OIE Collaborating Centres Reports Activities

Activities in 2021

This report has been submitted : 2022-01-25 04:42:44

Title of collaborating centre:	Surveillance, Control of Animal Protozoan Diseases
Address of Collaborating Centre:	Obihiro University of Agriculture and Veterinary Medicine Nishi 2-13, Inada-cho Obihiro, Hokkaido 080-8555 JAPAN
Tel.:	+81-155 49.56.49
Fax:	+81-155 49.56.43
E-mail address:	yokoyama@obihiro.ac.jp
Website:	https://www.obihiro.ac.jp/facility/protozoa/en
Name of Director of Institute (Responsible Official):	Prof. Shin-ichiro Kawazu, DVM, PhD
Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):	Prof. Naoaki Yokoyama, DVM, PhD
Name of writer:	Prof. Naoaki Yokoyama, DVM, PhD

ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories

ToR: To identify and maintain existing expertise, in particular within its region

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by the OIE

Disease control	
Title of activity	**Scope**
Identification and evaluation of anti-protozoan compounds as potential chemotherapeutic agents	Several compounds and medicinal plant extracts were evaluated as therapeutic agents against protozoan parasites. Pyronaridine tetraphosphate- based combinations, several natural product compounds, combination of clofazimine–atovaquone, naphthoquine phosphate, combination of 5-aminolevulenic acid-ferrous ion, tafenoquine, and compounds from the Medicines for Malaria Venture Box were evaluated as anti-babesial agents. Zingiber officinale rhizome and methanolic extract of turmeric (Curcuma longa) were evaluated as anti-piroplasm agent. Extracts from Egyptian and Mongolian herbal plants, synthesised benzyltriazole derivatives, and polyether ionophore kijimicin were evaluated against Toxoplasma gondii. Phenylpropanoid derivatives from chemically converted extract of Alpinia galanga (L.), derivatives of naturally occurring 2,5-diphenyloxazoles, synthesized nitrofurantoin analogs, and new series of imidazoles were evaluated as anti-Trypanosoma agents. Growth inhibition effect of oxidative stress supplied from low-temperature plasma at atmospheric pressure on Trypanosoma brucei was investigated.
Elucidation of mechanisms of pathogenesis	Using mouse model, the following were investigated in relation to Toxoplasma gondii infection: CXCR3-dependent immune pathology during early pregnancy, effect of CXCR3 deficiency on immune responses in brain, localization of Raft microdomain, and the involvement of toll-like receptor 2 in abnormal pregnancy. Manipulation of host cell signalling pathways by Toxoplasma gondii via its secreted effector molecules was reviewed. Reproductive injury caused by Neospora caninum was investigated in mice. Pathology of in vitro cultured strain of Trypanosoma equiperdum was studied in mice.
Tick biology	The role of ATG5 in the transition from autophagy to apoptosis during the degeneration of tick salivary glands was investigated.

Epidemiology, surveillance, risk assessment, modelling	
Title of activity	**Scope**
Surveillance of protozoan parasites	Hemoprotozoan parasites were surveyed in sheep and horses in Turkey, cattle in Sudan, deer keds (Lipoptena fortisetosa) in Poland, cattle and buffalo in Egypt, horses and donkeys in Nigeria, cattle in Uganda, horses in Philippines, and dogs in Thailand. Epidemiology of hemoprotozoan parasites infecting animals in Turkey was reviewed. Neospora caninum isolates from aborted bovine foetuses in Hokkaido, Japan was genetically characterized.

Epidemiological mapping	Global epidemiological maps were prepared for Babesia bovis, Babesia bigemina, Babesia divergens, Babesia sp. Mymensingh, Babesia caballi and Theileria equi and posted on the websites of our reference centres (https://www.obihiro.ac.jp/facility/protozoa/en/oie-reference-centres).

Training, capacity building	
Title of activity	**Scope**
Seminars on diagnosis, surveillance, and control of animal protozoan diseases	Scientists from Nigeria, Kyrgyzstan, Sri Lanka, Vietnam, Thailand, Myanmar, Japan, Paraguay, and Argentina were trained on diagnosis, surveillance, and control of animal protozoan diseases.

Wildlife	
Title of activity	**Scope**
Epidemiological surveys	Blastocystis sp. subtype 14 was surveyed in sika deer (Cervus nippon yesoensis) in Japan.

Aquatic animal diseases	
Title of activity	**Scope**
Disease investigation	Systemic toxoplasmosis in a female adult narrow-ridged finless porpoise was investigated.

Diagnosis, biotechnology and laboratory	
Title of activity	**Scope**
Development and evaluation of diagnostic assays	Immunochromatographic assays developed using four antigens were comparatively evaluated for the serodiagnosis of Neospora caninum in cattle.
Supply of diagnostic materials	Theileria equi and Babesia caballi IFAT slides were supplied to institutions in France, Argentina, and UK. Babesia gibsoni thin blood smears and positive serum were supplied to an institution in UK. Babesia caballi- and Theileria equi-positive serum samples were provided to a laboratory in Turkey. Trypanosoma DNA was supplied to an institution in United Arab Emirates. Plasmid DNA containing eGFP-expression cassette was provided to a laboratory in France. Toxoplasma gondii strains were provided to an institution in Japan.
Provision of confirmatory diagnostic services	Horses from Germany, UK, New Zealand, and Japan were tested for equine piroplasmosis. Tick species infesting animals in Japan were identified.
Expert advice on the diagnosis of protozoan diseases and tick identification	Expert advice for the diagnosis of animal protozoan diseases was provided to institutions in UK, New Zealand, Germany, the Netherlands, Turkey, Argentina, Mexico, Australia, Thailand, Kyrgyzstan, Japan, and Zimbabwe. Advice on in vitro cultivation of protozoan parasites was provided to institutions in the Netherlands and Iran. Expert advice for the identification of ticks was provided to institutions in South Korea, China, and Japan.
Development of tools for genetic manipulations	A stable transgenic Theileria equi parasite expressing an enhanced green fluorescent protein/blasticidin S deaminase was developed.

Vaccines	
Title of activity	**Scope**

Characterization of protozoan antigens as vaccine candidates	The effect of GRA6 antigen on the vertical transmission and protectivity against Neospora caninum Infection was evaluated in mice. Protective immunity induced by PLK:Δ gra9 live-attenuated strain against acute and chronic toxoplasmosis was investigated. PAN motif of ectodomain I in apical membrane antigen 1 in Babesia bovis was characterized as a vaccine candidate.

ToR : To propose or develop methods and procedures that facilitate harmonisation of international standards and guidelines applicable to the designated specialty

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare

Proposal title	Scope/Content	Applicable area
Validation of sero-diagnostic assays	Immunochromatographic assays developed using four antigens were comparatively evaluated for the sero-diagnosis of Neospora caninum in cattle.	☒Surveillance and control of animal diseases ☐Food safety ☐Animal welfare

ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same specialty, and should the need arise, with Collaborating Centres in other disciplines

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

3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
1. OIE Reference Laboratory for Surra, Institute of Tropical Medicine, Antwerp, Belgium, 2. OIE Reference Laboratory for Animal trypanosomoses of African origin, Campus international de Baillarguet, TA A-17 / G 34398 Montpellier, Cedex 5, France	Belgium and France	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	To create awareness on NTTAT as high impact neglected veterinary diseases, develop tools to improve the surveillance capacity in OIE member countries, foster collaborative research, and fill gaps in knowledge on disease epidemiology, pathogenesis, drug efficacy, vaccines, modes of transmission, reservoir hosts, and vector control.

4. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
Faculty of Veterinary Medicine, Mansoura University, El-Mansoura	Egypt	☒Africa ☐Americas ☐Asia and Pacific ☐Europe ☐Middle East	To evaluate the extracts from Egyptian herbal plants against Toxoplasma gondii.
Faculty of Veterinary Medicine, Selcuk University	Turkey	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	To survey hemoprotozoan parasites infecting animals and review their epidemiology in Turkey.
1. College of Veterinary Medicine, Sudan University of Science and Technology, 2. Faculty of Veterinary Medicine, University of Khartoum	Sudan	☒Africa ☐Americas ☐Asia and Pacific ☐Europe ☐Middle East	To survey the bovine hemoprotozoan parasites in Sudan.
1. College of Veterinary Medicine and Biomedical Sciences, Cavite State University, 2. Saddle & Clubs Leisure Park, Philippine Racing Club Inc., 3. Main Campus and College of Veterinary Medicine, Barili Campus, Cebu Technological University, 4. College of Science, De La Salle University	Philippines	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	To survey the piroplasms in thoroughbred racehorses in Philippines.
1. Graduate School of Veterinary Sciences, Chiang Mai University, 2. Faculty of Veterinary Medicine, Chiang Mai University	Thailand	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	To evaluate Babesia bovis apical membrane antigen 1 as a vaccine candidate.
Institute of Veterinary Medicine, Mongolian University of Life Sciences	Mongolia	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	To evaluate Mongolian compound library as anti-Toxoplasma agents and survey Bactrian camels in Mongolia for infections with bovine Babesia species.

School of Veterinary Medicine and Animal Resources, Makerere University	Uganda	☒Africa ☐Americas ☐Asia and Pacific ☐Europe ☐Middle East	To survey the hemoprotozoan parasites infecting cattle at the wildlife-livestock interface in Uganda.
Faculty of Veterinary Medicine, University of Warmia and Mazury in Olsztyn	Poland	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	To survey the hemoprotozoan parasites in deer keds in Poland.
National Institutes of Allergy and Infectious Diseases, National Institutes of Health	USA	☐Africa ☒Americas ☐Asia and Pacific ☐Europe ☐Middle East	To review the manipulation of host cell signalling pathways caused by Toxoplasma gondii via secreted effector molecules.

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

5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?

Yes

Name of expert	Kind of consultancy	Subject
Dr. Naoaki Yokoyama	OIE ad hoc group on equine piroplasmosis	Revision of terrestrial animal health code for equine piroplasmosis
Dr. Noboru Inoue	OIE ad hoc Group on surra and dourine	Revision of terrestrial animal health code for surra and dourine

ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries

6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?

Yes
a) Technical visits: 0
b) Seminars: 21
c) Hands-on training courses: 0
d) Internships (>1 month): 0

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Nigeria	2
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Vietnam	2
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Thailand	2
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Myanmar	1
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Sri Lanka	1
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Japan	7
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Kyrgyzstan	2
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Paraguay	2
b	Diagnosis, Surveillance, and control of equine piroplasmosis and bovine babesiosis	Argentina	2

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

7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?

Yes

National/International	Title of event	Co-organiser	Date (mm/yy)	Location	No. Participants
International	AAVS-OIE-UGM Session on Collaboration between VEEs and International Organizations in Asia	Faculty of Veterinary Medicine, Universitas Gadjah Mada (UGM), Indonesia	3/2021	Indonesia (virtual)	200

ToR: To collect, process, analyse, publish and disseminate data and information relevant to the designated specialty

8. Publication and dissemination of any information within the remit of the mandate given by the OIE that may be useful to Member Countries of the OIE

a) Articles published in peer-reviewed journals: 59

1. Doaa Salman, Motamed E Mahmoud, Wilawan Pumidonming, Tolubaeva Mairamkul, Eiji Oohashi, Makoto Igarashi, Characterization of a spontaneous cyst-forming strain of Toxoplasma gondii isolated from Tokachi subprefecture in Japan. Parasitology International. 2020 Sep 19; 80: 102199.
2. Akari Nishida, Rina Ikeda, Hidefumi Furuoka, Yoshifumi Nishikawa, CXCR3-dependent immune pathology in mice following infection with Toxoplasma gondii during early pregnancy. Infection and Immunity. 2021 Jan 19;89(2):e00253-20.
3. Shimaa Abd El-Salam El-Sayed, Mohamed Abdo Rizk, Aaron Edmond Ringo, Yongchang Li, Mingming Liu, Shengwei Ji, Jixu Li, Benedicto Byamukama, Maria A Tumwebaze, Xuenan Xuan, Ikuo Igarashi, Impact of using pyronaridine tetraphosphate- based combination therapy in the treatment of babesiosis caused by Babesia bovis, B. caballi, and B. gibsoni in vitro and B. microti in mice. Parasitology International. Volume 81, April 2021, 102260.
4. Sara T Elazab, Amal F Soliman, Yoshifumi Nishikawa, Effect of some plant extracts from Egyptian herbal plants against Toxoplasma gondii tachyzoites in vitro. The Journal of Veterinary Medical Science. 2021 Jan 14; 83(1): 100-107.
5. Arpron Leesombun, Masatomi Iijima, Baldorj Pagmadulam, Banzragchgarav Orkhon, Hiroyasu Doi, Kunio Issiki, Ryuichi Sawa, Coh-Ichi Nihei, Yoshifumi Nishikawa, Metacytofilin has potent anti-malarial activity. Parasitology International. 2021 Apr; 81: 102267.
6. Rikako Konishi, Yuna Kurokawa, Kanna Tomioku, Tatsunori Masatani, Xuenan Xuan, Akikazu Fujita, Raft microdomain localized in the luminal leaflet of inner membrane complex of living Toxoplasma gondii. European Journal of Cell Biology. 2021 Jan 2; 100(2): 151149.
7. Yanan Wang, Houshuang Zhang, Li Luo, Yongzhi Zhou, Jie Cao, Xuenan Xuan, Hiroshi Suzuki, Jinlin Zhou, ATG5 is instrumental in the transition from autophagy to apoptosis during the degeneration of tick salivary glands. PLOS Neglected Tropical Diseases. 2021 Jan 29; 15(1): e0009074.
8. Onur Ceylan, Benedicto Byamukama, Ceylan Ceylan, Eloiza May Galon, Mingming Liu, Tatsunori Masatani, Xuenan Xuan, Ferda Sevinc, Tick-borne hemoparasites of sheep: a molecular research in Turkey. Pathogens. 2021 Feb 3; 10(2): 162.
9. Shotaro Nakagun, Masao Amano, El-Sayed N El-Alfy, Yoshifumi Nishikawa, Akira Shiozaki, Yuko Tajima, Tadasu K Yamada, Yoshiyasu Kobayashi, Disseminated toxoplasmosis in a narrow-ridged finless porpoise (Neophocaena asiaeorientalis) with transplacental embryonal transmission. Journal of Wildlife Diseases. 2021 Jan 6; 57(1): 205-210.
10. Akira Soga, Takahiro Shirozu, Shinya Fukumoto, Glyoxalase pathway is required for normal liver-stage proliferation of Plasmodium berghei. Biochemical and Biophysical Research Communications. 2021 Mar 2; 549: 61-66.
11. Onur Ceylan, Xuenan Xuan, Ferda Sevinc, primary tick-borne protozoan and rickettsial infections of animals in Turkey. Pathogens. 2021 Feb 19; 10(2): 231.
12. Ragab M Fereig, Hanan H Abdelbaky, Yoshifumi Nishikawa, Vaccination with Neospora GRA6 interrupts the vertical transmission and partially protects dams and offspring against Neospora caninum infection in mice. Vaccines (Basel). 2021 Feb 15; 9(2): 155.
13. Hang Li, Bing-Yi Yang, Ming Ming Liu, Shao-Wei Zhao, Su-Zhu Xie, Hao Wang, Shuang Zhang, Xuean Xuan, Li-Jun Jia, Reproductive injury in male BALB/c mice infected with Neospora caninum. Parasites & Vectors. 2021 Mar 16; 14(1): 158.
14. Jixu Li, Eloiza May Galon, Huanping Guo, Mingming Liu, Yongchang Li, Shengwei Ji, Iqra Zafar, Yang Gao, Weiqing Zheng, Paul Franck Adjou Moumouni, Mohamed Abdo Rizk, Maria Agnes Tumwebaze, Byamukama Benedicto, Aaron Edmond Ringo, Tatsunori Masatani, Xuenan Xuan, PLK:Δ gra9 live attenuated strain induces protective immunity against acute and chronic toxoplasmosis. Frontiers in Microbiology. 2021 Mar 11; 12: 619335.
15. Melanny Ika Sulistyowaty, Nguyen Hoang Uyen, Keisuke Suganuma, Ben-Yeddy Abel Chitama, Kazuhide Yahata, Osamu Kaneko, Sachiko Sugimoto, Yoshi Yamano, Susumu Kawakami, Hideaki Otsuka, Katsuyoshi Matsunami, Six new phenylpropanoid derivatives from chemically converted extract of Alpinia galanga (L.) and their antiparasitic activities. Molecules. 2021 Mar 21; 26(6): 1756.
16. Remigiusz Gałęcki, Jerzy Jaroszewski, Tadeusz Bakuła, Eloiza M Galon, Xuenan Xuan, Molecular detection of selected pathogens with zoonotic potential in deer keds (Lipoptena fortisetosa). Pathogens. 2021 Mar 10; 10(3): 324.

17. El-Sayed El-Alfy, Yuma Ohari, Naomi Shimoda, Yoshifumi Nishikawa, Genetic characterization of Neospora caninum from aborted bovine fetuses in Hokkaido, Japan. Infection Genetics and Evolution. 2021 Apr 2; 104838.
18. Naoaki Yokoyama, Thillaiampalam Sivakumar, Sanae Ikehara, Yoshihiro Akimoto, Takashi Yamaguchi, Ken Wakai, Kenji Ishikawa, Masaru Hori, Tetsuji Shimizu, Hajime Sakakita, Yuzuru Ikehara, Growth inhibition effect on Trypanosoma brucei gambiense by the oxidative stress supplied from low-temperature plasma at atmospheric pressure. Japanese Journal of Applied Physics. 15 January 2021; 60(2)
19. Yukihiro Goto, Rie Kamihira, Yoichi Nakao, Motohiro Nonaka, Ryo Takano, Xuenan Xuan, Kentaro Kato, The efficacy of marine natural products against Plasmodium falciparum. Journal of Parasitology. 2021 Mar 1; 107(2): 284-288.
20. Fumiaki Ihara, Yoshifumi Nishikawa, Toxoplasma gondii manipulates host cell signaling pathways via its secreted effector molecules. Parasitology International. 2021 Apr 24; 83: 102368.
21. Bumduuren Tuvshintulga, Arifin Budiman Nugraha, Tomoka Mizutani, Mingming Liu, Takahiro Ishizaki, Thillaiampalam Sivakumar, Xuenan Xuan, Naoaki Yokoyama, Ikuo Igarashi, Development of a stable transgenic Theileria equi parasite expressing an enhanced green fluorescent protein/blasticidin S deaminase. Scientific Reports. 2021 Apr 27; 11(1): 9107.
22. Mingming Liu, Shengwei Ji, Daisuke Kondoh, Eloiza May Galon, Jixu Li, Mizuki Tomihari, Masashi Yanagawa, Michihito Tagawa, Mami Adachi, Masahito Asada, Ikuo Igarashi, Aiko Iguchi, Xuenan Xuan, Tafenoquine is a promising drug candidate for the treatment of babesiosis. Antimicrobial Agents and Chemotherapy. 2021 Jun 17; 65(7): e0020421.
23. Orkhon Banzragchgarav, Javzan Batkhuu, Punsantsogvoo Myagmarsuren, Badgar Battsetseg, Banzragch Battur, Yoshifumi Nishikawa, In vitro potently active anti-Plasmodium and anti-Toxoplasma Mongolian plant extracts. Acta Parasitologica. 2021 Dec; 66(4): 1442-1447.
24. Hany M Ibrahim, Eloiza May S Galon, Maria Agnes Tumwebaze, Benedicto Byamukama, Mingming Liu, Khaled Mohammed-Geba, Sherin K Sheir, Asmaa Galal-Khallaf, Heba M Abd El Latif, Dalia S Morsi, Nora M Bishr, Xuenan Xuan, Serological survey of Babesia bigemina and Babesia bovis in cattle and water buffaloes from Menoufia province, Egypt. Acta Parasitologica. 2021 May 27.
25. Nanang Rudianto Ariefta, Takuya Koseki, Yoshifumi Nishikawa, Yoshihito Shiono, Spirocollequins A and B, new alkaloids featuring a spirocyclic isoindolinone core, from Colletotrichum boninense AM-12-2. Tetrahedron Letters. 2021 Feb 2; 64: 152736
26. Thom Do, Ruttayaporn Ngasaman, Vannarat Saechan, Opal Pitaksakulrat, Mingming Liu, Xuenan Xuan, Tawin Inpankaew, First molecular detection of Babesia gibsoni in stray dogs from Thailand. Pathogens. 2021 May 22; 10(6): 639.
27. Ehab Mossaad, Alex Gaithuma, Yassir O Mohamed, Keisuke Suganuma, Rika Umemiya-Shirafuji, Yuma Ohari, Bashir Salim, Mingming Liu, Xuenan Xuan, Molecular characterization of ticks and tick-borne pathogens in cattle from Khartoum state and East Darfur state, Sudan. Pathogens. 2021 May 10; 10(5): 580.
28. ThankGod E Onyiche, Thillaiampalam Sivakumar, Bumduuren Tuvshintulga, Arifin Budiman Nugraha, Believe Ahedor, Lehlohonolo Mofokeng, Joshua Luka, Ali Mohammed, Albert W Mbaya, Abdullahi A Biu, Naoaki Yokoyama, Oriel Thekisoe, Serosurvey for equine piroplasms in horses and donkeys from North-Western Nigeria using IFAT and ELISA. Journal of Immunoassay and Immunochemistry. 2021 Jun 7; 1-14.
29. Koichi Narita, Keisuke Suganuma, Toshihiro Murata, Ryutaro Kondo, Hiroka Satoh, Kazuhiro Watanabe, Kenroh Sasaki, Noboru Inoue, Yuichi Yoshimura, Synthesis and evaluation of trypanocidal activity of derivatives of naturally occurring 2,5-diphenyloxazoles. Bioorganic & Medicinal Chemistry. 2021 Jun 12; 42: 116253.
30. Yusuke Tanaka, Keisuke Suganuma, Kenichi Watanabe, Yoshiyasu Kobayashi, Pathology of female mice experimentally infected with an in vitro cultured strain of Trypanosoma equiperdum. Journal of Veterinary Medical Science. 2021 Aug 6; 83(8): 1212-1218.
31. Kasumi Kawamura, Aiko Kume, Rika Umemiya-Shirafuji, Shunji Kasai, Hiroshi Suzuki, Effect of α-tocopheryloxy acetic acid, a vitamin E derivative mitocan, on the experimental infection of mice with Plasmodium yoelii. Malaria Journal. 2021 Jun 24; 20(1): 280.
32. Linous Munsimbwe, Anna Seetsi, Boniface Namangala, David D. N'Da, Noboru Inoue, Keisuke Suganuma, In vitro and in vivo trypanocidal efficacy of synthesized nitrofurantoin analogs. Molecules. 2021 Jun 2; 26(11): 3372.
33. Oluyomi Stephen Adeyemi, Nthatisi Innocentia Molefe-Nyembe, Abiodun Omokehinde Eseola, Winfried Plass, Oluwatosin Kudirat Shittu, Ibrahim Olatunji Yunusa, Olubunmi Atolani, Ikponmwosa Owen Evbuomwan, Oluwakemi J Awakan, Keisuke Suganuma, Kentaro Kato, New series of imidazoles showed promising growth inhibitory and curative potential against Trypanosoma infection. Yale Journal of Biology And Medicine. 2021 Jun 30; 94(2): 199-207.
34. Huanping Guo, Yang Gao, David D N'Da, Xuenan Xuan, In vitro anti-Toxoplasma gondii efficacy of synthesised benzyltriazole derivatives. Onderstepoort Journal of Veterinary Research. 2021 Jun 11; 88(1): e1-e8.
35. Benedicto Byamukama, Patrick Vudriko, Maria Agnes Tumwebaze, Dickson Stuart Tayebwa, Joseph Byaruhanga, Martin Kamilo Angwe, Jixu Li, Eloiza May Galon, Aaron Ringo, Mingming Liu, Yongchang Li, Shengwei Ji, Mohamed Abdo Rizk, Paul Frank Adjou Moumouni, Seung-Hun Lee, Ferda Sevinc, Xuenan Xuan, Molecular detection of selected tick-borne pathogens infecting cattle at the wildlife-livestock interface of Queen Elizabeth National Park in Kasese District, Uganda. Ticks and Tick-borne Diseases. 2021 Jun 17; 12(5): 101772.

36. Onur Ceylan, Byamukama Benedicto, Ceylan Ceylan, Maria Tumwebaze, Eloiza May Galon, Mingming Liu, Xuenan Xuan, Ferda Sevinc, A survey on equine tick-borne diseases: The molecular detection of Babesia ovis DNA in Turkish racehorses. Ticks and Tick-borne Diseases. 2021 Jul 12; 12(5): 101784.
37. Kazuhiko Nakayama, Yuta Kimura, Yu Kitahara, Akira Soga, Asako Haraguchi, Jun Hakozaki, Makoto Sugiyama, Kodai Kusakisako, Shinya Fukumoto, Hiromi Ikadai, Role of Plasmodium berghei ookinete surface and oocyst capsule protein, a novel oocyst capsule-associated protein, in ookinete motility. Parasites & Vectors. 2021 Jul 21; 14(1): 373.
38. Shiomi Koudatsu, Tatsunori Masatani, Rikako Konishi, Masahito Asada, Hassan Hakimi, Yuna Kurokawa, Kanna Tomioku, Osamu Kaneko, Akikazu Fujita, Glycosphingolipid GM3 is localized in both exoplasmic and cytoplasmic leaflets of Plasmodium falciparum malaria parasite plasma membrane. Scientific Reports. 2021 Jul 21; 11(1): 14890.
39. Orkhon Banzragchgarav, Nanang R Ariefta, Toshihiro Murata, Punsantsogvoo Myagmarsuren, Badgar Battsetseg, Banzragch Battur, Javzan Batkhuu, Nishikawa Yoshifumi, Evaluation of Mongolian compound library for potential antimalarial and anti-Toxoplasma agents. Parasitology International. 2021 Jul 22; 85: 102424.
40. Amarin Rittipornlertrak, Boondarika Nambooppha, Anucha Muenthaisong, Veerasak Punyapornwithaya, Saruda Tiwananthagorn, Yang-Tsung Chung, Bumduuren Tuvshintulga, Thillaiampalam Sivakumar, Naoaki Yokoyama, Nattawooti Sthitmatee, Structural and immunological characterization of an epitope within the PAN motif of ectodomain I in Babesia bovis apical membrane antigen 1 for vaccine development. PeerJ. 2021 Jul 16; 9: e11765.
41. Mohamed Abdo Rizk, Shimaa Abd El-Salam El-Sayed, Ikuo Igarashi, Evaluation of the inhibitory effect of Zingiber officinale rhizome on Babesia and Theileria parasites. Parasitology International. 2021 Aug 2; 85: 102431.
42. Shengwei Ji, Mingming Liu, Eloiza May Galon, Mohamed Abdo Rizk, Jixu Li, Yongchang Li, Iqra Zafar, Ikuo Igarashi, Xuenan Xuan, In vitro screening of novel anti-Babesia gibsoni drugs from natural products. Parasitology International. 2021 Aug 10; 85: 102437.
43. Takahiro Ishizaki, Masahito Asada, Hassan Hakimi, Nattawat Chaiyawong, Yuto Kegawa, Kazuhide Yahata, Osamu Kaneko, cAMP-dependent protein kinase regulates secretion of apical membrane antigen 1 (AMA1) in Plasmodium yoelii. Parasitology International. 2021 Aug 11; 102435.
44. Hassan Hakimi, Masahito Asada, Takahiro Ishizaki, Shinichiro Kawazu, Isolation of viable Babesia bovis merozoites to study parasite invasion. Scientific Reports. 2021 Aug 20; 11(1): 16959.
45. Rika Umemiya-Shirafuji, Jinlin Zhou, Min Liao, Badgar Battsetseg, Damdinsuren Boldbaatar, Takeshi Hatta, Thasaneeya Kuboki, Takeshi Sakaguchi, Huey Shy Chee, Takeharu Miyoshi, Xiaohong Huang, Naotoshi Tsuji, Xuenan Xuan, Kozo Fujisaki, Data from expressed sequence tags from the organs and embryos of parthenogenetic Haemaphysalis longicornis. BMC Research Notes. 2021 Aug 25; 14(1): 326.
46. Takahiro Shirozu, Yu-ki Morishita, Mami Koketsu, Shinya Fukumoto, Molecular detection of Blastocystis sp. subtype 14 in the Yezo sika deer (Cervus nippon yesoensis) in Hokkaido, Japan. Veterinary Parasitology-Regional Studies and Reports. 2021 Jul; 25: 100585
47. Mohamed Abdo Rizk, Shimaa Abd El-Salam El-Sayed, Ikuo Igarashi, Effects of methanolic extract from turmeric (Curcuma longa) against the in vitro multiplication of several Babesia species and Theileria equi. Parasitologia. 2021; 1(4): 188-196
48. Bumduuren Tuvshintulga, Thillaiampalam Sivakumar, Arifin Budiman Nugraha, Believe Ahedor, Enkhbaatar Batmagnai, Davaajav Otgonsuren, Ming Ming Liu, Xuenan Xuan, Ikuo Igarashi, Naoaki Yokoyama, A combination of clofazimine–atovaquone as a potent therapeutic regimen for the radical cure of Babesia microti infection in immunocompromised hosts. The Journal of Infectious Diseases. 2021 Oct 19; jiab537.
49. Rina Ikeda, Nanako Ushio, Ahmed M Abdou, Hidefumi Furuoka, Yoshifumi Nishikawa, Toll-like receptor 2 is involved in abnormal pregnancy in mice infected with Toxoplasma gondii during late pregnancy. Frontiers in Microbiology. 2021 Oct 5; 12: 741104.
50. Hassan Hakimi, Masahito Asada, Shin-Ichiro Kawazu, Recent Advances in Molecular Genetic Tools for Babesia. Veterinary Sciences. 2021 Oct 8; 8(10): 222.
51. Ragab M Fereig, Hanan H Abdelbaky, Yoshifumi Nishikawa, Comparative evaluation of four potent Neospora caninum diagnostic antigens using immunochromatographic assay for detection of specific antibody in cattle. Microorganisms. 2021 Oct 11; 9(10): 2133.
52. Eloiza May Galon, Adrian Miki Macalanda, Mary Margarett Garcia, Chrysler James Ibasco, Anatolio Garvida, Shengwei Ji, Iqra Zafar, Yae Hasegawa, Mingming Liu, Rochelle Haidee Ybañez, Rika Umemiya-Shirafuji, Adrian Ybañez, Florencia Claveria, Xuenan Xuan, Molecular identification of selected tick-borne protozoan and bacterial pathogens in thoroughbred racehorses in Cavite, Philippines. Pathogens. 2021 Oct 13; 10(10): 1318.
53. Shengwei Ji, Mingming Liu, Eloiza May Galon, Mohamed Abdo Rizk, Bumduuren Tuvshintulga, Jixu Li, Iqra Zafar, Yae Hasegawa, Naoaki Yokoyama, Xuenan Xuan, Inhibitory effect of naphthoquine phosphate against Babesia gibsoni in vitro and Babesia rodhaini in vivo. Research Square. 27 Oct 2021
54. Afraa Elata, Keisuke Suganuma, Ehab Mossaad, Iqra Zafar, Eloiza May Galon, Keiichiro Yoshimoto, Tohru Tanaka, Xuan Xuenan, Shin-Ichiro Kawazu, Evaluation of 5-aminolevulenic acid plus ferrous ion for its potential to improve symptoms of bovine babesiosis. Parasitologia. 2021, 1(4), 218-224

55. Arpron Leesombun, Coh-Ichi Nihei, Daisuke Kondoh, Yoshifumi Nishikawa, Polyether ionophore kijimicin inhibits growth of Toxoplasma gondii and controls acute toxoplasmosis in mice. Parasitology Research. 2021 Nov 9.
56. Kazuhide Yahata, Melissa N Hart, Heledd Davies, Masahito Asada, Samuel C Wassmer, Thomas J Templeton, Moritz Treeck, Robert W Moon, Osamu Kaneko, Gliding motility of Plasmodium merozoites. Proceedings of the National Academy of Sciences of the U S A. 2021 Nov 30; 118(48): e2114442118.
57. Kousuke Umeda, Youta Goto, Kenichi Watanabe, Nanako Ushio, Ragab M Fereig, Fumiaki Ihara, Sachi Tanaka, Yutaka Suzuki, Yoshifumi Nishikawa, Transcriptomic analysis of the effects of chemokine receptor CXCR3 deficiency on immune responses in the mouse brain during Toxoplasma gondii infection. Microorganisms. 2021 Nov 12; 9(11): 2340.
58. Rawan A. Satti, Eman A. Awadelkareem, Keisuke Suganuma, Bashir Salim, Noboru Inoue, Xuenan Xuan, Suheir Rehan, Ehab Mossaad, Cattle anaplasmosis and babesiosis: Major tick-borne diseases affecting the cattle industry in Khartoum State, Sudan. Veterinary Parasitology: Regional Studies and Reports. 2021 Dec; 26: 100632.
59. Mohamed Abdo Rizk, Shimaa Abd El-Salam El-Sayed, Mahmoud S Alkhoudary, Khalaf F Alsharif, Mohamed M Abdel-Daim, Ikuo Igarashi, Compounds from the Medicines for Malaria Venture Box inhibit in vitro growth of Babesia divergens, a blood-borne parasite of veterinary and zoonotic importance. Molecules. 2021 Nov 24; 26(23): 7118.

b) International conferences: 3
1. Kawazu, S. One Health: 13 Years of Collaboration of NRCPD and CPH: The Importance of Collaborative Researches Between Japan and the Philippines. 2nd International Forum on Collaborative Researches in Parasitic Diseases (online), Philippines, May 25, 2021.
2. Yokoyama, N. A success story of SATREPS project: Control of protozoan diseases to improve livestock production in Mongolia. Veterinary Science – Sustainable Cooperation, Mongolia, November 18, 2021.
3. Suganuma, K., Inoue, N. Dourine and Trypanosoma equiperdum in Mongolia. Veterinary Science – Sustainable Cooperation, Mongolia, November 18, 2021.

c) National conferences: 12
1. Shiramizu, T., Soga, A., Morishita, Y., Seki, N., Koji, M., Fukumoto, S. Epidemiological study of Cryptosporidium and blastocystis infections in Tokachi region-dwelling Yezo deer. 90th Annual Meeting of the Japanese Society of Parasitology, Japan, April 16 – 17, 2021.
2. Hassan, H., Sakaguchi, M., Yamagishi, J., Kawazu, S., Kaneko, O., Asada, M. A novel Babesia bovis secreted protein responsible for binding of infected erythrocyte to endothelial cell. 90th Annual Meeting of the Japanese Society of Parasitology, Japan, April 16 – 17, 2021.
3. Asada, M., Hassan, H., Kaneko, O., Kawazu, S. Babesia bovis TRAP-related molecule p200 plays an important role in erythrocyte stage proliferation. 90th Annual Meeting of the Japanese Society of Parasitology, Japan, April 16 – 17, 2021.
4. Ahmed, A., Ikeda, R., Watanabe, K., Furuoka, H., Nishikawa, Y. Role of dense granule antigen 7 on vertical transmission of Neospora caninum in mice. 90th Annual Meeting of the Japanese Society of Parasitology, Japan, April 16 – 17, 2021.
5. Ikeda, R., Ahmed, A., Furuoka, H., Nishikawa, Y. TLR2-dependent immune pathology in Toxoplasma infection during pregnancy. 90th Annual Meeting of the Japanese Society of Parasitology, Japan, April 16 – 17, 2021.
6. Hassan, H., Asada, M., Kawazu, S. Cyclic GMP-dependent protein kinase plays a central role for egress of Babesia bovis. 164th meeting of the Japanese Society of Veterinary Science (online), Japan, September 7 – 13, 2021.
7. Suganuma, K., Nakazaki, K., Ohari, Y., Fukumoto, S., Kawazu, S., Inoue, N. Epidemiological survey of trypanosoma parasitizing the sika deer inhabiting the Tokachi district of Hokkaido. 164th meeting of the Japanese Society of Veterinary Science (online), Japan, September 7 – 13, 2021.
8. Fereig, R., Shimoda, N., Hanan, A., Nishikawa, Y. Immunization with Neospora GRA6 confers efficient protection against Neospora caninum infection in both non-pregnant and pregnant mice. 164th meeting of the Japanese Society of Veterinary Science (online), Japan, September 7 – 13, 2021.
9. Onari, Y., Kusaki, K., Shirafuji, R., Mohamed, W.M.A., Abdallah, M., Moustafa, M., Chatanga, E., Matsuno, K., Barker, S., Nonaka, N., Nakao, R. Molecular genetic analysis of Haemaphysalis longicornis using mitogenome and genome-wide single nucleotide polymorphisms. 164th meeting of the Japanese Society of Veterinary Science (online), Japan, September 7 – 13, 2021.
10. Suganuma, K., Chino, M., Kida, K., Yrjo, G., Miura, R., Onari, Y., Mizushima, D., Inoue, N. Analysis of the effects of Trypanosoma theileri infection on dairy cow productivity. 164th meeting of the Japanese Society of Veterinary Science (online), Japan, September 7 – 13, 2021.
11. Naomasa, S., Sato, S., Tuvshintulga, B., Suzuki, H., Shirafuji, R. Expression analysis of ATAQ gene in Haemaphysalis longicornis. 30th Annual Meeting of the Acarological Society of Japan, Japan, September 18, 2021.
12. Yokoyama, N. About the possibility of plasma technology to develop treatments for protozoal diseases. 38th Annual Meeting of the Japan Society of Plasma Science and Technology, Japan, November 23, 2021.

d) Other
(Provide website address or link to appropriate information): 1
https://www.obihiro.ac.jp/facility/protozoa/en/oie

9. Additional comments regarding your report: