

OIE Reference Laboratory Reports Activities

Activities in 2021

This report has been submitted : 2022-01-04 18:06:09

Name of disease (or topic) for which you are a designated OIE Reference Laboratory:	Rabies
Address of laboratory:	New Haw Addlestone Surrey KT15 3NB UNITED KINGDOM
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Name (including Title) of Head of Laboratory (Responsible Official):	Professor Anthony R. Fooks (PhD) Head of OIE Reference Laboratory (Rabies)
Name (including Title and Position) of OIE Reference Expert:	Professor Anthony R. Fooks (PhD) Head of OIE Reference Laboratory (Rabies)
Which of the following defines your laboratory? Check all that apply:	Governmental

ToR 1: To use, promote and disseminate diagnostic methods validated according to OIE Standards

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 OIE Manual (Yes/No)	Total number of test performed last year	
		Nationally	Internationally
Indirect diagnostic tests		Nationally	Internationally
FAVN	Yes	1210	8920
Direct diagnostic tests		Nationally	Internationally
FAT	Yes	532	0
RTCIT	Yes	0	0
Real time Taqman / SYBR RT-PCR	Yes	455	0
Reverse-transcriptase PCR	Yes	2	10

ToR 2: To develop reference material in accordance with OIE requirements, and implement and promote the application of OIE Standards. To store and distribute to national laboratories biological reference products and any other reagents used in the diagnosis and control of the designated pathogens or disease.

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

No

3. Did your laboratory supply standard reference reagents (non OIE-approved) and/or other diagnostic reagents to OIE Member Countries?

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient OIE Member Countries	Region of recipients
CVS virus	PCR, RTCIT	Provided	0	1ml	1	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to OIE Member Countries?

No

ToR 3: To develop, standardise and validate, according to OIE Standards, new procedures for diagnosis and control of the designated pathogens or diseases

6. Did your laboratory develop new diagnostic methods validated according to OIE Standards for the designated pathogen or disease?

Yes

7. Did your laboratory develop new vaccines according to OIE Standards for the designated pathogen or disease?

No

Name of the new test or diagnostic method or vaccine developed	Description and References (Publication, website, etc.)
A simplified method for measuring neutralising antibodies against rabies virus.	A fluorescent recombinant rabies virus was constructed by inserting the mCherry gene in front of the ribonucleoprotein gene of the SAD B-19 genome and its glycoprotein was replaced by that of Challenge virus standard (CVS)-11 to ensure antigenic authenticity with the standard test. Comparative assessment of virus neutralisation test using mCherry producing virus (NTCV) against using CVS-11 (FAVN) demonstrated that test results were equivalent to each other; therefore this new recombinant virus (termed mCCCG) can be used as an alternative to CVS-11 for measuring antibody titres against rabies virus. This new serological test is cheaper, quicker, and easier to perform compared with other serological tests for measuring rabies virus-specific neutralising antibodies. An inter-laboratory assessment is required to assess reproducibility.

ToR 4: To provide diagnostic testing facilities, and, where appropriate, scientific and technical advice on disease control measures to OIE Member Countries

8. Did your laboratory carry out diagnostic testing for other OIE Member Countries?

Yes

Name of OIE Member Country seeking assistance	Date (month)	No. samples received for provision of diagnostic support	No. samples received for provision of confirmatory diagnoses
SOUTH AFRICA	January	399	0
JORDAN	February	17	0
SOUTH AFRICA	February	784	0
ETHIOPIA	February	2	2
SOUTH AFRICA	March	242	0
ETHIOPIA	April	6	6
ETHIOPIA	May	6	6
ETHIOPIA	June	1	1
SOUTH AFRICA	June	729	0
SOUTH AFRICA	July	385	0
SOUTH AFRICA	August	162	0
SOUTH AFRICA	September	404	0
ETHIOPIA	September	4	4
SOUTH AFRICA	October	286	0
SOUTH AFRICA	November	325	0
ETHIOPIA	November	2	2
ETHIOPIA	December	2	2

9. Did your laboratory provide expert advice in technical consultancies on the request of an OIE Member Country?

Yes

Name of the OIE Member Country receiving a technical consultancy	Purpose	How the advice was provided
SOUTH AFRICA	Advice and consultancy for rabies serology.	Provision of technical reports & SOPs.
SINGAPORE	Technical advice for diagnostic testing.	Provision of technical information & SOPs.
JORDAN	Training, advice and consultancy.	Provision of technical information & SOPs.
INDIA	Advice and consultancy as an OIE Reference Laboratory.	Provision of mentoring support.
SIERRA LEONE	Technical assistance as part of the design phase for an OIE Twinning Project.	Provision of technical information & SOPs.

ToR 5: To carry out and/or coordinate scientific and technical studies in collaboration with other laboratories, centres or organisations

10. Did your laboratory participate in international scientific studies in collaboration with OIE Member Countries other than the own?

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	OIE Member Countries involved other than your country
EU-funded H2020 'Development of Next Generation Dual-Target Rabies/Flavivirus Infectious DNA (iDNA) Vaccine' [RABYD-VAX; https://rabyd-vax.eu]	4-years (2017/21).	Vaccine development.	4	BELGIUM
Coalition for Epidemic Preparedness Innovations (CEPI)-funded via Imperial College London, UK 'Assessment of protection afforded by a self-amplifying RNA vaccine against rabies'.	2-years (2019/21).	Vaccine development.	1	UNITED STATES OF AMERICA
EU-funded H2020 'European Virus Archive Global [EVAg; https://www.european-virus-archive.com]	4-years (2020/23).	Characterisation of rabies virus isolates.	50	FRANCE

ToR 6: To collect, process, analyse, publish and disseminate epizootiological data relevant to the designated pathogens or diseases

11. Did your Laboratory collect epizootiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:

Nationally, surveillance data from passive surveillance programmes (wild bats, zoo bats) and targeted testing (suspect animals and humans, deaths in quarantine and illegal landings) is collected. From an international perspective, whole viral genomic data is collated to inform rabies elimination programmes.

12. Did your laboratory disseminate epizootiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:

National data (including positive cases) is reported to the UK Government (veterinary & public health departments) and subsequently reported to WHO (Rabies Bulletin Europe quarterly reports, Annual Zoonosis Reports), EFSA (annual reports), OIE (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.

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

a) Articles published in peer-reviewed journals: 9

Smith, T.G., Fooks, A.R., Moore, S.M., Freuling, C.M., Müller, T., Torres, G. and R.M. Wallace (2021). Negligible risk of rabies importation in dogs thirty days after demonstration of adequate serum antibody titer. *Vaccine* 39(18); 2496-2499.

Calvelage, S., Freuling, C.M., Fooks, A.R., Höper, D., Marston, D.A., McElhinney, L., Rasmussen, T.B., Finke, S., Beer, M. and T Müller. (2021). Full-Genome Sequences and Phylogenetic Analysis of Archived Danish European Bat Lyssavirus 1 (EBLV-1) Emphasize a Higher Genetic Resolution and Spatial Segregation for Sublineage 1a. *Viruses* 13, 634.

Al-Eitan, L.N., Wu, G., Golding, M., Tang, Y., Goharriz, H., Marston, D.A., Fooks., A.R. and L.M. McElhinney (2021). Whole-genome sequencing and phylogenetic analysis of rabies viruses from Jordan. *PLoS Negl Trop Dis.* 15(5) e0009431.

Shiple, R., Wright, E., Lean, F.Z.X., Selden, D., Horton, D.L., Fooks, A.R. and A.C. Banyard (2021). Assessing Rabies Vaccine Protection against a Novel Lyssavirus, Kotalahti Bat Lyssavirus. *Viruses* 13(5); 947.

Fooks, A.R., Shiple, R., Markotter, W., Tordo, N., Freuling, C.M., Müller, T., McElhinney, L.M., Banyard, A.C., Rupprecht, C.E. (2021). Renewed Public Health Threat from Emerging Lyssaviruses. *Viruses* 13(9);1769.

Kuhn JH, Adkins S, Agwanda BR, Al Kubrusli R, Alkhovsky Альховский Сергей Владимирович SV, Amarasinghe GK, Avšič-Županc T, Ayllón MA, Bahl J, Balkema-Buschmann A, Ballinger MJ, Basler CF, Bavari S, Beer M, Bejerman N, Bennett AJ, Bente DA, Bergeron É, Bird BH, Blair CD, Blasdel KR, Blystad DR, Bojko J, Borth WB, Bradfute S, Breyta R, Briese T, Brown PA, Brown JK, Buchholz UJ, Buchmeier MJ, Bukreyev A, Burt F, Büttner C, Calisher CH, Cao 曹 M, Casas I, Chandran K, Charrel RN, Cheng Q, Chiaki 千代 Y, Chiapello M, Choi IR, Ciuffo M, Clegg JCS, Crozier I, Dal Bó E, de la Torre JC, de Lamballerie X, de Swart RL, Debat H, Dheilly NM, Di Cicco E, Di Paola N, Di Serio F, Dietzgen RG, Digiaro M, Dolnik O, Drebot MA, Drexler JF, Dundon WG, Duprex WP, Dürwald R, Dye JM,

Easton AJ, Ebihara 野口 浩 H, Elbeaino T, Ergünay K, Ferguson HW, Fooks AR, Forgia M, Formenty PBH, Fránová J, Freitas-Astúa J, Fu 傅 强 J, Fülrl S, Gago-Zachert S, Gão 高 GF, García ML, García-Sastre A, Garrison AR, Gaskin T, Gonzalez JJ, Griffiths A, Goldberg TL, Groschup MH, Günther S, Hall RA, Hammond J, Han 韩 T, Hepojoki J, Hewson R, Hong 洪 强 J, Hong 洪 强 N, Hongo 洪 强 S, Horie 堀江 M, Hu JS, Hu T, Hughes HR, Hüttner F, Hyndman TH, Ilyas M, Jalkanen R, Jiāng 姜 D, Jonson GB, Junglen S, Kadono 加野野 F, Kaukinen KH, Kawate M, Klempa B, Klingström J, Kobinger G, Koloniuk I, Kondō 小野 浩 H, Koonin EV, Krupovic M, Kubota 久保田 K, Kurath G, Laenen L, Lambert AJ, Langevin SL, Lee B, Lefkowitz EJ, Leroy EM, Li 李 强 S, Li 李 强 L, Lí 李 强 J, Liu 刘 强 H, Lukashevich IS, Maes P, de Souza WM, Marklewitz M, Marshall SH, Marzano SL, Massart S, McCauley JW, Melzer M, Mielke-Ehret N, Miller KM, Ming TJ, Mirazimi A, Mordecai GJ, Mühlbach HP, Mühlberger E, Naidu R, Natsuaki 内津 隆 T, Navarro JA, Netesov 内津 隆 Сергей Викторович SV, Neumann G, Nowotny N, Nunes MRT, Olmedo-Velarde A, Palacios G, Pallás V, Pályi B, Παπα Άννα Παπά A, Paraskevopoulou Σοφία Παρασκευοπούλου S, Park AC, Parrish CR, Patterson DA, Pauvolid-Corrêa A, Pawęska JT, Payne S, Peracchio C, Pérez DR, Postler TS, Qi 齐 强 L, Radoshitzky SR, Resende RO, Reyes CA, Rima BK, Luna GR, Romanowski V, Rota P, Rubbenstroth D, Rubino L, Runstadler JA, Sabanadzovic S, Sall AA, Salvato MS, Sang R, Sasaya 佐佐木 T, Schulze AD, Schwemmler M, Shi 史 强 M, Shí 史 强 X, Shí 史 强 Z, Shimamoto 志本 Y, Shirako Y, Siddell SG, Simmonds P, Sironi M, Smagghe G, Smither S, Song 宋 强 JW, Spann K, Spengler JR, Stenglein MD, Stone DM, Sugano J, Suttle CA, Tabata A, Takada 高田 A, Takeuchi 武内 S, Tchouassi DP, Teffer A, Tesh RB, Thornburg NJ, Tomitaka 小野 浩 Y, Tomonaga 小野 浩 K, Tordo N, Torto B, Towner JS, Tsuda 津田 S, Tu 杜 强 C, Turina M, Tzanetakis IE, Uchida J, Usugi 宇都 隆 T, Vaira AM, Vallino M, van den Hoogen B, Varsani A, Vasilakis Νικόσ Βασιλάκης N, Verbeek M, von Bargen S, Wada 和田 J, Wahl V, Walker PJ, Wang 王 强 LF, Wang 王 强 G, Wang 王 强 Y, Wang 王 强 Y, Waqas M, Wèi 魏 强 T, Wen 文 强 S, Whitfield AE, Williams JV, Wolf YI, Wu 吴 强 J, Xu 徐 强 L, Yanagisawa 岩谷 浩 H, Yang 杨 强 C, Yang 杨 强 Z, Zerbini FM, Zhai 翟 强 L, Zhang 张 强 YZ, Zhang 张 强 S, Zhang 张 强 J, Zhang 张 强 Z, Zhou 周 强 X. (2021). Taxonomic update of phylum Negarnaviricota (Riboviria: Orthornavirae), including the large orders Bunyavirales and Mononegavirales. Arch Virol. doi: 10.1007/s00705-021-05143-6.

Lugelo, A., Hampson, K., Czupryna, A., Bigambo, M., McElhinney, L.M., Marston, D.A., Kazwala, R. and F. Lankester (2021). Investigating the Efficacy of a Canine Rabies Vaccine Following Storage Outside of the Cold-Chain in a Passive Cooling Device. Front. Vet. Sci. 8; 728271.

Folly, A.J., Marston, D.A., Golding, M., Shukla, S., Wilkie, R., Lean, F.Z.X., Núñez, A., Worledge, L., Aegerter, J., Banyard, A.C., Fooks, A.R., Johnson, N., and L.M. McElhinney (2021). Incursion of European Bat Lyssavirus 1 (EBLV-1) in Serotine Bats in the United Kingdom. Viruses 13(10); 1979.

Ameh, V.O., Wu, G., Goharriz, H., Shipley, R., Fooks, A.R., Sabeta, C.T. and L.M. McElhinney. (2021). Serum Neutralization Profiles of Straw-Colored Fruit bats (*Eidolon helvum*) in Makurdi (Nigeria) against Four Lineages of Lagos Bat Lyssavirus. Viruses 13(12); 2378.

b) International conferences: 4

'Defining antigenic requirements for pan-lyssavirus neutralisation'. Poster presented by Rebecca Shipley at the American Society for Virology [Feb 2021].

'Rabies and Lyssaviruses - Global Perspective' Keynote presentation by Prof Anthony R. Fooks for World Zoonoses Day 2021 [Jul 2021].

'Serum Neutralisation profiles of Straw-Colored Fruit Bats (*Eidolon helvum*) against four Lineages of Lagos Bat Lyssavirus (LBV)'. Poster presented by Veronica Ameh at IMED Virtual Conference [Nov 2021].

'Strengthening Pandemic Preparedness in Ghana'. Poster presented by Dr Richard Sur-Ire at the Africa CDC One Health Conference [Dec 2021].

c) National conferences: 0

d) Other:

(Provide website address or link to appropriate information) 2

EU-funded H2020 'Development of Next-Generation Dual-Target Rabies/Flavivirus Infectious DNA (iDNA) Vaccine' [RABYD-VAX; <https://rabyd-vax.eu>]

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

ToR 7: To provide scientific and technical training for personnel from OIE Member Countries**To recommend the prescribed and alternative tests or vaccines as OIE Standards**

14. Did your laboratory provide scientific and technical training to laboratory personnel from other OIE Member Countries?

Yes

- a) Technical visits: 0
- b) Seminars: 0
- c) Hands-on training courses: 2
- 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
(c) 'Veterinary Public Health Interventions at the Human-Animal Interface'.	Ghana, Ethiopia, Egypt & Bangladesh	>100
(c) 'Disease Outbreak Preparedness & Management'.	Ghana, Ethiopia, Egypt & Bangladesh	>100

ToR 8: To maintain a system of quality assurance, biosafety and biosecurity relevant for the pathogen and the disease concerned

15. 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.	ISO17025 Certificate 2021.pdf

16. 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)

17. Does your laboratory maintain a “biorisk management system” for the pathogen and the disease concerned?

Yes

(See *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 1.1.4*)

ToR 9: To organise and participate in scientific meetings on behalf of the OIE

18. Did your laboratory organise scientific meetings on behalf of the OIE?

No

19. Did your laboratory participate in scientific meetings on behalf of the OIE?

Yes

Title of event	Date (mm/yy)	Location	Role (speaker, presenting poster, short communications)	Title of the work presented
World Zoonoses Day 2021.	07/21	Virtual (hosted by India)	Keynote speaker	‘Rabies and Lyssaviruses – Global Perspective’.

ToR 10: To establish and maintain a network with other OIE Reference Laboratories designated for the same pathogen or disease and organise regular inter-laboratory proficiency testing to ensure comparability of results

20. Did your laboratory exchange information with other OIE Reference Laboratories designated for the same

pathogen or disease?

Yes

21. Was your laboratory involved in maintaining a network with OIE Reference Laboratories designated for the same pathogen or disease by organising or participating in proficiency tests?

No

22. Did your laboratory collaborate with other OIE 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 OIE Reference Laboratories
OIE Rabies Laboratory (RABLAB) Network.	Development of an OIE Expert Community of Practice for Rabies.	FLI (Germany), CDC (USA), ANSES (France), CFIA (Canada), OVI (South Africa), KVI (Israel), APQA (Republic of South Korea), SENASICA (Mexico), CVRI (China), IDAH (Romania).
Characterisation of bat lyssaviruses.	Whole genome sequencing of EBLV-1 in the UK compared with European EBLV-1 sequences.	FLI (Germany) & ANSES (France).
Assessment of rabies serum antibody titers in dogs 30-days post-vaccination.	Measurement of a serum antibody titers in dogs post-vaccination.	FLI (Germany) & CDC (USA).
Public health threat from emerging lyssaviruses.	Assessment of vaccine cross-protection against emerging lyssaviruses.	FLI (Germany).

ToR 11: To organise inter-laboratory proficiency testing with laboratories other than OIE Reference Laboratories for the same pathogens and diseases to ensure equivalence of results

23. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than OIE Reference Laboratories for the same disease?

Yes

Note: See Interlaboratory test comparisons in: Laboratory Proficiency Testing at: <http://www.oie.int/en/our-scientific-expertise/reference-laboratories/proficiency-testing> see point 1.3

Purpose for inter-laboratory test comparisons ¹	No. participating laboratories	Region(s) of participating OIE Member Countries
VETQAS national rabies serology scheme (FAVN).	>2	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East
Kansas State University rabies serology scheme.	>20	<input type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East

ToR 12: To place expert consultants at the disposal of the OIE

24. Did your laboratory place expert consultants at the disposal of the OIE?

Yes

Kind of consultancy	Location	Subject (facultative)
Review of OIE Standards.	Virtual.	Review of chapters for the OIE Terrestrial Manual.
Review of OIE Standards.	Virtual.	Review of modules for Global Laboratory Leadership Programme (GLLP).
Technical assistance.	Virtual.	Participation in the OIE Rabies Laboratories Network (RABLAB).

25. Additional comments regarding your report:

The laboratory twinning project to develop and support specialist capability in Sierra Leone was approved by the OIE BSC. The 1st interim report on this project was submitted in December 2021.

Staff from the OIE Reference Laboratory are available for participation in ad hoc working groups, as required.

Restrictions on travel, as a direct result of the COVID-19 pandemic, have limited the ability for developing new collaborative and research efforts.