

WOAH Reference Laboratory Reports Activities 2023

Activities in 2023

This report has been submitted : 7 juin 2024 16:49

Laboratory Information

Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:	Rabies
Address of laboratory:	Animal and Plant Health Agency, Woodham Lane, New Haw, Addlestone Surrey KT15 3NB Weybridge UNITED KINGDOM
Tel.:	+44-208 415.22.38
E-mail address:	tony.fooks@apha.gov.uk
Website:	www.defra.gov.uk/apha
Name (including Title) of Head of Laboratory (Responsible Official):	Professor Anthony R. Fooks (PhD) Head of WOAH Reference Laboratory (Rabies) and Deputy Dr Lorraine M. McElhinney (PhD), Head of UK National Rabies Laboratory (Rabies).
Name (including Title and Position) of WOAH Reference Expert:	Professor Anthony Fooks (PhD) WOAH Reference Expert (Rabies)
Which of the following defines your laboratory? Check all that apply:	Governmental

TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAH Manual (Yes/No)	Total number of test performed last year	
		Nationally	Internationally
Indirect diagnostic tests			
FAVN		1702	13303
Direct diagnostic tests			
FAT (dFA)		541	1
RTCIT		29	0
Real time Taqman / SYBR RT-PCR		1619	3
Reverse-transcriptase Polymerase Chain		5	0

TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAH?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOAH Members?

Yes

TYPE OF REAGENT AVAILABLE	RELATED DIAGNOSTIC TEST	PRODUCED/ PROVIDE	AMOUNT SUPPLIED NATIONALLY (ML, MG)	AMOUNT SUPPLIED INTERNATIONALLY (ML, MG)	NO. OF RECIPIENT WOAH MEMBER COUNTRIES	COUNTRY OF RECIPIENTS
Archived samples of historic WOAH rabies antibody reference	FAVN / RTCIT	Provided	0	(5 x 220µl)	1	UNITED STATES OF AMERICA,

serum.						
RNA from Lyssavirus phylogroups 1, 2 & 3.	RT-PCR	Provided	0	18 x 0.02ml	1	SPAIN,
RNA from Lyssavirus phylogroups 1, 2 & 3.	RT-PCR	Provided	0	18 x 0.02ml	1	SPAIN,

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAHA Members?

Not applicable

TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

No

7. Did your laboratory validate diagnostic methods according to WOAHA Standards for the designated pathogen or disease?

No

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

No

9. Did your laboratory validate vaccines according to WOAHA Standards for the designated pathogen or disease?

No

TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAHA Members?

Yes

NAME OF WOAHA MEMBER COUNTRY SEEKING ASSISTANCE	DATE	WHICH DIAGNOSTIC TEST USED	NO. SAMPLES RECEIVED FOR PROVISION OF DIAGNOSTIC SUPPORT	NO. SAMPLES RECEIVED FOR PROVISION OF CONFIRMATORY DIAGNOSES
SPAIN	2023-03-06	39 (FAVN mouse), vaccine study	39	0
ETHIOPIA	2023-04-19	8 (PCR wolf samples)	8	0
FRANCE	2023-04-13	44 (FAVN human)	44	0
SPAIN	2023-04-25	30 (FAVN dog), vaccine study	30	0
FRANCE	2023-12-04	44 (FAVN human)	44	0

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAHA Member?

Yes

NAME OF THE WOAHA MEMBER COUNTRY RECEIVING A TECHNICAL CONSULTANCY	PURPOSE	HOW THE ADVICE WAS PROVIDED
GHANA	In-country technical assistance, as part of a UK Official Development Assistance Funded Animal Health Systems Strengthening Project.	Technical assistance.
SIERRA LEONE	In-country technical assistance for the implementation / completion phases as part of a WOAHA-funded Twinning Project.	Practical experience, advice and training in FAT and PCR techniques for rabies.
SOUTH AFRICA	Advice and support in rabies serology, focussing on ELISA.	Practical experience and training using commercially available ELISA kits.
GEORGIA	Advice and support using the rabies antigen detection (FAT) technique.	Discussions on and troubleshooting problems using the FAT.

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAHA Members other than the own?

Yes

Title of the study	Duration	PURPOSE OF THE STUDY	PARTNERS (INSTITUTIONS)	WOAHA MEMBER COUNTRIES INVOLVED OTHER THAN YOUR
--------------------	----------	----------------------	-------------------------	---

				COUNTRY
DEFRA-Funded SE0433, WP2 'Understanding global threat of lyssaviruses'.	4 years (2020 – 2024)	International collaborative lyssavirus surveillance and characterisation of lyssaviruses. Studies into phylogeography and evolution of lyssaviruses	3	NIGERIA SOUTH AFRICA TANZANIA
EU-funded H2020 'European Virus Archive Global' [EVAg; https://www.european-virus-archive.com]	4-years (2020 - 2024)	Characterisation of rabies virus isolates.	~50	FRANCE
UK Official Development Assistance Funded Animal Health Systems Strengthening Project.	3-years (2022 - 2025)	Capability-building in ODA-eligible countries in West & Central Africa.	4	GAMBIA GHANA NIGERIA ZAMBIA

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOA?H?

No

TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

IF THE ANSWER IS YES, PLEASE PROVIDE DETAILS OF THE DATA COLLECTED:

APHA Test data (suspect animals, death in quarantine, illegal imports), including positive cases, is reported to UK Government (veterinary & public health departments) and subsequently reported to WHO (Rabies Bulletin Europe quarterly reports, Annual Zoonosis Reports), EFSA (annual reports), WOA (case/incident reports) and EU (via EURL). Data is also published in assessment reports, Science Blogs, peer reviewed journals and at national and international conferences. Bat submission and test data reported via a publicly accessible Dashboard Bat Rabies Dashboard | Tableau Public Companion animal import data and rabies serology test results collated and communicated, where appropriate.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

IF THE ANSWER IS YES, PLEASE PROVIDE DETAILS OF THE DATA COLLECTED:

All published articles available on request.

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

7

1. Natesan, K., Isloor, S., Vinayagamurthy, B., Ramakrishnaiah, S., Doddamane, R. and A.R. Fooks (2023). *Developments in Rabies Vaccines: The Path Traversed from Pasteur to the Modern Era of Immunization. Vaccines (Basel)* 11(4): 756. doi: 10.3390/vaccines11040756. PMID: 37112668.

2. Wang, X., Terrie, L., Wu, G., Van Damme, E.J.M., Thorrez, L., Fooks, A.R., Banyard, A.C., Jochmans, D. and J. Neyts (2023). *Urtica dioica Agglutinin Prevents Rabies Virus Infection in a Muscle Explant Model. J. Pharmaceutics* 15(5): 1353. doi: 10.3390/pharmaceutics15051353. PMID: 37242595.

3. Lushasi, K., Brunker, K., Rajeev, M., Ferguson, E.A., Jaswant, G., Baker, L.L., Biek, R., Changalucha, J., Cleaveland, S., Czupryna, A., Fooks, A.R., Govella, N.J., Haydon, D.T., Johnson, P.C.D., Kazwala, R., Lembo, T., Marston, D., Masoud, M., Maziku, M., Mbunda, E., Mchau, G., Mohamed, A.Z., Mpolya, E., Ngeleja, C., Ng'habi, K., Nonga, H., Omar, K., Rysava, K., Sambo, M., Sikana, L., Steenson, R. and K. Hampson (2023). *Integrating contact tracing and whole-genome sequencing to track the elimination of dog-mediated rabies: an observational and genomic study. Elife* 25;12 e85262. doi: 10.7554/eLife.85262. PMID: 37227428.

4. Wu, G., McElhinney, L.M., Goharriz, H., Amaya-Cuesta, J., Fooks, A.R. and A.C. Banyard (2023). *A simplified method for measuring neutralising antibodies against rabies virus. J. Virol. Methods* 319; 114769. doi: 10.1016/j.jviromet.2023.114769.

5. Smith, S.P., Shipley, R., Drake, P., Fooks, A.R., Ma, J. and A.C. Banyard (2023). *Characterisation of a Live-Attenuated Rabies Virus Expressing a Secreted scFv for the Treatment of Rabies. Viruses* 15; 1674. <https://doi.org/10.3390/v15081674>.

6. Kuhn JH, Abe J, Adkins S, Alkhovsky SV, Avšič-Županc T, Ayllón MA, Bahl J, Balkema-Buschmann A, Ballinger MJ, Kumar Baranwal V, Beer M, Bejerman N, Bergeron É, Biedenkopf N, Blair CD, Blasdel KR, Blouin AG, Bradfute SB, Briese T, Brown PA, Buchholz UJ, Buchmeier MJ, Bukreyev A, Burt F, Büttner C, Calisher CH, Cao M, Casas I, Chandran K, Charrel RN, Kumar Chaturvedi K, Chooi KM, Crane A, Dal Bó E, Carlos de la Torre J, de Souza WM, de Swart RL, Debat H, Dheilly NM, Di Paola N, Di Serio F, Dietzgen RG, Digiaro M, Drexler JF, Duprex WP, Dürwald R, Easton AJ, Elbeaino T, Ergünay K, Feng G, Firth AE, Fooks AR, Formenty PBH, Freitas-Astúa J, Gago-Zachert S, Laura García M, García-Sastre A, Garrison AR, Gaskin TR, Gong W, Gonzalez JJ, de Bellocq J, Griffiths A, Groschup MH, Günther I, Günther S, Hammond J, Hasegawa Y, Hayashi K, Hepojoki J, Higgins CM, Hongō S, Horie M, Hughes HR, Hume AJ, Hyndman TH, Ikeda K, Jiāng D, Jonson GB, Junglen S, Klempa B, Klingström J, Kondō H, Koonin EV, Krupovic M, Kubota K, Kurath G, Laenen L, Lambert AJ, Li J, Li JM, Liu R, Lukashovich IS, MacDiarmid RM, Maes P, Marklewitz M, Marshall SH, Marzano SL, McCauley JW, Mirazimi A, Mühlberger E, Nabeshima T, Naidu R, Natsuaki T, Navarro B, Navarro JA, Neriya Y, Netesov SV, Neumann G, Nowotny N, Nunes MRT, Ochoa-Corona FM, Okada T, Palacios G, Pallás V, Papa A, Paraskevopoulou S, Parrish CR, Pauvolid-Corrêa A, Pawęska JT, Pérez DR, Pfaff F, Plemper RK, Postler TS, Rabbidge LO, Radoshitzky SR, Ramos-González PL, Rehanek M, Resende RO, Reyes CA, Rodrigues TCS, Romanowski V, Rubbenstroth D, Rubino L, Runstadler JA, Sabanadzovic S, Sadiq S, Salvato MS, Sasaya T, Schwemmler M, Sharpe SR, Shi M, Shimomoto Y, Kavi Sidharthan V, Sironi M, Smither S, Song JW, Spann KM, Spengler JR, Stenglein MD, Takada A, Takeyama S, Tatara A, Tesh RB, Thornburg NJ, Tian X, Tischler ND, Tomitaka Y, Tomonaga K, Tordo N, Tu C, Turina M, Tzanetakis IE, Maria Vaira A, van den Hoogen B, Vanmechelen B, Vasilakis N, Verbeek M, von Bargen S, Wada J, Wahl V, Walker PJ, Waltzek TB, Whitfield AE, Wolf YI, Xia H, Xylogianni E, Yanagisawa H, Yano K, Ye G, Yuan Z, Zerbini FM, Zhang G, Zhang S, Zhang YZ, Zhao L, Økland AL. Annual (2023) taxonomic update of RNA-directed RNA polymerase-encoding negative-sense RNA viruses (realm Riboviria: kingdom Orthornavirae: phylum Negarnaviricota). *J Gen Virol*. 104(8). doi: 10.1099/jgv.0.001864. PMID: 37622664.

7. Lugelo A, Hampson K, McElhinney LM, Lankester F. Evaluation of an iELISA for detection and quantification of rabies antibodies in domestic dog sera. *Vaccine*. 2023 Oct 20;41(44):6565-6571. doi: 10.1016/j.vaccine.2023.09.004. Epub 2023 Sep 15. PMID: 37716829.

b) International conferences:

4

1. Pan-African Rabies Conference (PARACON), Accra, Ghana [Mar 2023]
2. 9th European Meeting on Viral Zoonosis, St. Raphael, France [Sept 2023]
3. Rabies in the Americas (RITA), Bogota, Columbia [Oct 2023]
4. United Against Rabies Forum Stakeholder Meeting, Rome, Italy [Nov 2023]

c) National conferences:

2

1. Association of Veterinary Teaching and Research Workers (AVTRW), Edinburgh, Scotland, UK [Sept 2023]
2. National Bat Conference, Nottingham, UK [Sept 2023]

d) Other (Provide website address or link to appropriate information):

1

EU-funded H2020 'European Virus Archive Global' [EVA-GLOBAL; <https://www.european-virus-archive.com>]

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAHA Members?

Yes

- a) Technical visit : 4
- b) Seminars : 1
- c) Hands-on training courses: 1
- d) Internships (>1 month) 0

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
A	SIERRA LEONE	4
A	SIERRA LEONE	9
A	SIERRA LEONE	8
A	SIERRA LEONE	8
C	SOUTH AFRICA	1
B	GEORGIA	2

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
UKAS accredited to BS EN ISO 17025:2005	1769Testing Multiple (ukas.com)	APHA_1769Testing-Multiple_UKAS.pdf

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
Fluorescent antibody virus neutralisation test (FAVN)	UKAS (ISO17025:2005)
Fluorescent antibody test (FAT)	UKAS (ISO17025:2005)
Taqman real-time RT-PCR (Real time RT-PCR)	UKAS (ISO17025:2005)
SYBR real-time RT-PCR	UKAS (ISO17025:2005)
Conventional reverse-transcriptase PCR (RT-PCR)	UKAS (ISO17025:2005)
Rabies tissue culture isolation test (RTCIT)	UKAS (ISO17025:2005)
Detection of Rabies Virus Antigen by H&E and IHC	UKAS (ISO17025:2005)

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

APHA maintains a complete and functioning laboratory biological risk management system, which ensures that the laboratory is in compliance with applicable local, national (UK Health and Safety Executive), regional, and international standards and requirements for biosafety and laboratory biosecurity. Rabies is notifiable in the UK Rabies: how to spot and report the disease in animals - GOV.UK (www.gov.uk) Lyssaviruses are handled at the highest level of animal pathogen biosecurity SAPO4 / Schedule 5 The Approved List of biological agents: Advisory Committee on Dangerous Pathogens (hse.gov.uk)

TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOA?H?

No

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOA?H?

Yes

Title of event	Date (mm/yy)	Location	Role (speaker, presenting poster, short communications)	Title of the work presented
Pan-African Rabies Conference (PARACON).	2023-03-10	Ghana	Delegate	Not applicable.
National Institute of Animal Biotechnology (NIAB) One Health & Zoonoses Meeting.	2023-03-27	India	Speaker	Role of APHA's International Reference Laboratories.
United Against Rabies Forum Stakeholder Meeting.	2023-11-06	Italy	Speaker	United Against Rabies / WOA?H Country Partnership Programme.

TOR10: NETWORK WITH WOA?H REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOA?H Reference Laboratories designated for the same pathogen or disease?

Yes

24. Do you network (collaborate or share information) with other WOA?H Reference Laboratories designated for the same pathogen?

Yes

NETWORK/DISEASE	ROLE OF YOUR LABORATORY (PARTICIPANT, ORGANISER, ETC)	NO. PARTICIPANTS	PARTICIPATING WOA?H REF. LABS
RABLAB / Rabies	Participant	12	FLI (Germany), CDC (USA), ANSES (France), CFIA (Canada), OVI (South Africa), KVI (Israel), APQA (Republic of South Korea), SENASICA (Mexico), CVRI (China), IDAH (Romania), KVAFSU-CVA (India).

UAR Country Partnership Programme	Technical advisor / organiser.	3	KVAFSU-CVA (India), CVRI (China), OVI (South Africa).
-----------------------------------	--------------------------------	---	---

25. Did you organise or participate in inter-laboratory proficiency tests with WOA Reference Laboratories designated for the same pathogen?

Yes

PURPOSE OF THE PROFICIENCY TESTS: 1	ROLE OF YOUR REFERENCE LABORATORY (ORGANISER/ PARTICIPANT)	NO. PARTICIPANTS	PARTICIPATING WOA REF. LABS/ ORGANISING WOA REF. LAB.
VETQAS International rabies serology proficiency scheme (FAVN, RFFIT, ELISA) (every 6 months)	APHA Laboratory Participant / APHA Quality Assurance Unit (Independent VETQAS organiser)	Confidential	Confidential
VETQAS International rabies PCR proficiency scheme (every 6 months)	APHA Laboratory independent Provision of consultancy APHA Quality Assurance Unit VETQAS (organiser)	Confidential	Confidential
Rabies diagnostic (FAT, PCR) proficiency testing	Participant	Confidential	Organised by the WOA Reference Laboratory at the Friedrich-Loeffler-Institute, Germany.

26. Did your laboratory collaborate with other WOA Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

Yes

TITLE OF THE PROJECT OR CONTRACT	SCOPE	NAME(S) OF RELEVANT WOA REFERENCE LABORATORIES
Developments in Rabies Vaccines.	A review of the development of rabies vaccines from Pasteur to the modern era. These vaccines, though, faced numerous challenges; these pioneering works have formed the cornerstone for the generation of the current successful vaccines to prevent rabies.	KVAFSU-CVA (India)
Incursion of EBLV-1 to the UK.	To use whole genome sequencing data to ascertain when EBLV-1 entered the UK and to compare the isolate against other Western European EBLV-1 sequences.	ANSES (France)

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOA Reference Laboratories for the same pathogen?

Yes

Purpose for inter-laboratory test comparisons ¹	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the Test	WOAH Member Countries
Rabies serology proficiency testing. Organised by Kansas State University Rabies Laboratory.	Participant	1	FAVN	UNITED KINGDOM, UNITED STATES OF AMERICA,
Rabies (from canine specimens) PCR proficiency scheme. Organised by VETQAS, UK.	Organiser and participant.	3	PCR	SIERRA LEONE, UNITED KINGDOM, UNITED STATES OF AMERICA,

TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOA?

Yes

KIND OF CONSULTANCY	Location	SUBJECT (FACULTATIVE)
Review of WOA Standards.	Virtual	Review of the rabies chapter 3.1.18 for the WOA Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2023.
Technical assistance.	Virtual	Participation in the WOA Rabies Laboratories Network (RABLAB).
Technical assistance.	Virtual	Participation in the WOA / WHO / FAO Collaborating

		Centres and Experts meetings on Rabies.
Twinning questionnaire & interview (following a request from WOAH HQ, Paris, France).	Virtual & in person	Knowledge sharing in lessons learned from three WOAH-funded twinning projects for rabies.
Review of the National Rabies Plan in Eritrea (following a request from WOAH Sub-Regional Representation for Eastern Africa).	Virtual & in person	Review of the NRP for Eritrea.
Technical assistance and planning (following a request from the United Against Rabies / WOAH HQ, Paris, France).	Virtual	Technical assistance for the Country Partnership Programme for Rabies between the following countries: India / Nepal China / Indonesia Republic of South Africa / Malawi

29. Additional comments regarding your report: