar sample requiring *Campylobacter* enumeration (sample 153, January 2020), where 6 labs performed the test. The expected range of the microbiological result could not be determined for this sample and the scheme organisers reported that the level of *Campylobacter* dropped during the period of distribution. It was originally contaminated with a low level of *C. jejuni* (<20cfu per disc) and therefore all results were considered correct; 7 labs reported <10cfu/g and one lab reported a low value enumeration (30cfu/g).

Table 4. Overview of performance of the 2022 to 2023 European Food Microbiology Legislation Scheme

Sample code	Brief sample details	Required examinations	OLs achieving more than 70% of the maximum possible score[1]
Distribution EFL59 Meat foods			
EFL175	Raw poultry burger made with herbs, sampled from a local butcher whilst on the market	*Salmonella* spp.	12/12
EFL176	Uncooked lamb mince meat sampled at the end of the manufacturing process	Aerobic Colony Count *Escherichia coli* enumeration	11/12 12/12
EFL177	Broiler carcases sampled after they have been chilled	*Salmonella* spp. *Campylobacter* spp.	11/11 8/11[2]
Distribution EFL60 Dairy foods			
EFL178	Farm produced salted garlic herb butter made from raw milk, sample taken from a market stall	*L. monocytogenes* enumeration *Salmonella* spp.	11/11 11/11
EFL179	Pasteurised cream sampled at the end of the manufacturing process	*L. monocytogenes* detection *Enterobacteriaceae*	11/11 9/11
EFL180	Dried infant formulae for infants below 6 months, sampled from supermarket shelf	*L. monocytogenes* detection *Salmonella* spp. *Cronobacter* spp.	8/10 10/10 2/10[3]
Distribution EFL61 Ready-to-Eat foods			
EFL181	Cut fruit salad sampled during the manufacturing process	*L. monocytogenes* detection *Escherichia coli*	9/12 11/12
EFL182	Cottage cheese made from raw milk sampled from a 4°C refrigerator from a local supermarket	*L. monocytogenes* enumeration *Salmonella* spp.	11/12 6/12[4]
EFL183	Cooked chilli and coriander king prawns sampled at the end of the manufacturing process	*L. monocytogenes* detection *Escherichia coli* Coagulase-positive staphylococci	11/12 9/12 8/12[5]

Sample code	Brief sample details	Required examinations	OLs achieving more than 70% of the maximum possible score[1]
Distribution EFL62 Miscellaneous foods			
EFL184	Collagen protein powder supplement, product sampled whilst on the market	*L. monocytogenes* enumeration *Salmonella* spp.	7/11 10/11
EFL185	Minced beef, product sampled at the end of the manufacturing process	Aerobic Colony Count *Escherichia coli* enumeration	9/11 9/11
EFL186	Gruyère cheese made from raw cows' milk, product sampled whilst on the market	*L. monocytogenes* enumeration *Salmonella* spp.	7/11[6] 10/11

[1] Number of laboratories achieving more than 70% compared to the total laboratories participating in the examination. Those that did not return any data or did not examine samples were not included in this table.
[2] Ten laboratories correctly identified the food category and name for examination.
[3] Nine laboratories correctly identified the food category and name for examination.
[4] Twelve laboratories correctly identified the food category and name for examination.
[5] Eleven laboratories correctly identified the food category.
[6] Eleven laboratories correctly identified the food category and name for examination.

Sample EFL180 was a dried infant formula for infants below 6 months and was sampled on the market during its shelf life (Table 4). Eight laboratories indicated category 1.1 for *Listeria monocytogenes*, whilst one laboratory did not indicate this testing for compliance. The organisers provided an examination comment that 'this product is not considered ready-to-eat until reconstituted. Laboratories not indicating that *L. monocytogenes* is required for testing are accepted as correct'. This compares to the last sample with the same product details (EFL154, February 2020), where 12 (out of 12) laboratories indicated *Listeria monocytogenes* testing and no examination comment was provided by the organisers that time. Therefore, there has been an improvement by one laboratory for correctly interpreting this sample type as not ready-to-eat and not requiring *Listeria monocytogenes* for compliance.

The same sample also required examination for *Cronobacter* spp. Nine laboratories indicated this test for compliance and of these, 2 laboratories performed microbiological examination. For EFL154, in February 2020, the same number of laboratories indicated examination for *Cronobacter* spp., but only one laboratory performed microbiological examination. Therefore, there has been an improvement by one laboratory performing microbiological examination for this organism.

Cronobacter spp. testing under food category 1.24 is associated with the following footnote in EU 2073/2005: 'Parallel testing for *Enterobacteriaceae* and *Cronobacter* spp. shall be

conducted, unless a correlation between these micro-organisms has been established at an individual plant level. If *Enterobacteriaceae* are detected in any of the product samples tested in such a plant, the batch must be tested for *Cronobacter* spp. It shall be the responsibility of the manufacturer to demonstrate to the satisfaction of the competent authority whether such a correlation exists between *Enterobacteriaceae* and *Cronobacter* spp.' No laboratories indicated *Enterobacteriaceae* for compliance for EFL180. The footnote is unclear regarding the testing for *Enterobacteriaceae* for this sample type for compliance to the regulation and the NRL is currently seeking guidance and clarification from the FSA for the requirement under this footnote in the regulation.

In 2021 to 2022, 3 laboratories did not submit results for at least one entire distribution, of which one laboratory did not submit results for 2 distributions. This increased to 5 laboratories not submitting results this year for one or more distributions, including 2 who did not submit results for 2 distributions. Furthermore, one of these 2 laboratories is the same laboratory who did not submit for 2 distributions last year. No trend can be observed in the 4 food groups distributed for this scheme (RTE, dairy, miscellaneous, meat) and the NRL will be following up with these observations to understand any difficulties or issues the laboratories may be experiencing.

The NRL understands that laboratories continue to experience difficulties following the impact of COVID-19, and as observed above, has seen another year where not all laboratories were able to examine all the distributions sent to them. However, the examination rate remains high, with an average return of results at over 90% per distribution, demonstrating a high level of laboratory capacity and capability. The NRL continues to offer its support to laboratories experiencing any difficulties with testing, and both the NRL and the scheme organisers are available for assistance.

Samples processed from the European Food Microbiology Scheme aids participating laboratories to maintain their knowledge of micro-criteria and how these can be interpreted and applied to foods at manufacture and on the market. The scheme not only provides a single suitable platform to assess microbiological proficiency, but also enables the demonstration of laboratory understanding to show compliance against legislative requirements, as laboratories test a variety of samples for official control. Decisions on testing should be based on fact, not assumption and laboratories should refer to the FEPTU guide to scoring for more information.

The NRL will continue to assess laboratory performance through proficiency testing and has invited all UK official laboratories to register to the EFL scheme for the 2023 to 2024 distributions. All OLs are now fully obligated to participate on request by the NRL and to adhere to the adopted OCRs (EU 2017/625). OLs are encouraged to participate to provide overall assurance of laboratory competence, identify areas of weakness and the need for further training as well as demonstrating compliance with laboratory quality standards and accreditation. OLs will also continue to have access to expert advice and support from FEPTU and the NRL.

Related to core functions: 4.a, 4.b, 4.c.

Participate as UK-NRL in EURL ring trials and other initiatives

The UK NRL has continued to experience a reduced participation to EURL proficiency tests (PTs) in this reporting period. This is due to the UK leaving the EU as a Member State; however, the EU has allowed the UK to participate in proficiency testing, under the discretion of the individual EURLs. As there is a need to take part in external quality assessments made by international organisations after the transfer of EU regulation (EC) 625/2017 into UK law (UK SI 2019 No. 665), the NRL has accepted the offers of PT participation from the EURLs.

Participation provides the only route to obtain direct comparison with EU NRLs and assurance that UK NRL's diagnostic and operating standards are comparable to the EU. This is important for biosecurity capability and facilitating trade both in and outside the EU.

The UK NRL received 12 distributions from all 6 EURLs, which includes tests for detection, enumeration, DNA sequencing and culture strain typing, and subsequent analyses and interpretation. Table 5 lists these activities and a summary of performance (see Annexe for EURL PT reports).

In March 2022, the UK NRL participated in the *Campylobacter* enumeration from chicken skin and received an acceptable performance. When comparing with the other NRLs, the UK's 10 enumeration results were generally lower than expected, including one sample that was over 3 scales lower than the median value and another 2 samples that were approximately 2 scales lower. However, the UK NRL results matched 100% with the correct identifications, which included *Campylobacter jejuni*, *C. coli* and *C. lari*.

The *Campylobacter* EURL also provided a typing PT for *Campylobacter*, which involved WGS and cluster analysis of 7 *Campylobacter* samples. The 20 NRLs were assessed on the correct MLST type, Q30 (>70%), reference coverage (>98% of reference genome) and GC-deviation (<4% deviation from the reference genome). As WGS is still in implementation in the EU, various methods were used by the NRLs for the DNA library preparation, sequencing and bioinformatic analysis. The UK NRL generated high GC coverage, which may be due to the DNA library prep kit; however, the UK fulfilled the criteria for the other quality parameters, including the correct MLST type and correct clustering of samples.

The UK NRL participated in the fourth EURL *Listeria* challenge testing PT, which required participants to assess the growth potential of *Listeria monocytogenes* in an artificially contaminated food sample for over 2 weeks. The UKHSA outsourced the participation of this PT to Campden BRI, as they have extensive expertise in challenge testing and in addition, takes an active role in the development of the ISO Standards for challenge testing (ISO 20976). Campden BRI complied with all the steps required except for the storage conditions for the first temperature recording. This was noted as a discrepancy, which was resolved at Campden BRI

and accepted by the EURL. In spite of this discrepancy, the results generated were considered satisfactory.

The Listeria EURL also organised a typing PT based on the cgMLST technique for *L. monocytogenes*, where 10 coded samples were tested for serotype, cgMLST and whether they grouped into a cluster. Although the UK correctly matched the serotype, a discrepancy was identified for using numbers and not Roman numerals (that is, IV not 4). In addition, one strain was reported as clonal cluster (CC) CC204 and not CC388; this was a transcription error when reporting to the EURL. Despite these errors, the EURL accepted the remedial actions and all other results reported by the UK laboratory match with the intended.

The STEC EURL organised 2 detection and identification PTs in this reporting year; PT33 in cheese and PT34 in spent irrigation water (following a highly contaminated PT in October 2021). The UK NRL generated satisfactory results for PT33, where 2 different strains were used; an *stx*1 positive O78 strain and an *agg*R, *aai*C positive O104 strain. The *stx*1 strain was more easily detected than the *agg*R strain due to the method used at FWEMS, which is based on the technical Standard ISO 13136:2013. The PT34 was organised to also optimise the procedure for the pre-treatment of spent irrigation water to incorporate into the full Standard of ISO 13136. An O157, *eae*, *stx*1 and *stx*2 positive strain was successfully detected by PCR and isolated by culture by the UK NRL, achieving optimum results.

The UK NRL scored well for the detection of *Salmonella* in hygiene sponges, where detection was found in 6/6 high level samples (17 cfu/sample), 6/6 low level samples (2 cfu/sample) and 4/4 negative for the blank samples. The UKHSA NRL did not officially register to the serotyping and cluster analysis PT from the *Salmonella* EURL, but received a panel via APHA, as they registered on behalf of the UK. Interim results for the serotyping part of the PT indicate that the UKHSA NRL matched 100% with the intended results of 20 *Salmonella* strains.

The AR EURL organised the PT for typing and characterisation for antimicrobial resistance in *Campylobacter, Salmonella* and *Escherichia coli* this year. UKHSA recently implemented the method stipulated in EU legislation (a broth dilution method) and participation of this PT assures and further validates the method for the UK NRL and UKHSA. The PT is complex, and involves testing 8 strains each of *Campylobacter*, *Salmonella* and *E. coli* against 6, 25 and 25 antibiotics, respectively, with several dilutions for each antibiotic. This generates hundreds of data points, which the UK NRL submitted, alongside their interpretation of each antibiotic (sensitive or resistant) and the ESBL categorisation each strain would be reported as. Despite several years of not participating in this PT, the UK NRL achieved satisfactory results for all 3 organism panels and did not go over the 5% deviation level set by the EURL.

The National Food Institute (DTU) in Denmark organises the global Genomic PTs and the UK participated to 2/3 parts in 2022; *E. coli* and *Staphylococcus aureus*, but not for *Enterococcus faecium/faecalis*. Each organism consisted of 2 DNA and 2 corresponding bacterial pure culture strains, and participants submitted detailed methodology, quality parameters, MLST results, antimicrobial resistance gene detections and predicted phenotype. For the *S. aureus* part, the

UK NRL achieved the correct MLST result and detected most of the AR genes except for two, which are being investigated. The *E.coli* strains also generated similar results and further feedback of this PT will be shared at the next AR EURL workshop.

The CPS enumeration PT was distributed later in 2022 and therefore intended results and reports are still outstanding from the EURL.

Referrals to detect staphylococcal enterotoxins in milk and cheese samples has remained very low in the UK, with on average one request for testing made every 2 years and therefore the need to maintain capability is unjustified for the UK NRL. Therefore, with agreement from the FSA, the NRL maintains a testing ability by sub-contracting the service to a designated official laboratory in the EURL network, who regularly participates in the EURL proficiency testing.

Related to core functions: 1.a, 2.e, 4.c, 4.d.

Organise teams or classroom-based workshops for UK OLs

The UK NRL held a classroom-based workshop in March 2023 for the ‘Interpretation of the Microbiological Criteria and the European Microbiology Legislation Scheme’ as a hybrid meeting (see Annexe for agenda). Invitations were restricted to UK Food Examiners or trainee FEs, as they are responsible for interpreting results and deciding what tests should be performed on samples received in their laboratories as OLs. The main objective was for participants to recap their knowledge on the microbiological criteria, discuss problem matrices and gain knowledge on how this affects their performance in the European Microbiology Legislation (EFL) Scheme.

Most of the 28 participants attended via Teams from 13 OLs and also from FEPTU. The workshop started with a couple of introductory presentations and then was more interactive, with participants invited to vote on what testing should be performed on example difficult sample. This prompted extensive discussions on the microbiological criteria EU 2073/2005. The second part of the workshop then focused on the EFL scheme and how to improve the submission form and the result entry. This also stimulated useful and timely discussions.

Initial feedback suggested that it was well received and an evaluation form was sent to participants to ascertain further feedback. Copies of the presentations were distributed to those who joined the workshop. A list of food types and areas that laboratories find hard to interpret for compliance (as evidenced from the results of the EFL scheme) has been compiled by the NRL and sent to the FSA for further advice and consideration.

In 2023 to 2024, the UK NRL will plan to have a laboratory-based workshop and a classroom-based workshop, dependent on the OLs’ needs.

Related to core functions: 2.a, 3.a, 4.e.

Table 5. NRL participation in EURL ring trials, March 2022 to February 2023

Month received	Organism – test[1]	Reference	Matrix or pure culture	Comments[2]
March 2022	*Campylobacter*: enumeration and voluntary species identification	PT31	Chicken skin	Acceptable performance for enumeration Excellent rating for species identification
March 2022	*Campylobacter*: WGS and cluster analysis	PT33	DNA extracts and pure cultures	Sequence quality needs improvement but cluster analysis satisfactory
April 2022	*Listeria monocytogenes:* challenge testing	PT4	RTE foods; 3 batches of 2 food samples	Overall satisfactory
June 2022	STEC: detection and identification	PT33	Cheese	Overall satisfactory
September 2022	*Salmonella*: detection	PPS-Food-2022	Hygiene sponges	Good performance (100% samples matched with intended)
September 2022	AMR AST for: *Campylobacter* *Salmonella* *E.coli*	EURL-AR 2022 EQAS	pure cultures	(5% deviation = unsatisfactory) 0% deviation, satisfactory results 4.1% deviation, satisfactory results 0% deviation, satisfactory results
September 2022	CPS: enumeration	Anses_LSAI_22_08_EURL	Shrimps	Awaiting performance evaluation from EURL

Month received	Organism – test[1]	Reference	Matrix or pure culture	Comments[2]
October 2022	STEC: detection and identification	PT34	Spent irrigation water	Overall satisfactory
October 2022	WGS for: *E.coli* *Staphylococcus aureus*	DTU Genomic PT 2022	DNA extracts and pure cultures	 Matched MLST; overall satisfactory or high quality Matched MLST; overall satisfactory or high quality
October 2022	*Listeria monocytogenes:* cgMLST	Anses_LSAI_22_10_EURL	Fastq files and pure cultures	Deviated in serotype nomenclature and 1 out of 10 clonal complex types incorrect. Matched all serotype and other clonal complex results with intended
November 2022	*Salmonella*: typing and cluster analysis	*Salmonella* typing PT 2021	Pure cultures	Interim serotyping results indicate 100% match with intended results; awaiting cluster analysis results and full report
November 2022	STEC: typing and WGS cluster analysis	PT35 and WGS5	Pure cultures	Overall satisfactory

[1] STEC = Shiga toxin *Escherichia coli;* CPS = coagulase positive staphylococci.
[2] Performance grading taken directly from EURL reporting.

Core Function 5. Co-ordination within the UK of international initiatives

Support food aspect of the EU-wide AR monitoring (Decision EU 2020/1729)

EU-wide AR monitoring has been in place since 1 January 2015, where fresh meat at retail and animals at slaughterhouse has been sampled and tested in the UK by the APHA. This Decision EU 2020/1729 applied from 1 January 2021 and covers the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria for the period 2021 to 2027 in the EU. This also includes sampling at Border Control Posts and the use of WGS in place of broth micro-dilution testing.

For 2022, AMR monitoring was carried out in laying hens, broilers, fattening turkeys and fresh meat derived from broilers and turkeys. At the time of writing, it was unknown whether the UK was required to submit data due to EU Exit. The NRL has been available for support and advice for this work to the APHA and FSA.

Additional information regarding APHA liaison and AMR work can be found above in Core Function 1 .Liaise with APHA regarding mutual NRL activities.

Related to core functions: 1.b, 2.a, 5.a.

Participate in EURL activities relating to whole genome sequencing

A joint EURL activity was initiated in 2017, via a mandate from the European Commission to EFSA and ECDC to expand the molecular typing data collection to WGS data. This was followed by a letter from the EU requesting EFSA and ECDC to implement the collection and analysis of WGS by June 2022.

Before the UK left the EU, UK participated in a number of initiatives related to this activity, including submission of information via surveys and attending a ‘Science meets Policy conference: Next Generation Sequencing to tackle food-borne diseases in the EU’ in September 2020. A series of methods have also been released, in order to harmonise WGS, the methods and analysis used and how it is interpreted.

Related to core functions: 1.a, 2.e, 5.a.

Discussion of specific areas

Management structure within UKHSA

The position of Principle Investigator and Project Representative for the NRL contract was changed via a variation to contract from Dr Jim McLauchlin to Dr Shona Neal in April 2022. In July 2022, Dr Jim McLauchlin suddenly passed away and since then, the NRL has been supported by FWEMS colleagues. Dr Caroline Willis was appointed interim Lead FWE Microbiologist in November 2022 and has been attending the FSA quarterly steering group meetings and giving direction and knowledge to the NRL.

EU exit

Since leaving the EU on 31 January 2020, the UK NRL has experienced a reduced level of communications with the EURLs. This is due to the limited activities that the EURLs are now permitted to offer to the UK, predominantly only allowing UK NRL participation in proficiency tests. Consequently, the UK NRL has lost presence on the EURL *Listeria* challenge testing working groups and has been unable to attend all of the EURL annual workshops and training for this reporting period. Therefore, the UK NRL now regularly checks the EURL websites for new information which may be useful for the UK and produces reports based on presentations given to the EURL meetings.

Due to the sensitive nature of communicating with the EURLs and the EU, the UK NRL has sought clarification and consent from FSA for specific activities where the UK NRL felt it was appropriate and mutually beneficial to respond and engage with the EURLs and EU. In addition, the NRL has liaised with FSA, DEFRA, and UKHSA EU Exit departments to ensure information is transparent and current. The UK NRL has also liaised with the UKHSA EU Exit department in relation to the Memorandum of Understanding between UKHSA and ECDC, which was signed in December 2021. This MoU will aid the reopening of communication and shared learning regarding public health threats through testing, surveillance and preparedness.

As part of the Northern Ireland protocol, EU law continues to apply post EU Exit in respect of the Official Control Regulations (EU) 2017/625. Therefore, NI have NRLs based in the EU which have been designated by FSA to fulfil this obligation. The UK NRL continues to support the NI OL and has initiated liaisons with the NI NRLs to ensure activities are not too burdensome on the NI OL and to reduce overlap in activities.

In April 2022, the government announced that import controls on EU goods planned from July would not be introduced in 2022. At the time of writing, the BTOM confirmed that physical checks will continue to be carried out on high risk produce, and physical checks will be introduced for medium risk produce from 31 January 2024. UKHSA FW&E representatives have

been contributing to FSA discussions and risk categorisation activities in preparation for the introduction of checks.

Despite these challenges, the NRL has managed to continue to communicate with the EURLs and successfully participate in all of the relevant activities that the EURLs have offered, including attending meetings and participating in proficiency testing.

Summary and forward look to proposed UKHSA NRL Activities, April 2023 to March 2024

Core Function 1. Secretariat services

1.a Disseminate information or advice from international organisations to FSA, OLs and other UK laboratories in a timely and effective manner.
1.a Produce and circulate quarterly newsletters to FSA, OLs and other UK laboratories.
1.a Co-ordinate the OL User Day to update UK OLs and other relevant UK laboratories of the NRL core functions.
1.b Prepare and carry out an audit regarding the OL's capabilities and requirements.
1.b Review content of the UK Food Examiner Register.
1.c Continue liaison meetings with APHA for AMR, *Campylobacter* and *Salmonella*.
1.c Liaise with CEFAS for *E.coli* and *Salmonella* in shellfish activities.
1.c Liaise with Campden BRI to discuss and implement challenge testing activities
1.d Provide regular updates to the FSA on NRL activities by producing monthly reports.
1.d Produce and submit annual report to the FSA on NRL activities for 2023 to 2024.
1.e Arrange quarterly meetings with FSA and FSS.
1.f Maintain and update the NRL web content on the UKHSA website.

Core Function 2. Advice and representation within the UK and internationally

2.a. Provide impartial expert advice to FSA, OLs and other UK laboratories, upon request.
2.b. Represent the UK at relevant international meetings and working groups; consult FSA prior to meetings and submit an internal report after attendance of meetings.
2.c. Attend training workshops at international organisations, where relevant and after successful applications.
2.d. Liaise with FSA in matters concerning testing capabilities post EU Exit.
2.e. Keep abreast of methodology developments and advise FSA and OLs (for example Service Level Agreement for CPS toxin testing).
2.g. Participate in the BSI AW9 microbiology committee.
2.g. Participate in Working Group to revise the ISO/TS 13136:2012 (PCR detection of STEC) and other working groups where appropriate.

Core Function 3. Research and development, including production of standard operating procedures, codes of practice and guidance documents

3.a. Update food methods archive on NRL website.
3.a. Produce a poor performance protocol for OL participation in the EFL proficiency test scheme.
3.a Draft a manuscript for peer-review summarising multiple-year of OL performance of the EFL PT scheme.

Core Function 4. Compliance assessment via audits and ring trials

4.a. Ensure consistency and quality of testing approached applied by UK OLs and support where necessary.
4.b. Liaise with FEPTU and monitor OL's comparative testing performance and assist OLs in the implementation of corrective measures.
4.b. Evaluate OL's performance using trend analysis and report appropriately to the FSA.
4.c. Coordinate the participation of OLs in international method validation studies and other initiatives and report to FSA.
4.d. Participate as UK-NRL in proficiency tests and method validation studies organised by the EURL (where available) and report to FSA.
4.e. Organise Teams or classroom-based workshops for UK OLs, dependent on the 2019 audit (1.b) and OL needs.
4.e. Organise a practical workshop for UK OLs, dependent on the 2019 audit (1.b) and OL needs.
4.g Assess OL capability and capacity for the UK via an audit.

Core Function 5. Coordination within the UK of international initiatives

5.a. Support the food aspect of the EU-wide AR monitoring (Decision (EU) 2020/1729), liaising with FSA, OLs, relevant Reference Laboratories and APHA.
5.a Provide information regarding Whole Genome Sequencing when requested from the EURLs, and participate in any related workshops, proficiency testing, training and guidance documentation, where necessary.
5.a Participate in training opportunities provided by international organisations.

Core Function 6. Communication of results and data use

6. Communicate with FSA of results and data use, when required.

Core Function 7. Incident management

7. Perform defined work when requested by FSA for incident management, with joint agreement and where appropriate.

Summary of NRL activities for April 2023 to March 2024

Activities	Function	Core	0	1	2	3	4	5	6	7	8	9	10	11	12
			March 2023	April	May	June	July	August	September	October	November	December	January 2024	February	March
Disseminate information from external organisations to FSA	Disseminate information	1.a													
Produce and circulate quarterly newsletter to FSA, OLs and other labs	Disseminate information	1.a, 1.c													
OL User Day meeting at NRL/hybrid, TBC	Meeting	1.a, 1.c													
Analyse and publish OL Survey results for capabilities and capacity	Secretariat	1.b													
Review content of UK Food Examiner register	Secretariat	1.b													
Continue liaison meetings with APHA *Salmonella*, *Campylobacter* and AMR NRLs	Secretariat	1.c													
Liaise with CEFAS for *E.coli* and *Salmonella* in shellfish activities	Secretariat	1.c													
Liaise with Campden BRI to discuss challenge testing activities	Secretariat	1.c													
Monthly reporting to FSA	Coordination	1.d													
2022 to 2023 Annual report to FSA	Coordination	1.d													
Arrange quarterly meetings with FSA	Coordination	1.e													
Maintain and update NRL web content on UKHSA website	Website	1.f													
Provide advice to FSA, OLs, and other UK labs on request	Advice	2.a, 2.d, 2.e													
Salmonella Workshop, TBC, May	EURL workshop	2.b													
Antimicrobial Resistance 17th workshop, virtual, 23 to 24 May	EURL workshop	2.b													
Campylobacter 18th Workshop, TBC	EURL workshop	2.b													
E. coli 18th Workshop in Rome, 5 to 6 October	EURL workshop	2.b													
Coagulase positive staphylococci 17th workshop, 24 to 26 October	EURL Workshop	2.b													
STEC detection in food training in EURL, Rome, 13 to 17 November	EURL training	2.c													

Activities	Function	Core	0	1	2	3	4	5	6	7	8	9	10	11	12
			March 2023	April	May	June	July	August	September	October	November	December	January 2024	February	March
Listeria 17th workshop, 4 to 6 December	EURL workshop	2.b													
Liaising with FSA concerning EU exit strategy	Advice and communication	2.f													
Participation in WG for revised ISO 13136 (STEC)	Advice and representation	2.g, 5.a													
Participation in BSI AW9 microbiology committee	Advice and representation	2.g													
Produce poor performance protocol for OL PT participation	PT document	3.a													
Produce OL performance review of 4 years' participation of EFL scheme	Peer-reviewed manuscript	3.a, 4.b													
Revise and publish UK SOPs on website	Maintain SOPs	3.a													
Focussed testing and method development for FSA, upon request and joint agreement	R&D	3.b, 3.c, 3.d													
Liaise with FEPTU and monitor OL's testing of EFL scheme	UK PT	4.b, 4.f													
Campylobacter enumeration in chicken skin PT from EURL (PT34)	EURL PT	4.d													
Salmonella detection in seeds PT from EURL	EURL PT	4.d													
Listeria detection and enumeration in flavoured milk from EURL	EURL PT	4.d													
ILT for STEC ISO 13136 validation from EURL, TBC	ISO ILT	4.c													
AMR *E. coli*, *Salmonella* and *Campylobacter* PT from EURL	EURL PT	4.d													
AMR isolation of *E. coli* from meat or caeca PT from EURL	EURL PT	4.d													
Coag+ Staph enumeration PT from EURL, TBC	EURL PT	4.d													
STEC detection in sprouts from EURL (PT 37)	EURL PT	4.d													
E. coli and STEC id and typing and WGS PT from EURL (PT-38 and WGS6)	EURL PT	4.d													
Salmonella typing PT from EURL, TBD	EURL PT	4.d													
DTU Genomic WGS PT on *E. coli*, *Salmonella* and *Campylobacter*	International PT	4.d													

Activities	Function	Core	0	1	2	3	4	5	6	7	8	9	10	11	12
			March 2023	April	May	June	July	August	September	October	November	December	January 2024	February	March
Organise practical workshop for UK OLs	Workshop	4.e													
Assessing OL capability and capacity for the UK via an audit	Audit	4.g													
Support food aspect of EU-wide AR monitoring (Decision 2013/652/EU), if required	EU monitoring	5.a													
Provide information regarding WGS processes to EURLs and other international organisations, when contacted	EURL initiative	5.a													
Communicate with FSA of results and data use, when required	Communication	6													
Perform defined work when requested by FSA for incident management, with joint agreement and where appropriate	Incident management	7													

Annexe. Documents produced from NRL activities

Core Function 1. Secretariat services

EURL Websites	*Listeria monocytogenes* Coagulase-positive staphylococci *E. coli* (including STEC) *Campylobacter* *Salmonella* Antimicrobial resistance
Dissemination of information from the EURLs Related to core functions: 1.a, 1.c, 2.d, 2.e, 2.f, 4.c, 5.a	eurl_ws_2022_future_activities_closing_remarks_hs_eurl 6 Kirsten Closure 220524 (2) 667_03-eurl-update-2022 segerman et al 2022 EURL-Salmonella Newsletter June 2022 EURL-Salmonella Newsletter September 2022 EURL-Salmonella Newsletter December 2022 EURL-Salmonella Newsletter March 2023 671_2022-dec-newsletter-no16-final-v2b
Quarterly newsletters Related to core functions; 1.a, 2.d, 2.e, 2.f	NRL newsletter Q1 2022-3 NRL newsletter Q2 2022-3_final NRL newsletter Q3 2022-3_Final NRL newsletter Q4 2022-3_final
Coordination of 2022 OL User Day Related to core functions: 1.a, 1.b, 1.c, 2.a, 2.d, 2.e, 2.f	User day 26sep2022 agenda_Final
Provide regular updates to FSA	FSA NRL Meeting 21June2022 minutes_KL_SN__edits (Final) FSA NRL Meeting 29Sept2022 minutes_KL_SN_AVedits (Final)

Related to core functions: 1.d	FSA NRL Meeting 15Dec2022 minutes _Draft_KL_SN_AV_CW edits FSA NRL Meeting 10Mar2023 minutes _Final Draft_KL_SN_AVedits_CW UK NRL Monthly Log for Apr22_Final UK NRL Monthly Log for May22_Final_SN_AV UK NRL Monthly Log for Jun22_Final UK NRL Monthly Log for July22_Final UK NRL Monthly Log for Aug22_Final UK NRL Monthly Log for Sept22_Final_AV SNedits UK NRL Monthly Log for Oct22_(Final)_AV_KL_SN UK NRL Monthly Log for Nov22_Final UK NRL Monthly Log for Dec22 (Final)_AV_SN_KLedits UK NRL Monthly Log for Jan23_Final_ AV_KL_SN_CWedits UK NRL Monthly Log for Feb23_Final UK NRL Monthly Log for Mar23_final

Core Function 2. Advice and representation within the UK/EU

Representation at relevant EURL meetings and prepare meeting reports Related to core functions: 1.a, 2.b	EURL Lm - 2022 workshop agenda Internal report of EURL meeting Lm 18 May 22_Final EURL Lm_2022 WS Report 2022-0107 EURL Salmonella Report of 2022 workshop Individual Report on the 27th Salmonella EURL Workshop 2022_FINAL Agenda Workshop CPS 2022 Internal report of EURL-AR meeting 2022_draft Summary of the 17th Campylobacter EURL Workshop 2022_final Agenda_2022 Internal report of EURL meeting_E.coli 2022_Final

Core Function 3. Production of standard operating procedures, codes of practice and guidance documents

Update and expand food methods archive on NRL website	UK national reference laboratory for food microbiology

Related to core functions: 1.a, 1.e, 3.a, 4.a	

Core Function 4. Compliance assessment via audits and ring trials

OL participation in the European Food Microbiology Legislation Proficiency Testing Scheme Related to core functions: 4.a, 4.b	FEPTU483.16_schedule and prices
Participate in EURL ring trials Related to core functions: 1.a, 2.e, 4.c, 4.d	EURL-Campylobacter_PT31-report EURL-Campylobacter_PT33-final_report LabX_individual_report_Anses_LSAI_22_06_EURL_Lm_CT Report PT33 non EU Interim summary report EURL Salm combined PT PPS Food 2022 EURL-AR Campylobacter 2022 Report from EURL EURL-AR E.coli 2022 Report from EURL EURL-AR Salmonella 2022 Report from EURL Report PT34 - non-EU Countries DTU Genomic PT 2022 Report from DTU LabX_individual_report_Anses_LSAI_22_10_EURL_Lm_Typing Interim summary report EURL-Salmonella PT Serotyping 2022 EURL_VTEC_PT35_LXXX
Organise classroom-based workshops for UK OLs Related to core functions: 2.a, 3.a, 4.e	Agenda Re Interpretation of Micro Criteria workshop_13March23_for participants_version2

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

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