UK Health Security Agency

2021 to 2022 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 2021 to March 2022

Contents

In memoriam – Jim McLauchlin

In July 2022, Dr Jim McLauchlin, Lead Public Health Microbiologist for the UKHSA Food Water and Environmental Microbiology Service, died suddenly at home. Jim worked for the Public Health Laboratory Service (PHLS), Health Protection Agency, Public Health England and then UK Health Security Agency over the course of 40 years.

In 2009, he became Lead Microbiologist for the FW&E Microbiology Service, which he led until his death in July 2022. During this time, he oversaw significant developments in the structure and service delivery of the FW&E laboratories, including the reconfiguration onto 3 sites at London, Porton and York, the move to multi-site UKAS accreditation, and the development and accreditation of methods such as PCR detection of Shiga-Toxin producing *E. coli* and *Salmonella*.

Jim also successfully led the Food Standard Agency's tender for the FW&E service to become the UK's National Reference Laboratory for Food Microbiology in 2011, and thanks to Jim's tenacity, passion and widely recognised expertise in food microbiology, the service has maintained this role since then.

Jim was elected as a Member of the European Food Safety Authority Biological Hazards panel, contributing to expert risk assessment about microbiological hazards in the food chain and delivered scientific opinions on a range of topics related to food microbiology.

He held an Honorary Professorship at the University of Liverpool, and published extensively, with over 200 publications to his name.

Jim was a highly valued colleague, leader and friend and his friendship, expert guidance and leadership will be greatly missed. His death has devastated us all and our thoughts are with his family, friends and colleagues as they come to terms with his loss.

This annual report is dedicated to Jim and we thank him for his direction, support and positivity to all the NRL's activities.

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). 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 2021 and March 2022 related to *Listeria monocytogenes*, coagulase-positive staphylococci, *Escherichia coli* (including Shiga-toxin producing *E. coli* (STEC)), *Campylobacter*, *Salmonella* and antimicrobial resistance (AMR).

The NRL has experienced reduced liaisons 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 information. The annual User Day was held as a half day via Teams, due to the social restrictions in response to the coronavirus (COVID-19) pandemic. The third OL audit report is currently being updated with OL information regarding the COVID-19 pandemic and EU Exit, and is planned for completion by the end of 2022.

Due to restrictions on some of the EURL activities as a result of EU Exit, the UK-NRL was invited and attended parts of 3 of the 6 European Reference Laboratories (EURL) meetings remotely and attended 2 online EURL training events. Throughout the year, the UK NRL gave impartial advice to FSA, OLs and other stakeholders and liaised with FSA concerning capabilities post EU Exit, including completion of a survey and queries. The NRL was active in the British Standards Institute (BSI) AW9 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. More publications are planned and other methods not on the GOV UK website are available upon request. A new FWEMS method 'Verification and Validation of Methods', FNES61, was drafted and finalised by the UK NRL and is based on the ISO Standard series 16140 Method Validation.

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 2021 to 2022 EFL scheme and continue to demonstrate a high proficiency in complying with the microbiological criteria (EC 2073/2005). However, there are particular criteria which causes inconsistent interpretation from the OLs; these are known to the NRL and work is being done to seek clarification.

The NRL participated in 7 EURL proficiency tests (PTs) and one inter-laboratory trial (ILT) from another NRL. There was satisfactory performance for 4 PTs, the ILT was evaluating the method, which had a good outcome, and one PT could not be evaluated due to gross

contamination of the matrix tested. The UK NRL are awaiting results of the other 2 PTs. The NRL organised a virtual workshop to introduce the Verification and Validation of Methods SOP to the OLs and other stakeholders and have received good feedback.

Details of the proposed NRL activities for 2022 to 2023, and a timeline to achieve these complete this report.

Abbreviation list

AFBI	Agri-Food and Biosciences Institute (Northern Ireland)
APHA	Animal and Plant Health Agency
AR/AMR	Antimicrobial resistance
BSI	British Standards Institute
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEN	European Committee for Standardization
COVID-19	Coronavirus Disease 2019
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 Reference Laboratory
FAO	Food and Agriculture Organization of the United Nations
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
MIC	Minimum inhibitory concentration
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
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) (previously Public Health England up to 30 September 2021; from this point referred to as UKHSA) has 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. Therefore, UKHSA has been designated as an NRL for these activities for FSA until March 2023, when the agreement will be reviewed.

This report details the secretariat services, advice and representation within the UK and internationally, production of documents, coordinating and participating in audits, ring trials and European Reference Laboratories (EURLs) initiatives, and communication of results and data between April 2021 and March 2022. Table 1 lists the NRL core functions and the activities described in this annual report.

Table 1. PHE/UKHSA NRL Core Functions, April 2021 to March 2022

Core Function	Description
1	Secretariat services
1.a	Disseminate information/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 to 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 AR, *Campylobacter* and *Salmonella*
1.c	Liaise with FSA in matters arising from implementing the retained Official Control Regulation, (EU) 2017/625, EU Exit strategy and the Laboratory Review

Core Function	Description
1.c	Liaise with Campden BRI to discuss and implement challenge testing activities
1.c	Liaise with CEFAS for *E. coli* and *Salmonella* in shellfish 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 2021 to 2022
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	Prepare a guidance document for OLs and the FSA on the use and validation of alternative methods for testing Official Controls
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 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

Core Function	Description
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 Skype/classroom-based workshops 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 receive reports, outbreaks and other related topics from the 6 EURLs. Some 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 stakeholder(s), for example, OLs, FSA, Food Standards Scotland (FSS), UKHSA food, water and environment (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.

General information disseminated

The NRL received monthly CODEX newsletters from DEFRA which was read and circulated to relevant colleagues where necessary.

Listeria monocytogenes

The *Listeria* EURL sent a Joint ECDC-EFSA report on European monitoring of *L. monocytogenes* isolates from food and clinical cases (ELiTE).

Escherichia coli (including STEC)

The NRL received 3 outbreak alerts from the EURL; 2 from US, and 1 from Republic of Ireland. This was lower than previous years, possibly due to the COVID-19 pandemic.

The EURL launched their new website in June 2020, which is fully accessible by the UK NRL.

The ONE Health European Joint Programme (EJP) newsletter was forwarded by the STEC EURL in March 2022, which was forwarded to relevant colleagues by the UK NRL.

Campylobacter

The EURL requested NRLs to check their contact details on the EURL website, which the UK NRL did on that same day.

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.

The EURL circulated an alert of outbreaks in US and Canada involving *Salmonella* in onions, which the UK NRL cascaded to relevant colleagues.

Antimicrobial resistance

The EURL's annual newsletter was downloaded from their website in January 2022 (see Annexe) and included a subgroup of the EU AMR One Health Network on National Action Plans, experiences from the EURL-AMR online training course and several research and surveillance reports on AMR in animals.

The EURL forwarded external communications regarding antimicrobial resistance over the reporting period to the NRLs, including a WHO proposal to support the Global Action Plan on AMR, the EU Summary Report on AMR in Zoonotic and indicator bacteria in 2018/19, the third Joint Interagency Antimicrobial Consumption and Resistance Report, a report on animals disease and outbreaks in Asia (volume 128) from FAO Emergency Centre for Transboundary Animal Disease, an EFSA Biological Hazards (BIOHAZ) Panel scientific opinion entitled 'Role played by the environment in the environment and spread of antimicrobial resistance through the food chain', the WHO launch of 3 tools to tackle AMR and various policies and guidance for AMR. The EURL also circulated an invitation to One Health EJM Thematic Integrative Meeting between EJP HARMONY and CARE. These were all assessed and circulated to appropriate colleagues in the UK.

Parallel correspondence from various EURLs

EURLs are engaged in joint horizontal activities and regulations; consequently, the UK NRL receives the same information from different EURLs. However, only one such activity was corresponded to the UK: an invitation to participate in the One Health Laboratory Capacity survey. This survey attempted to benchmark human, veterinary, clinical diagnostic, food, and feed microbiology systems across all EU/EAA countries and requested information from a country, regional and local level. Therefore, the UK NRL sent details to all the UK OLs to

respond directly, and the UK NRL submitted a response before the 31 July deadline. Results are still expected and will be published in an anonymised technical report.

Related to Core Function(s): 1.a, 1.c, 2.d, 2.e, 2.f, 4.c, 5.a

Production of NRL quarterly newsletters

The NRL have produced quarterly newsletters since 2016 to disseminate information to OLs and other stakeholders of NRL activities and aspects of food microbiology that could affect them. The newsletters' content is described below and are available in the Annexe:

- June 2021 included the OL performance from the EFL FEPTU PT scheme, the One Health laboratory capacity survey and a brief document update
- September 2021 announced the launch of UKHSA and described the NRL User Day and EU Exit-related news
- December 2021 described 2 of the EURL meetings that the UK NL attended, additional requirements for OLs under UKAS's publication LAB 33 and a document update
- March 2022 reported the NRLs' workshop on verification and validation of methods, an update on the 2019 OL audit, the EU One Health 2020 Zoonotic report summary and useful dates for the calendar

Related to Core Function(s): 1.a, 2.d, 2.e, 2.f

Co-ordination of the 2021 OL User Day

The NRL held the 9th annual User Day, via Microsoft Teams on 27 September. The meeting was held virtually because of restrictions due to the COVID-19 pandemic. As in 2020, this was organised as an afternoon meeting, and included presentations from FSA, the 2019 EU One Health Zoonotic report and EURL activities, the 2020 to 2021 EFL scheme and microbiology of raw milk and beef mince. Over 35 delegates attended from 11 OLs, UKHSA's Gastrointestinal Bacteria Reference Unit (GBRU) and the Food and Environmental Proficiency Testing Unit (FEPTU), FSA and FSS, the Northern Ireland Public Health Laboratory, Animal and Plant Health Agency and Campden BRI. There were fewer presentations compared to last year, and this allowed for more discussion, which was done in response to last year's feedback from delegates.

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

Related to Core Function(s): 1.a, 1.b, 1.c, 2.a, 2.d, 2.e, 2.f

Assist in disseminating and responding to EPIS and other alerts

The updated OCRs (EU 2017/625) included an additional requirement from the EURLs and NRLs to actively assist to outbreaks in the EU. This is aided by the EPIS alert system and close collaboration between the EURLs, EFSA and ECDC and 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 alert from the *Salmonella* EURL and one alert from the *Listeria* EURL were received.

These EPIS and other alerts are logged by the NRL and only relevant staff in UKHSA are contacted, as the EURL are requesting information on any related isolates from non-human origin. The specialist UKHSA staff then look in the UK database to identify any closely related strains relating to the incident cluster concerned. The NRL then responds to the EURL with any information concerning the enquiry from UKHSA colleagues. The UK NRL have also requested information from the EURLs regarding sources of particular strains to help UK incidents in this reporting period.

Related to Core Function(s): 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 and range of 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.

At the time of writing, the NRL has sent some additional questions to the OLs to evaluate what services changed during the COVID-19 pandemic restrictions and since the UK left the EU, and how the OLs have resolved any issues in disruption to their laboratory activities.

This further data will be collated and analysed and a report will be published by the end of the year.

Related to Core Function(s): 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 appropriate local support from the OLs. The register was updated by sending emails to the OLs requesting the relevant information and an updated list was uploaded on to the dedicated FSA Teams channel December 2021.Another update to this register is planned for later this year.

Related to Core Function(s): 1.b, 4.a

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

The UK NRL for Food Microbiology (UKHSA) have 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 to these meetings has expanded to include AFBI for Northern Ireland. Meetings were held remotely and reverted to 6-monthly in July and December 2021.

Related to Core Function(s): 1.b, 4.c, 5.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 competent authority, are responsible for audits in order to designate Official Laboratories (OLs). The UK has adopted the OCRs since leaving the EU and the FSA and the Food Standards Scotland (FSS) have recently signed an MoU with UKAS to share the audit responsibility.

In December 2021, a joint webinar was held for OLs and NRLs to gain information on the recently published LAB 33 Assessment and Accreditation of UK Official Food and Feed Laboratories and National Reference Laboratories, where the UK NRL attended.

Since leaving the EU, the UK has planned to introduce increased sampling on imported produce. The NRL has had several exchanges with the FSA regarding this in order to clarify sampling arrangements.

The NRL has answered queries from the FSA regarding laboratory and NRL capability and activities. Notably, the UK NRL received and completed a link to complete an EURL network access questionnaire in January 2022 for each of the 6 EURLs that the UK NRL liaise with.

The UK NRL has kept the FSA up to date with changes in the EURLs and EU relationships with PHE/UKHSA since leaving the EU and will continue to do so.

Related to Core Function(s): 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 2021, a remote 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 and participate in EURL challenge testing proficiency tests.

Related to Core Function(s): 1.c, 2.a

Liaise with CEFAS for any overlapping NRL activities

The UK NRL has forwarded any relevant correspondence to CEFAS since January 2019, when they became the UK NRL for foodborne viruses and bacteriological contaminants of shellfish. CEFAS liaise with the *E.coli* and *Salmonella* EURLs and share mutual activities with the UKHSA and APHA NRLs, especially related to PT participation and meeting attendance.

Related to Core Function(s): 1.c, 2.a

Provide regular updates to Food Standards Agency

NRL representatives met with FSA quarterly via Microsoft Teams (21 June 2021, 20 September 2021, 03 December 2021, 11 March 2022) 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, a public health management guidance, and reports of the 2016 and 2013 OL audits on the GOV.UK website. In March 2022, NRL content from the PHE section of the website has been transferred and updated to the UKHSA pages. There is also general information about the NRL, expert witness information, and contact details on the web page. The NRL will periodically review and update the standard methods and will increase the collection, where relevant.

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 hit.

Related to Core Function(s): 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 small business organisations to European institutes, and this service has encouraged stakeholders and others to contact the NRL. Requests received between April 2021 and March 2022 are categorised below:

General

- 13 separate requests to microbiologically test food or water, which was forwarded to the relevant laboratories
- an Indian technologies company requesting to test a sanitisation tool, and a Turkish company to test efficiency of respiratory filters, which were both directed to another laboratory within UKHSA

- an on-line survey from the DISCOVER One Health EJP project to ascertain prevention and control programs for *Salmonella* and *Campylobacter* in the EU, and was forwarded to the relevant expert at UKHSA
- 2 Freedom of Information enquiries; one regarding a novel food, which was referred to FSA and another concerning *Legionella* testing in hot water systems
- one request for an internship at NRL from an EU degree student; they were declined as due to COVID restrictions, UKHSA could not host visitors
- 2 OL enquiries concerning methodology; one regarding guidelines for testing of ice-cream, one concerning spatial mapping of incubator internal temperatures; both were dealt by NRL experts
- queries regarding Measurement Uncertainty (MU) were received from 2 OLs, for which the NRL gave advice
- a query concerning disinfectant use at border control posts, which advice was given by UKHSA experts
- FSA correspondence regarding post-EU transition arrangements for NRLs and OLs, capability of testing marine gastropods, the NRL review executive summary, participation to the EFL and *Campylobacter* PT schemes, and input to the surveillance survey on retail foods
- 2 queries concerning dilution factors in PT schemes and repeat samples for PTs, which were both forwarded to FEPTU
- APHA clarifying the reporting process for the UK, which the NRL responded
- following the recent Verification and validation of methods workshop, a query from another stakeholder was received, which the NRL advised and directed to other relevant colleagues

Listeria

- in April 2021, the *Listeria* EURL requested to publish UK 2019 data on their website, which the NRL allowed
- a clarification regarding *Listeria* in the microbiological criteria regulation, which the NRL responded
- FSA query regarding *Listeria* testing in Enoki mushrooms

Coagulase-positive staphylococci

- in April 2021, the CPS EURL requested any outbreak information for a new EURL newsletter, which the UK NRL did not have anything to contribute
- an enquiry regarding staphylococcal enterotoxin detection in clinical samples, and was advised by the NRL

Salmonella

- a query from a private laboratory regarding the selection of a *Salmonella* control strain and a related separate query on detection of *Salmonella* Nottingham in seafood
- advice was sought from a PhD student in Nigeria regarding a *Salmonella* study, which was forwarded to a UKHSA *Salmonella* expert

STEC/*E.coli*

- an enquiry as to whether indicator *E.coli* could be further characterised from raw pet food

Antimicrobial resistance

- in February 2022, the AR EURL requested permission to present azithromycin resistance data from the network at ECCMID 2022, however, the UK NRL did not have any data to include

Related to Core Function(s): 2.a, 2.d

Representation at relevant international meetings and prepare 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 antimicrobial resistance, coagulase-positive staphylococci (CPS) and *Escherichia coli* (incl. STEC) EURL meetings. In addition, where presentations have been available, the UK NRL have produced reports for the *Campylobacter* and *Salmonella* meetings (see Table 2). Presentations from the *Listeria* EURL meeting 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 2021 to March 2022

EURL Meeting	Date: From	Date: To	Location	Attendees
Coagulase-positive staphylococci (standardisation and enterotoxin)	4 April 2021	4 April 2021	Virtual	Shona Neal Amisha Vibhakar
Listeria monocytogenes	18 May 2021 17 June 2021	18 May 2021 17 June 2021	Virtual	Unable to attend
Salmonella	28 May 2021	28 May 2021	Virtual	Unable to attend
Antimicrobial resistance	21 September 2021	22 September 2021	Virtual	Shona Neal Amisha Vibhakar Marie Chattaway Satheesh Nair
Coagulase-positive staphylococci (enumeration and typing)	23 September 2021	23 September 2021	Virtual	Unable to attend
Campylobacter	28 September 2021	29 September 2021	Virtual	Unable to attend
E. coli	18 October 2021	19 October 2021	Virtual	Shona Neal Amisha Vibhakar

Related to Core Function(s): 1.a, 2.b

Attend training workshops at international organisations

Due to the COVID-19 pandemic, EURL training offered was limited and in addition, the UK NRL may not have received information on other training due to the UK leaving the EU. However, the UK NRL were able to attend 2 workshops organised by the AR EURL. The first was a 4-day virtual course in April 2021, entitled ‘Use of WGS for AMR’, which was similar to their course in October 2020.

The AR EURL also arranged a webinar to introduce a harmonised protocol for isolating *Campylobacter* for AMR monitoring, to support the new Commission Implementing Decision (EU) 2020/1729 for the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria. Although the UK NRL does not perform AMR monitoring for the EU Decision, the webinar was attended by the UK NRL and it was noted that the protocol and other supporting information was held on both the AR and *Campylobacter* EURLs’ websites.

Related to Core Function(s): 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’.

Keep abreast of methodology developments

The UK experiences low referrals of food for detection of Staphylococcal enterotoxin; therefore, the UK NRL outsources this method to an NRL in the Netherlands. Requests for this test on official control samples has not been received from an OL for over 4 years. This arrangement is known to the FSA.

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 with 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.

Related to Core Function(s): 2.e, 2.f

Participation in the BSI AW9 microbiology committee and other working groups

The UK NRL attended all 3 BSI AW9 committee meetings remotely, in May, August and December 2021. The status of the related ISO Standards were reviewed at these meetings and the UK NRL representative was asked to invite a statistician from UKHSA to join the committee, which unfortunately is still outstanding and possibly due to COVID priorities.

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

- ISO 23691 (Cardinal values)
- ISO 20836 (Performance of thermal cyclers)
- ISO 23418 (Whole Genome Sequencing for typing and genomic characterization of foodborne bacteria)
- ISO 20976 part 2 (Challenge tests to study inactivation potential and kinetic parameters)
- part 7 of the ISO 16140 series (Method validation)
- Amendment 1 to ISO 10272 Parts 1 and 2 (*Campylobacter*)
- ISO 22174 (General requirements for PCR)

In February 2022, a survey was circulated to ascertain how larger portion sizes are used in different food categories from the ISO/TC 34/SC 9 committee. The UK NRL responded with detailed information via the BSI committee and this will go towards deciding whether a validation study is required for larger portion sizes of qualitative methods.

A representative of the UK NRL is a 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*) which have recently released drafts of the new Standard to review to the scientific community.

Related to Core Function(s): 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 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 are currently looking to revise and update these methods to the current versions and have identified other relevant UKHSA methods which will be made available on the NRL webpage. In addition, UKHSA Standard Operating Procedures (SOPs) are available to OLs upon request.

Table 3. List of Standard Methods archived on the NRL website, March 2022

Document No.	Title	Version No.
FNES63	Determination of pH in food and water samples	2
FNES67	Determination of water activity in food	2
FNES8 [F12]	Enumeration of coagulase positive staphylococci (*Staphylococcus aureus* and other species)	4
FNES26 [F2]	Preparation of samples and dilutions, plating and sub-culture	4
FNES3 [F8]	Enumeration of β-glucuronidase positive *Escherichia coli*: Pour plate method	3
FNES22 [F19]	Detection and enumeration of *Listeria monocytogenes* and other *Listeria* species	4
FNES28 [F22]	Enumeration of β-glucuronidase positive *Escherichia coli* – most probable number technique	3
FNES16 [F13]	Detection of *Salmonella* species	4
FNES15 [F21]	Detection and enumeration of *Campylobacter* species	4
FNES4 [E1]	Detection and enumeration of bacteria in swabs and other environmental samples	4
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	3

Related to Core Function(s): 1.a, 1.e, 3.a, 4.a

Prepare specific guidance protocols for OLs and the FSA

The UK NRL have produced a new method for the Food, Water and Environment Microbiology Service (FWEMS) on the Verification and Validation of Methods based on this ISO 16140 series for method validation. This method, FNES61.01, is mostly based on Part 3: Protocol for the verification of reference and validated alternative methods implemented in a single laboratory and Part 4: Protocol for single-laboratory (in-house) method, as this was found to be most relevant to work performed in OLs. A remote workshop was organised and presented by the UK NRL to OLs and other stakeholders in March 2022 (described in Core Function 4, below) and the method launched and distributed to participants, including the FSA.

Other supporting documents to FNES61.01 include an Excel verification calculation tool, which is based on the ISO tool developed by ISO/TC 34/SC 9/WG 3 ‘Method Validation’ members and a report template for the verification or validation study performed by laboratories, which can also be used as a checklist to retain the study data.

Related to Core Function: 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 2022 to 2023 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 been no consistent poor performance from participant results (see next Core Function 4).

Related to Core Function: 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 January 2021 the UK Official Laboratories (OLs) for Food Microbiology were invited to register to the 2021 to 2022 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 Commision 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. After a temporary reduction in service in 2020 due to the COVID-19 incident and the statutory UKHSA (then PHE) response, where the schedule was

reduced to half the number of distributions for the 2020 to 2021 scheme, the distribution was reverted back to its normal 4 distributions for the 2021 to 2022 scheme.

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 network of official laboratories but also act 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.

In recognition of ongoing issues from the COVID-19 pandemic, the NRL were delighted to have received registrations from all 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 2021 to 2022 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.

All participating laboratories have continued to demonstrate high proficiency for achieving the correct results to comply with EC 2073/2005 (as amended); all food categories (listed in EC 2073/2005, Annexe 1) and testing parameters were correctly identified by the submitting laboratories for 8 out of the 12 samples distributed. From these 8 samples, 13/15 tests were examined; all submitting laboratories achieved more than 70 percent of the maximum possible score. Furthermore, for 5 of the 13 tests examined, all the submitting laboratories achieved one hundred percent of all available marks. Reporting of microbiological test results also has continued to remain good; 94% of results submitted (total n = 246) were reported correctly and awarded the maximum marks allocated for a fully correct microbiological result. This is compared to 97% of correctly reported microbiological results last year, although there was a reduced distribution (from 4 distributions in 2019 to 2020 down to 2) in place for the 2020 to 2021 scheme.

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. Only 3% of submissions had marks lost due to either these results being missing or incorrect.

No issues were identified for the examinations of *Salmonella* spp., aerobic colony counts, *Escherichia coli*, coagulase-positive staphylococci and *Enterobacteriaceae* (enumeration). This is an unchanged trend observed since the start of the NRL's analyses of official laboratory results for organisms being tested within this scheme.

Other examinations required for testing in this year's distribution included the detection and enumeration of *Listeria monocytogenes*, detection of *Enterobacteriaceae*, Shiga-toxin producing *Escherichia coli* (STEC), *Cronobacter* spp. and enumeration of presumptive *Bacillus cereus*. The following samples posed difficulties for the participants and these are

described in more detail; those not described were processed and interpreted well by the laboratories.

There was an increase in the number of false results being reported; these were for STEC (3 false-positives, sample EFL169), presumptive *Bacillus cereus* (1 false-positive, sample EFL173) and *L. monocytogenes* (4 false-negatives, sample EFL168). This is compared to one false-positive and one false-negative reported in 2 different samples last year, both for *L. monocytogenes* enumerations (Table 4).

Sample EFL163 listed in Table 4 required the examination of *L. monocytogenes.* The legislation states that products with a shelf-life of less than 5 days shall be automatically considered to belong to category 1.3 (ready-to-eat foods unable to support the growth of *L. monocytogenes*). Five laboratories selected category 1.3 for examination, whilst 7 laboratories selected to examine against criteria 1.2 (ready-to-eat foods able to support the growth of *L. monocytogenes*). As both food categories required *L. monocytogenes* enumeration, they were both accepted as being correct for this sample type.

Table 4. Overview of performance of the 2021 to 2022 European Food Microbiology Legislation Scheme

Sample code	Brief sample details	Required examination(s)	OLs achieving >70% of the maximum possible score [1]
Distribution EFL55 Meat foods			
EFL163	Steak tartare made with minced raw beef steak mixed with raw egg yolk, onions, and spices. Shelf life of <5 days, product sampled whilst on the market	*L. monocytogenes* enumeration *Salmonella* spp.	12/12 12/12
EFL164	Meat from flesh-bearing bones from poultry carcases, using mechanical instrument. Sampled at the end of the manufacturing process	Aerobic Colony Count *Escherichia coli* enumeration	12/12 12/12

Sample code	Brief sample details	Required examination(s)	OLs achieving >70% of the maximum possible score [1]
EFL165	Uncooked sausages made from Pork and herb seasoning. Products placed on the market during their shelf-life	*Salmonella* spp.	12/12
Distribution EFL56 Dairy foods			
EFL166	Locally produced ice-cream made with raw cow milk and heated to 63°C for 30 min during production. Product placed on the market during their shelf-life	*L. monocytogenes* enumeration *Salmonella* spp.	11/11 9/9
EFL167	Whey protein powder made from milk. Sampled at the end of the manufacturing process	*Enterobacteriaceae* Coagulase-positive staphylococci	12/12 12/12
EFL168	Unsalted butter made from raw milk. Sampled at local farm shop before sale of product	*L. monocytogenes* detection *Escherichia coli* enumeration	7/12[2] 5/5
Distribution EFL57 Ready-to-Eat foods			
EFL169	Ready-to-eat salad containing sprouted moong bean shoots, product sampled whilst on the market	*L. monocytogenes* enumeration *Salmonella* spp. Shiga-toxin producing *Escherichia coli*	12/12 12/12 3/6[3]
EFL170	Smoked salmon pâté made with dill and lemon with a shelf-life of <5 days, sampled before product left	*L. monocytogenes* detection	11/11

Sample code	Brief sample details	Required examination(s)	OLs achieving >70% of the maximum possible score [1]
	the immediate control of the food business operator		
EFL171	Garlic shrimp scampi dish served in a butter sauce made with herbs. Product sampled from a local supermarket during its shelf-life	*L. monocytogenes* enumeration *Salmonella* spp.	11/11 12/12
Distribution EFL58 Miscellaneous foods			
EFL172	Home-made unsalted sage butter made with unpasteurised cream; product sampled whilst on the market	*L. monocytogenes* enumeration *Salmonella* spp.	13/13 13/13
EFL173	Dried infant formulae intended for infants below 6 months. Sampled at the end of the manufacturing process	*Enterobacteriaceae* *Cronobacter* spp. Presumptive *Bacillus cereus*	7/13[4] 1/4[5] 11/13
EFL174	Unpasteurised fresh orange juice with pH 4.3 and shelf life of 3 days, sampled during the manufacturing process	*Escherichia coli* enumeration	13/13

[1]Number of laboratories achieving >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]Five laboratories correctly identified the food category but incorrectly performed an enumeration test for *Listeria monocytogenes.*

[3]Nine laboratories correctly identified the food category and 10 laboratories named the correct organism for examination.

[4]Thirteen laboratories correctly identified the food category and 12 laboratories named the correct organism for examination.

[5]Three laboratories correctly identified the food category and 4 laboratories named the correct organism for examination.

For sample EFL166 (see Table 4), examination for *L. monocytogenes* was required for compliance to EC 2073/2005. This sample was an ice cream which was kept frozen until the point of consumption and therefore unable to support the growth of *L. monocytogenes*. Category 1.3 applied, and an enumeration test was required. Seven laboratories selected this category correctly, whilst 4 laboratories incorrectly performed enumeration of the organism against category 1.2 for foods able to support growth of *L. monocytogenes*. This is an improvement from a previous similar sample, EFL132 from February 2018 (fresh strawberry ice-cream made from raw eggs and unpasteurised milk, product sampled at market during shelf-life), where 9 laboratories incorrectly tested this sample against category 1.2, and only 3 laboratories correctly testing against category 1.3.

The stage at which *L. monocytogenes* testing applies also confounds errors in the correct examination of this organism, as seen in the dairy distribution for sample EFL168 (see Table 4). Although not clear from the sample description about the nature of the farm shop, the product had not yet been placed on the market. Food category 1.2 applied and 25 grams was required to be examined. Whilst all 13 laboratories correctly selected the appropriate food category, 5 laboratories examined this sample for the enumeration of *L. monocytogenes*. This resulted in 4 of the 5 laboratories not being able to report the presence (detection) of *L. monocytogenes*, as the sample was contaminated at such low levels; therefore they reported a false-negative result.

STEC examination was required for EFL169, which contained a culturable non-toxigenic strain of *E. coli* O157. Although 10 OLs correctly named STEC for examination, it relies on PCR detection and expert isolation of the STEC strain and consequently only 6 OLs were able to perform this test. However, only 3/6 participants reported the correct result, as whilst the strain possessed the *eae* gene, it did not possess the *stx*1 and *stx*2 gene markers, which would classify this strain to be reported as a STEC. Participants were reminded by the scheme organisers that for compliance to EC 2073/2005, these genes must be determined for accurate reporting of a result for this food category (1.29) and examination.

A sample of dried infant formula was sent out in the final sample set of the year for miscellaneous foods distribution. Sample EFL173 was taken at end of manufacture and required parallel testing for *Enterobacteriaceae* and *Cronobacter* species against criteria 1.24 and 2.2.9, and presumptive *Bacillus cereus* testing against criteria 2.2.11 to comply with EC 2073/2005. There was low performance for this sample, particularly for detection of *Cronobacter* species, although improvements were observed compared to a previous identical sample with the same testing requirements (EFL125 in 2017).

Nine participating laboratories did not identify *Cronobacter* species as a required test for this sample. The legislation is difficult to interpret for testing of *Cronobacter* spp. at manufacture due to footnote 9 associated with category 2.2.9. (*Enterobacteriaceae* detection). Therefore,

the scheme organisers have taken category 1.24 to apply at manufacture, and laboratories were awarded marks accordingly. Only one laboratory performed examination of *Cronobacter* species and achieved full marks , which is an improvement since the last sample, as no laboratories performed this examination for the previous sample (EFL125 in 2017). Three laboratories identified the food category 1.24 for *Cronobacter* species testing, and 4 laboratories correctly named the examination, an improvement by one and 2 laboratories respectively from sample EFL125 in 2017.

All 13 laboratories correctly identified *Enterobacteriaceae* testing against category 2.2.9 for EFL 173, a stable performance since the last sample in 2017, EFL125. This year 8 laboratories performed examination, compared to 7 in 2017. However, 2 laboratories incorrectly performed an enumeration test when the criterion requires a presence/absence test and marks were deducted for the test result. However, this is an overall improvement, as 4 laboratories incorrectly performed enumeration in the 2017 sample EFL125. Since 2017, only one laboratory continued to incorrectly perform an enumeration test while 2 laboratories corrected their methodology to perform a presence/absence test from the 2017 to 2022 samples.

The NRL understands that laboratories continue to experience difficulties from the impact of COVID-19, and has observed 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 92% per distribution, demonstrating a high level of laboratory capacity and capability despite the continued strains placed on laboratories from the ongoing pandemic. 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 2022 to 2023 distributions. All official laboratories 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 partciplate to provide overall assurance of laboratory competence, identify areas of weakness and receive further training as well as compliance with laboratory quality standards and accreditation. OLs will also continue to have access to expert advice and support from FEPTU and/or the NRL.

Related to Core Function(s): 4.a, 4.b

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

In this reporting period, the UK NRL has continued to experience a slightly reduced participation to EURL proficiency tests (PTs). This is due to the UK leaving the EU as a Member State and the reduced participation that the UK NRL experiences in the EURL networks. 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's, which is important for biosecurity capability and facilitating trade both in and outside the EU.

Therefore, the UK NRL received 8 distributions from 4 EURLs and the Norwegian NRL, which includes tests for detection, enumeration, DNA sequencing and culture strain typing, and analyses. Table 5 lists these activities and a summary of performance.

Enumeration of *Campylobacter* from shredded cabbage and detection from raw milk was performed very well; however, an unaccredited new method was used to identify the species, so the result was not reported, which included thermotolerant *Campylobacter* (*C. jejuni, C. coli* and *C. lari*). When comparing the EURL reports with the UK NRL results, they match 100% with the correct identifications, thus giving good assurance that this new method is capable of speciating thermotolerant *Campylobacter* species. This new method will allow speciation of *Campylobacter* to be performed at the testing laboratory and not submitting to the reference laboratory, where confirmation and further typing are still provided. Accreditation of this test will be persued.

The UK NRL scored well for the detection of *Salmonella* in whole liquid eggs, where detection was found in 6/6 high level samples (50-100 cfu/25 g test portion), 5/6 low level samples (5-10 cfu/test portion) 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 interlaboratory trial (ILT) of MALDI-ToF for identification of *Bacillus cereus, Clostridium perfingens* and CPS was organised under the ToxDetect project and funded under One

Health EJP. The UK NRL was invited to participate via the CPS EURL network by the organising NRL in Norway. This PT was complex, involving the use of a custom profile library (ToxDetect library) and preparing the samples 4 different ways; thus, the ILT was evaluating the library and method, and not the laboratories. Nine laboratories participated and concluded that although there was no notable improvement when using the ToxDetect library to identify CPS, there was a slight improvement for *C. perfingens* and a significant improvement for *B. cereus*. This is incredibly useful for laboratories to quickly ascertain the difference between *B. cereus* and *B. anthracis*, as the latter requires a higher containment level and is more hazardous to health.

The STEC EURL organised a detection and identification PT (PT30) in spent irrigation water in October 2021. However, participants were sent an interim report a month later stating that the water was heavily contaminated with amoebae, which made detection and isolation of STEC extremely difficult for most NRLs, including the UK NRL. The STEC EURL added that a PT using the same matrix will be distributed in the 2022 to 2023 year.

Two PTs distributed later in 2021 (DTU Genomics and STEC typing PT) are still awaiting the intended results and reports from the respective EURLs, at the time of writing.

The NRL did not perform the AR EURL PT for typing and characterisation for antimicrobial resistance in *Salmonella*, *Campylobacter* or *Escherichia coli* this year, since the UK NRL adopts a different method to that stipulated in EU legislation (a broth dilution method whereas the UK NRL performs an agar dilution method). However, the UKHSA does have plans to implement broth dilution in the future.

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 and described earlier in ‘Keep abreast of methodology developments’, the NRL maintains a testing facility for samples by sub-contracting the service to a designated official laboratory in the EURL network and who regularly participates in the EURL proficiency testing.

Related to Core Function(s): 1.a, 2.e, 4.c, 4.d

Table 5. NRL participation in EURL ring trials, March 2021 to February 2022

Month Received	Organism – Test[1]	Reference	Matrix/Pure culture	Comments[2]
March 2021	*Campylobacter*: enumeration and voluntary species identification	PT29	Shredded cabbage	Excellent performance for enumeration (100%); Did not participate in species identification
March 2021	*Campylobacter*: detection and species identification	PT30	Raw milk	Excellent performance for detection (100%); Did not participate in species identification
March 2021	*Salmonella*: detection	*Salmonella* detection PT 2021	Whole liquid egg	Good performance (93%); detected *Salmonella* in 5/6 low level samples
June 2021	*Bacillus cereus, Clostridium perfingens* and CPS	Tox-Detect Project ILT	pure cultures	This inter-laboratory trial was evaluating the method MALDI-ToF and not the laboratories
October 2021	*Salmonella*, *E.coli* and *Campylobacter*: WGS	DTU Genomic PT 2021	pure cultures	Organiser unable to receive results due to external disruption, therefore impacting on PT schedule: awaiting intended results and report
October 2021	STEC: detection and identification	PT30	spent irrigation water samples	ILT void as most participants could not detect or isolate STEC: PT will be repeated in 2022 to 2023
November 2021	STEC: typing and WGS cluster analysis	PT31 & WGS4	Pure cultures	Awaiting intended results and report
November 2021	*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

1 STEC = Shiga toxin *Escherichia coli*

2 Performance grading taken directly from EURL reporting

Organise Skype or classroom-based workshops for UK OLs

Due to the COVID-19 pandemic and social restrictions, the UK NRL decided to hold workshops remotely for this reporting period. As the new FWEMS method for Validation of methods was approved within UKHSA (described earlier in ‘Prepare specific guidance protocols for OLs and the FSA’), the NRL arranged a Teams workshop ‘Method Verification and Validation’ in March 2022. The main objective is to support OLs and other laboratories on how to decide and work through verification and validation of methods.

Verification and validation of methods is now a requirement under the ISO 17025: 2017 Standard on General requirements for competence of testing and calibration laboratories, and is also referred in the EU 2073/2005 microbiological criteria Regulation and the EU 2017/625 Official Control Regulations. In addition, the ISO 16140 series for Method Validation have been developed as an internationally accepted process to aid laboratories and organisations. The NRL led the draft of the UKHSA method, adapted from the ISO 16140 series and focuses on verification of methods to reflect the processes of laboratory method implementation by UKHSA FWEMS. The workshop introduced this method to participants, along with a recent example of a verified method which was submitted to UKAS as an extension to scope by the UKHSA FWEMS.

There were 36 participants at this workshop from at least 10 OLs and also from Campden BRI, CEFAS and FSA. Initial feedback suggested that it was well received and an evaluation form was sent to participants to ascertain further feedback. The presentations, UKHSA SOP and the accompanying spreadsheet and report template were distributed to those who joined the workshop.

In 2022 to 2023, the UK NRL will plan to have workshops on Measurement Uncertainty and how to interpret the microbiological criteria. The NRL can also arrange other training based on OL needs and requests.

Related to Core Function(s): 2.a, 3.a, 4.e

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

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

Since 1 January 2015, fresh meat at retail and animals at slaughterhouse has been sampled and tested for the above EU Decision in the UK by the APHA. This new Decision 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 and now includes sampling at Border Control Posts and the use of WGS in place of broth micro-dilution testing.

For 2021, AMR monitoring was carried out in fattening pigs, bovine animals, pig meat and bovine meat. However, at the time of writing, it was unknown whether the UK were required to submit data due to EU Exit. The NRL have 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 Function(s): 1.b, 2.a, 5.a

Participate in EURL activities relating to Whole Genome Sequencing

Since the UK left the EU, UK participation in EURL WGS activities has significantly reduced or halted. This 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.

Information was presented at the EURL *Salmonella* meeting in May 2021, which detailed how WGS data would be collected, and the Terms of Reference drawn up to govern this activity. At the time of writing, it is unknown whether the UK will be submitted WGS data to the EFSA database.

Discussion of specific areas

COVID-19 pandemic

The COVID-19 pandemic has continued into this reporting period (April 2021 to March 2022), disrupting workflows of the UK NRL. All meetings with the UK NRL stakeholders, including FSA, APHA and the 6 EURLs, were arranged remotely and some were postponed. The UK NRL also arranged the OL User Day and the verification of methods workshop remotely, and whilst some attendees remarked that a remote meeting allowed them to attend and not had to travel, others stated that face-to-face meetings were valuable, especially when networking between sessions.

During the COVID-19 pandemic, the UK NRL also offered mutual support to UK OLs in terms of advice, procuring consumables or testing diverted samples for public health needs. No requests for additional assistance were received.

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 probably 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 have been unable to attend to most 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.

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 will commence liaison with the NI NRLs which there may be overlap in activities.

In April 2022, the government announced that import controls on EU goods planned from July will not be introduced in 2022. The NRL awaits information on the introduction of physical checks of goods imported into the UK and will advise accordingly.

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 2022 to March 2023

1 Core Function 1: Secretariat services

1.a Disseminate information/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.

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 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.

3 Core Function 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 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 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/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 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 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.

Summary of NRL activities for April 2022 to March 2023

Activities	Function	Core	0	1	2	3	4	5	6	7	8	9	10	11	12
Month			**Mar 2022**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan 2023**	**Feb**	**Mar**
Disseminate information from international organisations to FSA	Disseminate information	1.a													
Produce & circulate quarterly newsletter to FSA, OLs & other labs	Disseminate information	1.a													
OL User Day meeting at NRL, TBC	Meeting	1.a													
Disseminate EPIS and other alerts to FSA	Disseminate information	1.a													
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.b													
Liaise with CEFAS for *E.coli* and *Salmonella* in shellfish activities	Secretariat	1.c													
Liaising with FSA matters implementing (EU)2017/625, EU Exit strategy and Laboratory review	Advice/ communication	1.c													
2021 – 22 Annual report to FSA	Coordination	1.d													
2022 – 23 Annual report to FSA	Coordination	1.d													
Meetings with FSA	Coordination	1.d													
Monthly reporting to FSA	Coordination	1.d													

Activities	**Function**	**Core**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Month			**Mar 2022**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan 2023**	**Feb**	**Mar**
Maintain and update NRL web content on UKHSA website	Website	1.e													
Provide advice to FSA, OLs, and other UK labs on request	Advice	2.a													
Coagulase positive Staphylococci 16th Workshop, 30 - 1	EURL Workshop	2.b													
Listeria 16th Workshop, Porto, 17 - 18	EURL Workshop	2.b													
Salmonella Workshop, Remote, 24-25	EURL Workshop	2.b													
Antimicrobial Resistance 16th Workshop, Copenhagen/Hybrid, 09-10	EURL Workshop	2.b													
Campylobacter 17th Workshop in Sigtuna, Sweden, 26-28	EURL Workshop	2.b													
E. coli 17th Workshop in Rome/Hybrid, 10-11	EURL Workshop	2.b													
Liaise with FSA on testing capabilities post EU exit		2.d													
Agree the workflow and Service Level Agreement for CPS toxin testing with the Dutch NRL	Advice	2.e													
Participation in WG for revised ISO 13136 (STEC)	Advice & representation	2.g, 5.a													
Participation in BSI AW9 microbiology committee	Advice & representation	2.g													

Activities	**Function**	**Core**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Month			**Mar 2022**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan 2023**	**Feb**	**Mar**
Produce guidelines on alternative methods	Guidance document	3.a													
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													
Liaise with FEPTU & monitor OL's testing of EFL scheme	UK PT	4.b													
Coordinate participation of OLs in international method validation studies, TBD	International ring trials	4.c													
Campylobacter enumeration in chicken skin PT from EURL (PT31)	EURL PT	4.d													
Campylobacter WGS PT from EURL (PT33)	EURL PT	4.d													
Listeria challenge testing in RTE foods (PT4) from EURL	EURL PT	4.d													
AMR for *E. coli*, enterococci and staphylococci PT from EURL, TBC	EURL PT	4.d													
AMR *Salmonella* & *Campylobacter* PT from EURL, TBC	EURL PT	4.d													
AMR matrix isolation of *E. coli* PT from EURL, TBC	EURL PT	4.d													
STEC detection in dairy product from EURL (PT 33)	EURL PT	4.d													
Salmonella detection in matrix PT from EURL, TBD	EURL PT	4.d													

Activities	**Function**	**Core**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Month			**Mar 2022**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan 2023**	**Feb**	**Mar**
STEC detection in spent irrigation water from EURL (PT 34)	EURL PT	4.d													
E. coli & VTEC id & typing and WGS PT from EURL (PT-35 & WGS5)	EURL PT	4.d													
Listeria enumeration in TBC PT from EURL, TBC	EURL PT	4.d													
Listeria typing (WGS) PT from EURL, TBC	EURL PT	4.d													
Coag+ Staph enumeration PT from EURL, TBC	EURL PT	4.d													
Salmonella typing PT from EURL, TBD	EURL PT	4.d													
Organise practical workshop for UK OLs (pending relaxation of COVID restrictions and availability of teaching laboratory)	Workshop	4.e													
Organise Teams workshop for UK OLs, ‘Method verification and validation’	Workshop	4.e													
Organise remote workshop for UK OLs, ‘How to improve your EFL score’	Workshop	4.e													
Support food aspect of EU-wide AR monitoring (Decision 2013/652/EU superseded by 2020/1729/EU)	EU monitoring	5.a													
Provide information regarding WGS processes to EURLs and other international organisations	EURL initiative	5.a													

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_2021_future_activities_closing_remarks_hh_eurl 7_WP 2021_2022 11 Kirsten Closure 210528 EURL-Salmonella Newsletter June 2021 EURL-Salmonella Newsletter September 2021 EURL-Salmonella Newsletter December 2021 EURL-Salmonella Newsletter March 2022 623_2021-dec-newsletter-no15-final
Quarterly newsletters Related to Core Functions; 1.a, 2.d, 2.e, 2.f	NRL newsletter Q1 2021_FINAL NRL newsletter Q2 2021_FINAL NRL newsletter Q3 2021_draft_FINAL NRL newsletter Q4 2021-2_final
Coordination of 2020 OL User Day Related to Core Functions: 1.a, 1.b, 1.c, 2.a, 2.d, 2.e, 2.f	User day Sept 2021 agenda_FINAL
Provide regular updates to FSA Related to Core Functions: 1.d	FSA NRL Meeting 21Jun21 minutes_KL_SN_AV_JMcL_edits (Final Draft 02.00) FSA NRL Meeting 20Sept21 minutes_KL__SNedits (Final Draft) FSA NRL Meeting 03Dec21 minutes_KL__SN_AVedits (Final Draft)_David comments FSA NRL Meeting 11Mar2022 minutes_KL__SN_JMcL_edits (Final Draft) UK NRL Monthly Log_Apr21_Final UK NRL Monthly Log_May21_Final UK NRL Monthly Log_Jun21_(Final) UK NRL Monthly Log for July 21_Final

	UK NRL Monthly Log for Aug 21_final UK NRL Monthly Log for Sept 21_FINAL UK NRL Monthly Log for Oct21_(Final) UK NRL Monthly Log for Nov21_Final UK NRL Monthly Log for Dec21_Final UK NRL Monthly Log for Jan22_Final UK NRL Monthly Log for Feb22_Final UK NRL Monthly Log for Mar22_SN_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	AgendaCPS2021 1_EURL CPS_report 2021 workshop-combiné Internal report of EURL meeting - CPS Workshop May2021_final Draft agenda - 2021 Workshop of the NRLs for Listeria monocytogenes_part 1_0 Draft agenda - 2021 Workshop of the NRLs for Listeria monocytogenes_part 2_4 EURL Lm_2021 WS Report Programme of workshop 2021 v210517 2021-0130 Individual Report on the 26th Salmonella EURL Workshop 2021_Final Agenda workshop EURL_AR 2021_v16.09.2021_UK Internal report of EURL-AR meeting 2021 Preliminary programme EURL Campylobacter workshop 2021 Summary of the 16th Campylobacter EURL Workshop 2021_FINAL Draft_Agenda_2021 Internal report of EURL meeting_E.coli 2021
Attend training workshops at the EURL Related to Core Functions: 2.c, 2.e	2021 WGS EURL AMR monitoring training feedback_UK EURL AR webinar new protocol for isolation Campylobacter for AMR monitoring 5May21_Final
Core Function 3: Production of standard operating procedures, codes of practice and guidance documents	
Update and expand food methods archive on NRL website Related to Core Functions: 1.a, 1.e, 3.a, 4.a	UK national reference laboratory for food microbiology - GOV.UK

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*	FEPTU483.13 schedule and prices 2021 to 2022
Participate in EURL ring trials *Related to Core Functions: 1.a, 2.e, 4.c, 4.d*	EURL-Campylobacter_PT29-report EURL-Campylobacter_PT30-report 2021-0128 Maldi-PT-revised report Report PT30_23_12_2021 Interim summary report EURL-Salmonella PT Serotyping 2021
Organise classroom-based workshops for UK OLs *Related to Core* Functions: 2.a, 3.a, 4.e	Verification Validation of Methods workshop_March22_v01_final

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 heath secure.

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