



World Organisation
for Animal Health
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WOAH Twinning Project for Rabies between Anses-Nancy and AHRI (2018-2022)

Parent Institute: Nancy Laboratory for Rabies and Wildlife (**Anses-Nancy**),
WOAH/WHO/EU reference laboratory for rabies, Anses (French Agency
for Food, Environmental and Occupational Health & Safety), France

Candidate Institute: Animal Health Research Institute (**AHRI**),
Council of Agriculture, Executive Yuan, Taiwan (R.O.C.)



Objectives of this twinning project for rabies

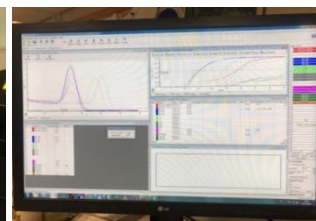
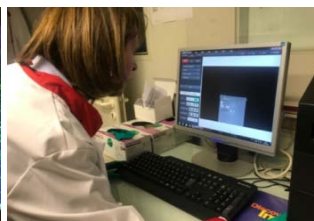
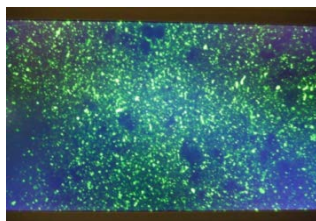
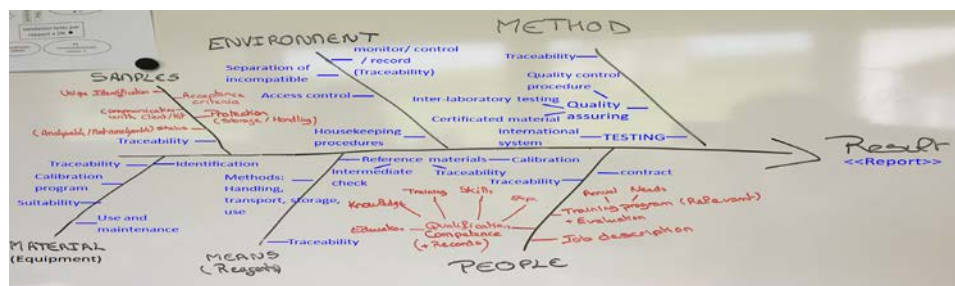
1. Improving quality management of rabies diagnosis and serological testing of rabies
2. Reinforcement of surveillance capacity for rabies control
3. Elucidations on pathogenicity of Taiwan ferret badger rabies virus
4. Organization of proficiency testing for rabies diagnosis in Asian region
5. Dissemination of information





Improving quality management of rabies laboratory activities

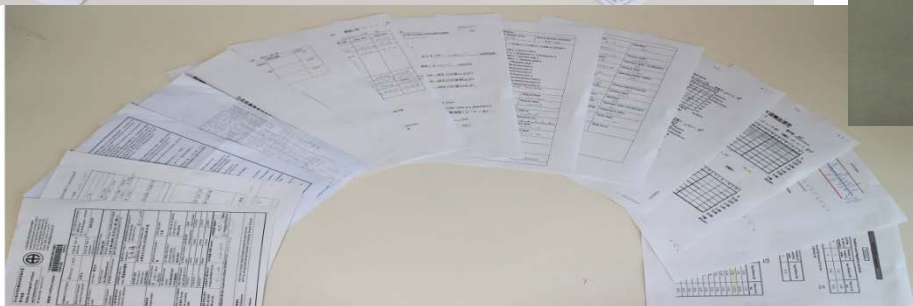
- AHRI sent trainees to Anses-Nancy to learn the establishment of quality management for rabies diagnosis and serological testing (2017, 2019).





Improving quality management of rabies laboratory activities

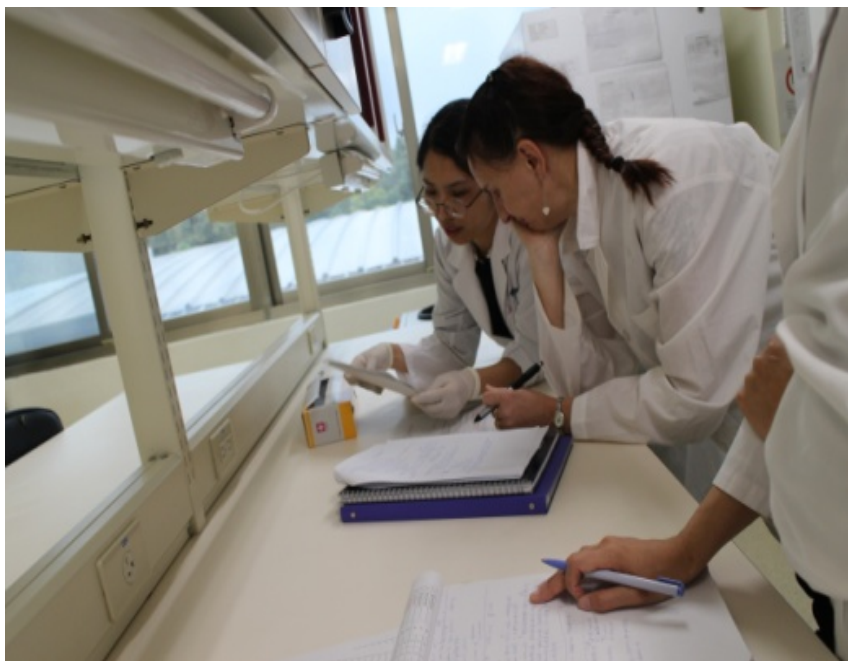
- AHRI set up and further utilized quality management procedures and related documents for rabies activities (2018-2019).





Improving quality management of rabies laboratory activities

- Internal audit given by Anses-Nancy on AHRI's quality management system for serological testing of rabies (2019).





Improving quality management of rabies laboratory activities

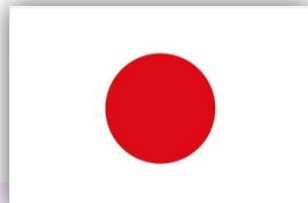
- AHRI trainees accepted quality management trainings in lines with ISO 17025 and passed the qualification test provided by Taiwan Accreditation Foundation (2019, 2021, 2022).





Improving quality management of rabies laboratory activities

- AHRI has been recognized by Japan authority, MAFF, as the rabies antibody testing institute for movements of dogs and cats into Japan (2022).



指定検査施設

Blood testing laboratories designated by the Minister of Agriculture, Forestry and Fisheries(MAFF)

狂犬病に対する抗体価の測定(*)は、農林水産大臣の指定する検査施設で行う必要があります。(指定を希望する検査施設の方は、[こちら\(検査施設の指定要領\)をご覧ください\(PDF:127KB\)](#))

血液の採取及び指定検査施設への送付は、あらかじめ検査施設に連絡を取り、検査申請書並びに血清の入った容器の表示方法、血清分離の必要の有無、保存・輸送方法に関する情報を入手のうえ行ってください。

また、血液を採取する際は、マイクロチップが読み取れることを確認してください。

※micro-RF FIT (マイクロ迅速蛍光フォーカス抑制試験)は、測定方法として認められておりませんのでご注意ください。

アジアAsia

台湾TAIWAN

行政院農業委員会家畜衛生試験所 製剤研究組 狂犬病研究及び血清学診断実験室
Laboratory for Rabies Research and Serology (LRRS) of Biologics Division

住所：新北市所在(No.376, Zhongzheng Rd., Danshui Dist., New Taipei City 25158, Taiwan (R.O.C), Room 301 at National Diagnostic Laboratory Building of AHRI)

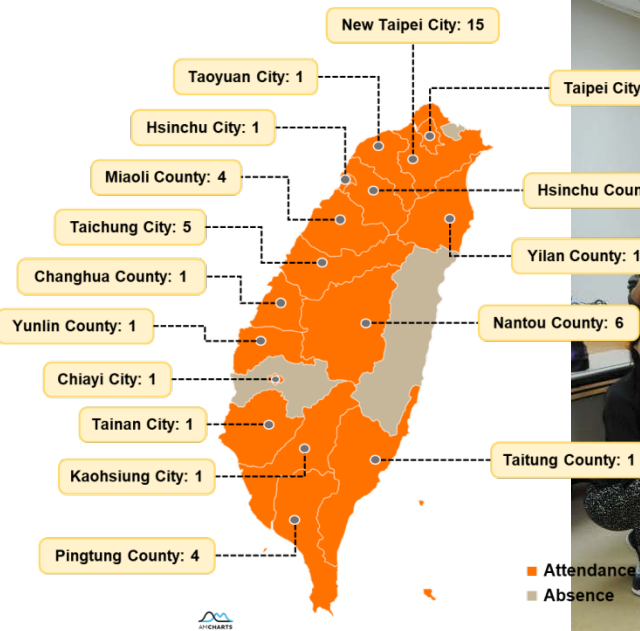




Strengthening surveillance capacity for rabies control

- Local workshop for rabies surveillance education and training

- 49 participants from 15 units of local animal inspection offices, as well as other veterinary and public health sectors attended this training (2017).



■ Attendance
■ Absence





Strengthening surveillance capacity for rabies control - Local workshop for rabies surveillance education and training

- A lesson plan-based discussion.
- The collaborative product from Anses-Nancy, Taiwan CDC, BAPHIQ, and AHRI (2017).

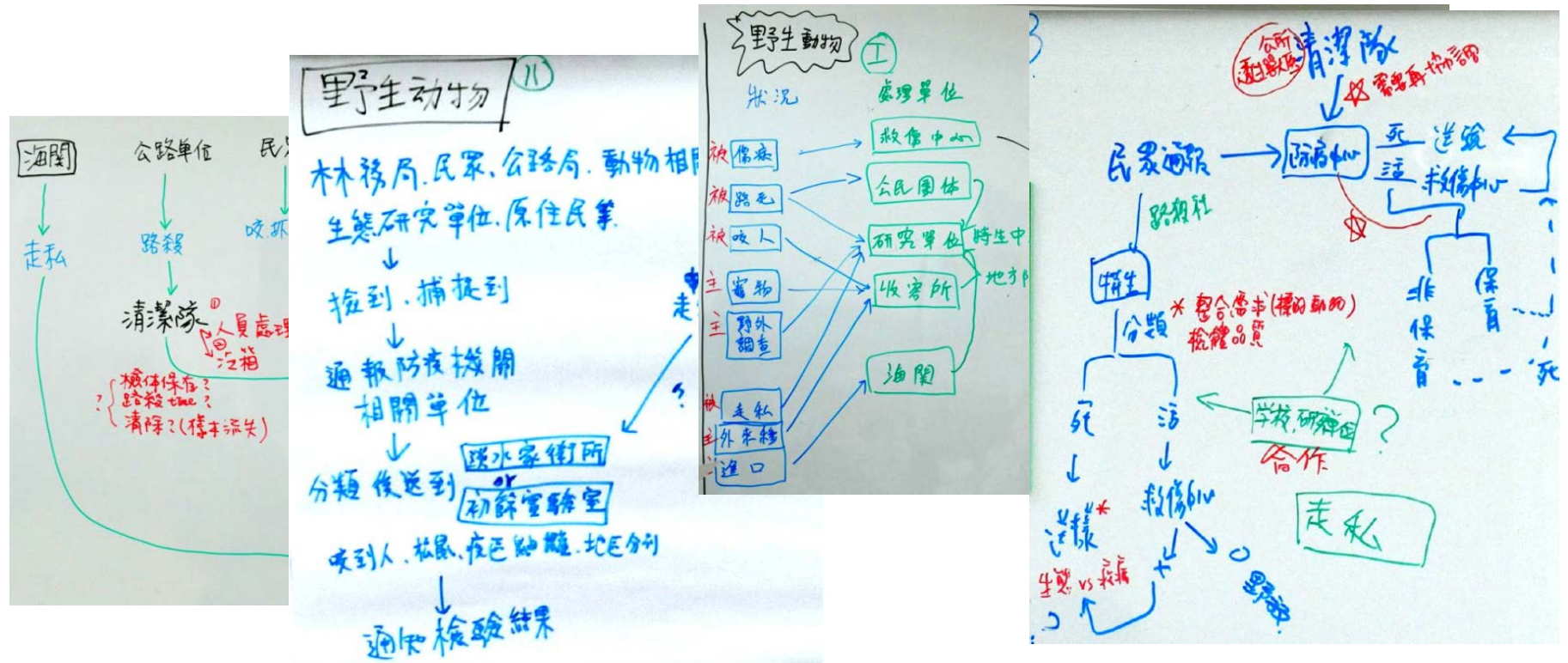


WOAH Twinning Project for Rabies between Anses-Nancy and AHRI



Strengthening surveillance capacity for rabies control - Local workshop for rabies surveillance education and training

At the workshop, trainees illustrated how they imaged the operations of the rabies surveillance system in Taiwan, and proposed their recommendations on how to improve the surveillance system for rabies control.

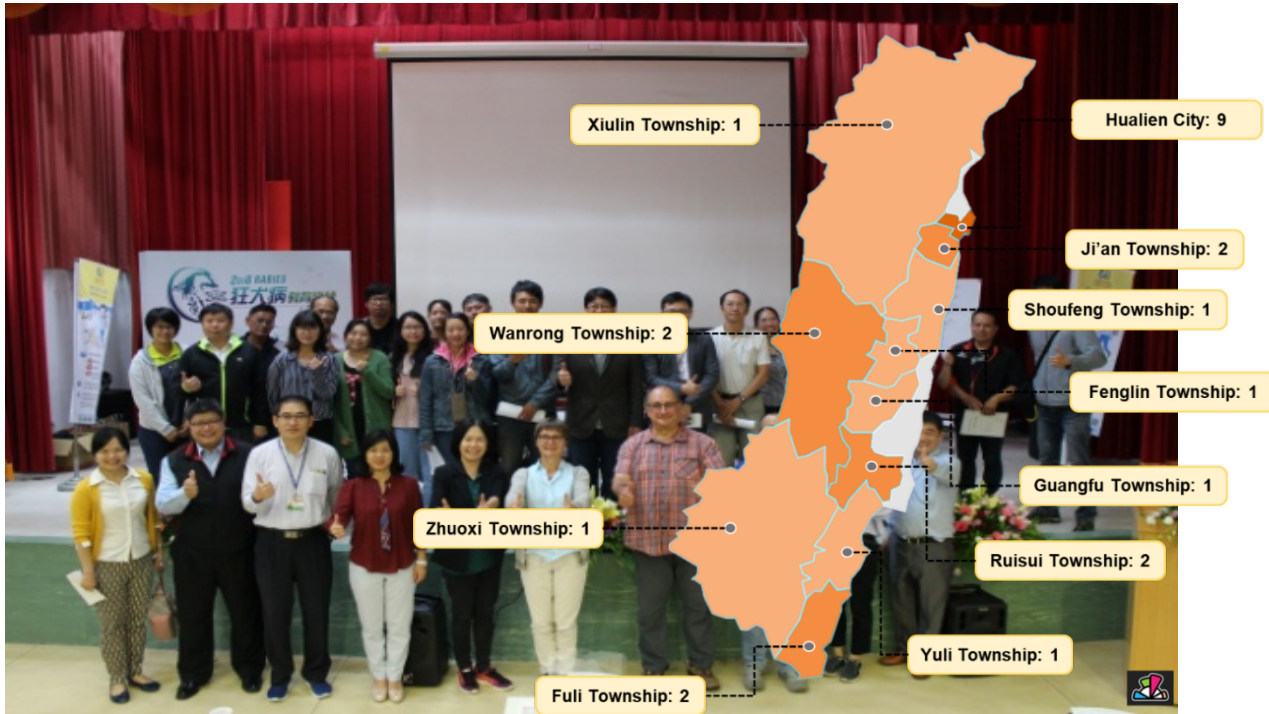
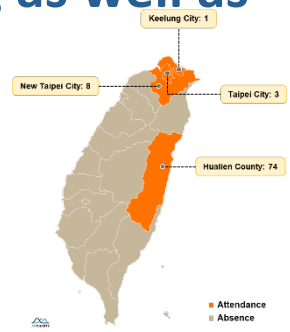




Strengthening surveillance capacity for rabies control

- Local workshop for rabies surveillance, education and training as well as awareness promotion to public

- 88 participants in this program (2018)
 - 2 rabies experts from Anses-Nancy
 - 12 participants from central Taiwanese government
 - 23 participants from local government units in Hualien
 - 51 participants from general public (indigenous people)

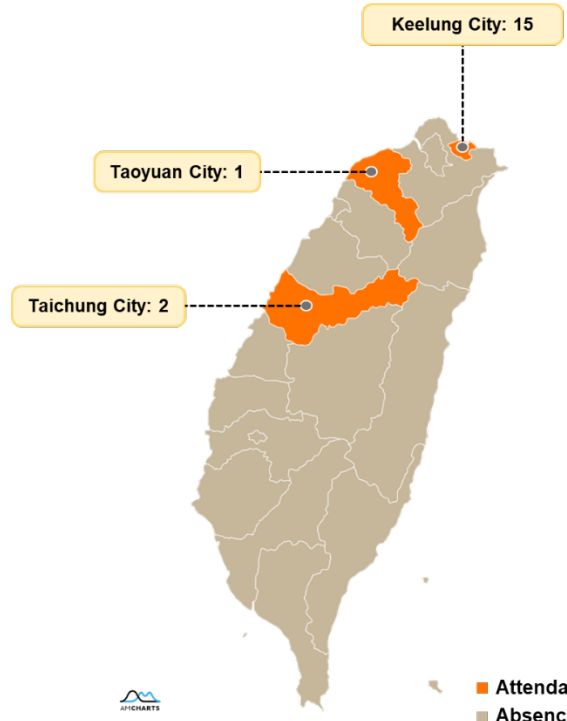


WOAH Twinning Project for Rabies between Anses-Nancy and AHRI



Strengthening surveillance capacity for rabies control - Local workshop for quarantine officers of border control

- 18 participants attended this training workshop from 3 branches of BAPHIQ (2020).

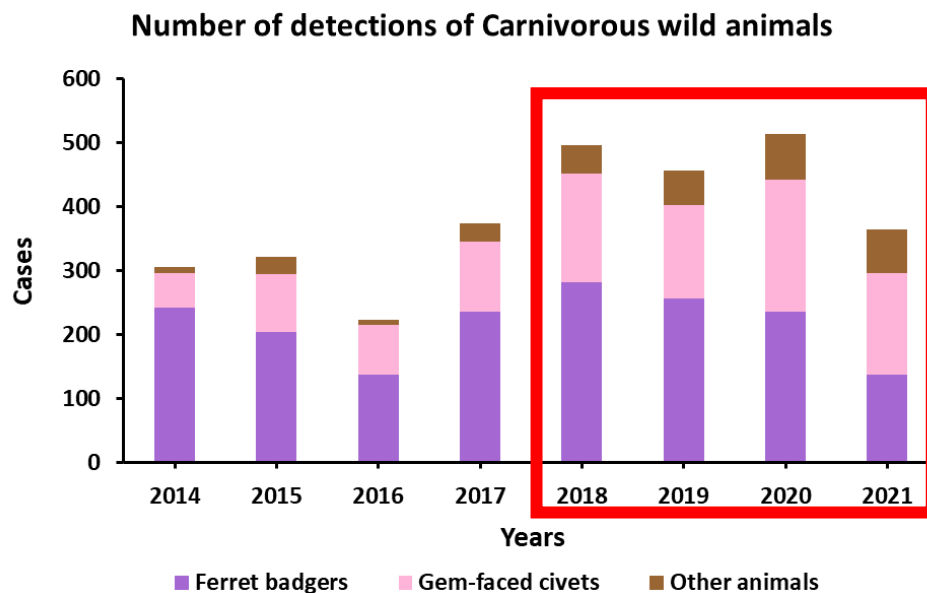
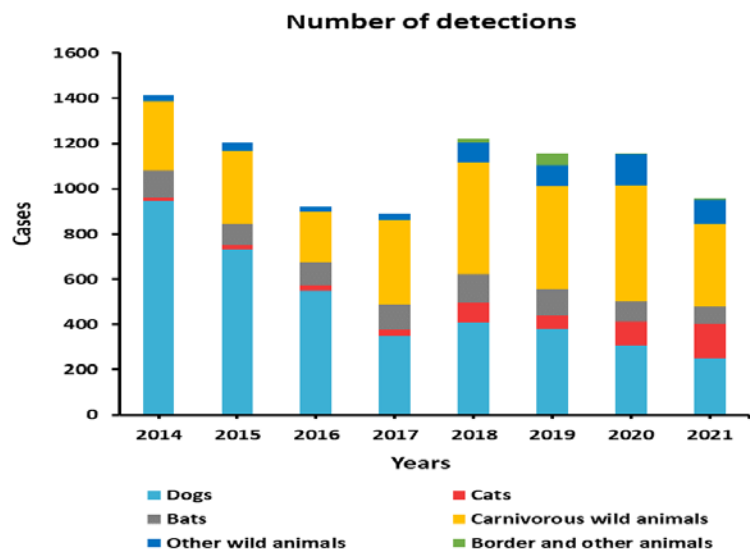


Attendance
Absence



Strengthening surveillance capacity for rabies control - Surveillance improvements after trainings

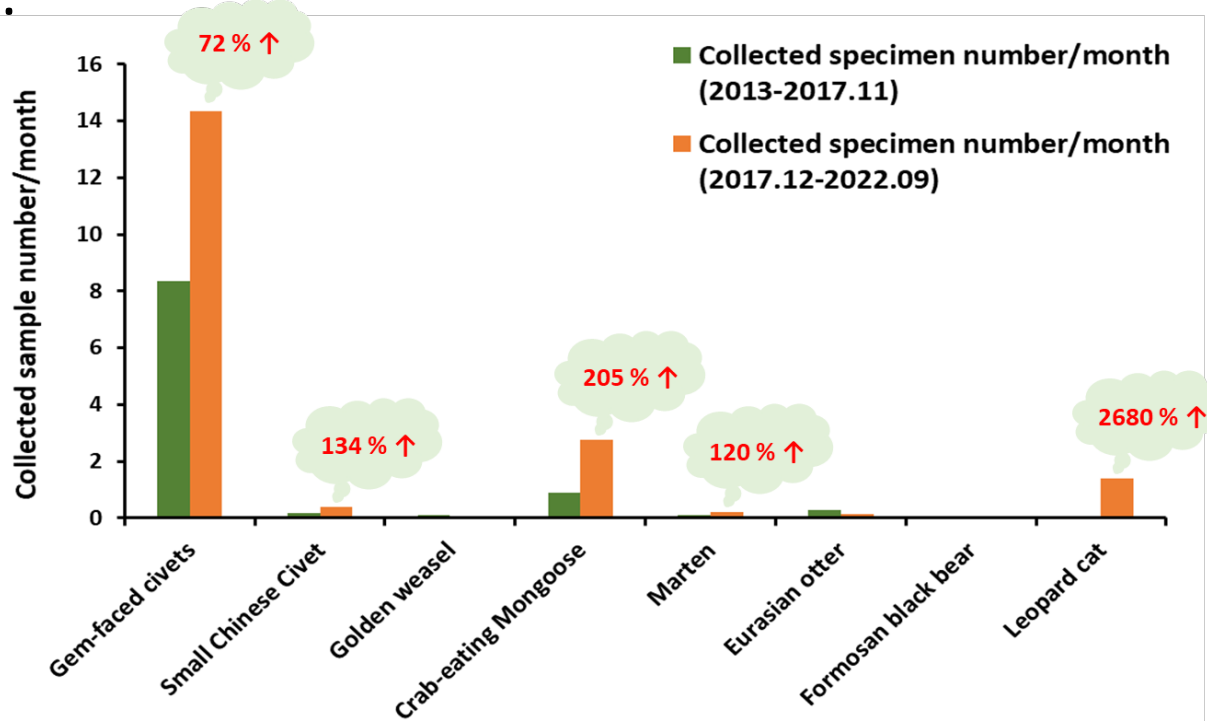
- After the training activities and the reinforcement measures, more animal specimens were included into the rabies surveillance system from 2018 to 2021, compared to the submitted numbers of animal specimens from 2014 to 2017) (BAPHIQ, 2014-2021), and among these, the total detection numbers of wild carnivorous specimens were increased; besides the purple and pink parts standing for total detection numbers of ferret badgers and gem-faced civets, the detection numbers of other wild carnivorous specimens (brown parts) were increased as well.





Strengthening surveillance capacity for rabies control - Surveillance improvements after trainings

- In addition, for various wild carnivore species, compared to the detection numbers before training activity (green color) the detection numbers after activity (orange color) were significantly increased.





Strengthening surveillance capacity for rabies control - Surveillance improvements after trainings

OIE WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future

OIE - WAHIS

Immediate notification (Final report)
08/07/2021

The event is resolved. No more follow-up reports will be submitted.

Sender	Country/territory	Report ID
Delegate of Chinese Taipei	Chinese Taipei	IN_150514
Report reference	Event status	Self-declaration
	Resolved	No

General information

Country or zone - Zone	Disease - Rabies virus (Inf. with)	Started on - 11/06/2021
Animal type - Terrestrial	Genotype/serotype/subtype - Not typed	Confirmed on - 30/06/2021
Causal agent - Rabies virus	Ended on - 30/06/2021	Disease category - OIE-listed
Reported on - 08/07/2021	Reason - Unusual host species	

Epidemiology

Source of the event or origin of the infection - Contact with specific infected wild carnivores.

Epidemiological comments: This yellow-throated marten showed weakness and suspected neurological symptoms, it was rescued on 11/06/2021 by the wildlife conservation authority amid the rural area in Taitung County. The case failed from medical treatment and was diagnosed with rabies by the Animal Health Research Institute on 30/06/2021.

Control measures at event level

Domestic control measures

Applied - Vaccination in response to the outbreak (s)

Wild control measures

Photo provided by
Kenting National Park

viruses

MD

- Moreover, in 2021, the rabies case in a yellow-throated marten was found.
- BAPHIQ input more budget for bat disease surveillance, especially in the context of concerning corona virus. In addition, AHRI has good collaboration with bat association. The novel bat lyssavirus was also be found.

Article Novel Bat Lyssaviruses Identified by Nationwide Passive Surveillance in Taiwan, 2018–2021

Shu-Chia Hu ¹, Chao-Lung Hsu ², Fan Lee ¹, Yang-Chang Tu ¹, Yen-Wen Chen ¹, Jen-Chieh Chang ¹ and Wei-Cheng Hsu ^{1,*}


¹ Animal Health Research Institute, New Taipei City 251203, Taiwan; schu@mail.nvri.gov.tw (S.-C.H.); fanlee@mail.nvri.gov.tw (F.L.); yctu@mail.nvri.gov.tw (Y.-C.T.); ywchen@mail.nvri.gov.tw (Y.-W.C.); jcchang@mail.nvri.gov.tw (J.-C.C.)
² Bat Conservation Society of Taipei, Taipei City 106056, Taiwan; chaolung@batinfo.org
 * Correspondence: wchsu@mail.nvri.gov.tw; Tel.: +886-2-2621-2111





Strengthening surveillance capacity for rabies control

- Releasing accomplishments at local veterinary conference

- The accomplishments of the three rabies surveillance workshops under the WOAHP Twinning project framework were released at Taiwan's veterinary system at the Conference of Chinese Society of Veterinary Sciences (2022).



Report of Education and Trainings on Rabies Surveillance in Taiwan under WOAHP Twinning Project for Rabies

111 年會員大會暨秋季學術論文研討會

OB2
Rabies Surveillance Education and Training Report in Taiwan
Yu-Chia Chang^{1*}, Ai-Ping Hsu^{1*}, Chun-Hsien Tseng¹, Yu-Hau Shih¹, Shu-Chia Hu¹, Ya-Chi Chang¹, Fan Lee¹, Chien-Yuan Huang¹
¹Animal Health Research Institute, Council of Agriculture, Executive Yuan

As a zoonotic infectious disease, rabies has been a threat for global public health. In order to promote regional rabies surveillance, the WOAHP Twinning Project for rabies has been implemented by Nancy Laboratory for Rabies and Wildlife (Anses-Nancy) and Animal Health Research Institute (AHRI) collaboratively. Under the cooperation framework, AHRI organized rabies surveillance education and training programs, including trainings for local veterinary services on wildlife rabies surveillance, courses for quarantine officers regarding international movement/quarantine of pets, and rabies awareness promotion for general public in Taiwan. Results of three lectures/training activities held respectively in Taichung (2017), in Hualien (2018), and in Taipei (2020) were incorporated for being brought out this report to display the achievements of WOAHP Twinning Project for rabies.

Keywords: Rabies, WOAHP Twinning Project, Rabies Surveillance Education and Training

111 年會員大會暨秋季學術論文研討會

口頭論文非競賽組

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OB2	Rabies Surveillance Education and Training Report in Taiwan Yu-Chia Chang ^{1*} , Ai-Ping Hsu ^{1*} , Chun-Hsien Tseng ¹ , Yu-Hau Shih ¹ , Shu-Chia Hu ¹ , Ya-Chi Chang ¹ , Fan Lee ¹ , Chien-Yuan Huang ¹	18
OB3	Diagnosis of African Swine Fever Virus for Border Investigation in Taiwan Yen-Wen Chen ¹ , Wei-Cheng Hsu ¹ , Shu-Chia Hu ¹ , Yang-Chang Tu ¹ , Yu-Liang Tsai-Han Chen ^{1*} , Yu-Liang Huang ¹ , Kuo-Jung Tsai ¹	19
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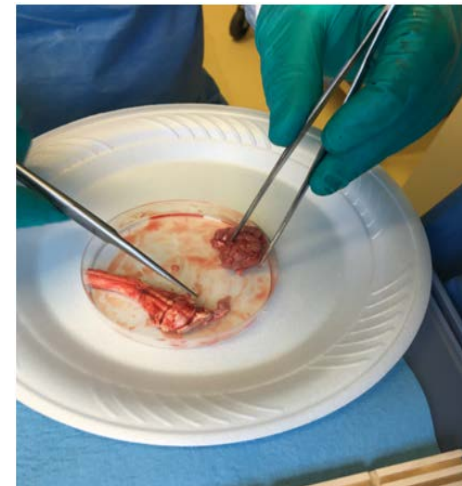
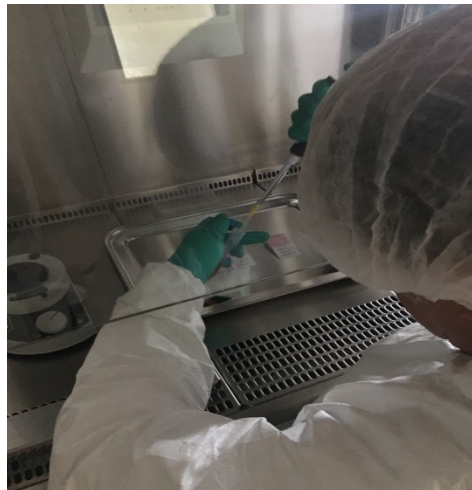


中華民國獸醫學會
 Chinese Society of Veterinary Science Since 1974



The elucidation on pathogenicity of Taiwan ferret badger rabies virus

- Training at Anses-Nancy for implementation of animal experiments on rabies (2017).
- AHRI applied what they learnt to conduct study trial in Taiwan on the gem-faced civets (2018-2019).





The elucidation on pathogenicity of Taiwan ferret badger rabies virus

- Results of pathogenicity of Taiwan ferret badger rabies virus on gem-faced civets was released in the Rabies in the Americas conference (RITA, 2019).



Pathogenicity investigation of Taiwan ferret badger rabies virus on Gem-faced civets

AI-Ping Hsu¹, Yi-Ta Lu², Chun-Hsien Tseng¹, Shih-Ying Lee¹, Yu-Hau Shih¹,
1. Division of Biologics, Animal Health Research Institute, Council of Agriculture, New Taipei City, Taiwan

Abstract
Since the first case of Taiwan ferret badgers rabies found in 2013, there have been 791 positive animal cases diagnosed till end of August, 2019. The surveillance revealed that Formosan ferret badger has been the major rabies-affected species in Taiwan as more than 99% of the cases diagnosed as positive were attributed to specimens from ferret badgers. However, there were still spill-over recorded with 6 positives cases in gem-faced civets, 1 positive in a house shrew, and 1 positive in a dog. Considering gem-faced civets had the second-ranking positive detection rate, as well as being the sympatric carnivores with ferret badgers, the pathogenicity of Taiwan ferret badger rabies virus in gem-faced civets was investigated from different aspects. First, five strains of virus harvested from brain/salivary gland homogenates of rabid gem-faced civets were conducted MICLD₅₀ titration, and the result showed the infectious titers were low (in the range of 0 to 1,000 MICLD₅₀). In order to clarify the possibility of cross-infection from ferret badgers to gem-faced civets, the salivary gland homogenate of Taiwan ferret badger rabies virus was inoculated to 2 gem-faced civets in respective group through intramuscular (higher than 10⁶ ferret badger IU-LD₅₀) or intracranial (higher than 10⁶ ferret badger IU-LD₅₀) routes, the results demonstrated all gem-faced civets survived for the observation periods (half year for IM route, two months for IC route). Moreover, one of the IC-inoculated gem-faced civets developed seroconversion. In conclusion, the foregoing results and sporadic cases of gem-faced civets might indicate potentially low cross-species transmission possibility from ferret badgers to gem-faced civets.

Virus	Year	Isolating place	Genetic group
Virus-1	2014	Pingtung	TW-I
Virus-2	2015	Taitung	TW-I
Virus-3	2015	Pingtung	TW-I
Virus-4	2015	Yunlin	TW-II
Virus-5	2015	Taitung	TW-I

Table 2. Detailed isolation information of Taiwan ferret badger rabies viruses derived from rabid gem-faced civets.
There were totally 6 positive cases of rabid gem-faced civets were discovered till now. Among them, five strains were conducted full-genome sequencing and phylogenetic analysis, and the result showed they were extremely related to Taiwan ferret badger rabies virus with sequence identity more than 95%. Moreover, there were also two genetic groups existing as what has already known of Taiwan ferret badger rabies virus.

Fig 2. Isolation locations of 6 Taiwan ferret badger rabies virus in gem-faced civets are pointed in Taiwan map.
The blue spots represent the virus of genetic group TW-I, and the red spot represent the virus of genetic group TW-II. This result of the relationship between isolating locations and genetic groups is consistent to viruses isolated from ferret badgers.

Fig 3. MICLD₅₀ titration of brain/salivary gland homogenates from rabid gem-faced civets.
The titration results showed the infectious titers were low (in the range of 0 to 1,000 MICLD₅₀).

Table 3. Pathogenicity studies of gem-faced civets receiving Taiwan ferret badger rabies virus through IM or IC route.

Animal No.	Inoculation route	Dosage	Observation period	Survival	Death/ Survival	Neutralization Antibody to rabies
1	IM	>10 ⁶ ferret-badger IM-LD ₅₀	6 months	Survival	Negative	Negative
2	IM	>10 ⁶ ferret-badger IM-LD ₅₀	6 months	Survival	Negative	Negative
3	IC	>10 ⁶ ferret-badger IM-LD ₅₀	2 months	Survival	Negative	Negative
4	IC	>10 ⁶ ferret-badger IM-LD ₅₀	2 months	Survival	Positive	Positive

The survey results showed gem-faced civets were highly resistant to challenge of Taiwan ferret badger rabies virus, even with very high titers of more than 10⁶ or 10⁷ ferret-badger IM-LD₅₀, all animals were survival.

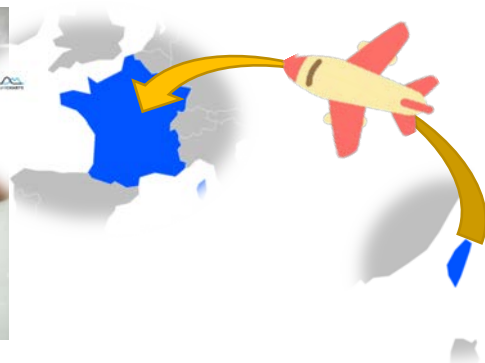
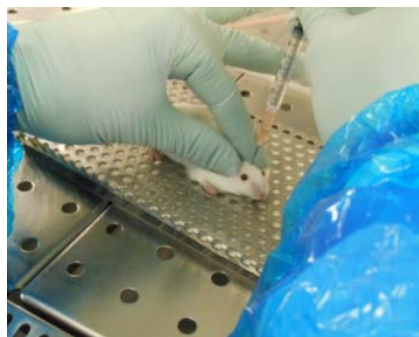
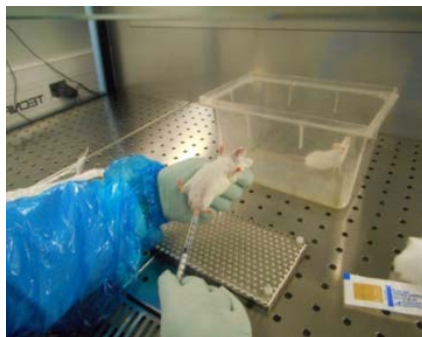
Conclusion
Although Formosan ferret badgers are sympatric with gem-faced civets, and both are nocturnal animals, in this study, it was shown that Taiwan ferret badger rabies virus was not as lethal to gem-faced civets as to ferret badgers. It seemed the ferret badger plays the role of unique reservoir and vector in the rabies epidemic in Taiwan.

Trivial name	Ferret badger	Gem-faced civet
Scientific name	<i>Mustela sibirica</i>	<i>Ptilopus larvot</i>
Ethology	Nocturnality	Nocturnality
Feeding habit	Omnivores	Omnivores
Habitat elevation	0~2,000 meters	0~2,000 meters
Weight	4~1.75 kg	3~5 kg



Development of proficiency testing organization for rabies diagnosis in Asian region

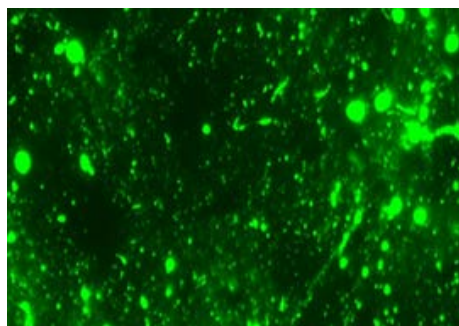
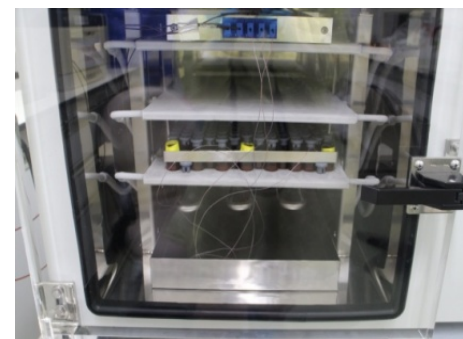
- The trainees from AHRI had learned activity organization and panel production procedures for proficiency testing (2017, 2019).





Development of proficiency testing organization for rabies diagnosis in Asian region

- AHRI applied what they learned to produce testing panels, to verify the quality of testing panels, and to pack the panels in accordance with international standards (2019-2022).





Development of proficiency testing organization for rabies diagnosis in Asian region

- AHRI staff received a training program on how to organize the proficiency testing activity held by Industrial Technology Research Institute, Taiwan (2022).





Development of proficiency testing organization for rabies diagnosis in Asian region

2019

2020

2021

2022

First call for registration:
16 registering laboratories



Reopening for registration:
13 registering laboratories

Pioneer-run proficiency test
11 participating laboratories





Development of proficiency testing organization for rabies diagnosis in Asian region

- The testing panels were sent to participating laboratories (2022).
- Participating laboratories sent back diagnosis results and answers for the technical questionnaire (2022).
- The report of proficiency testing activity was completed and released to the participating laboratories (2022).



11 labs from 7 countries

WOAH Twinning Project for Rabies between Anses-Nancy and AHRI

Reference No. AHRI-1112524029

行政院農業委員會
家畜衛生試驗所
AHRI
ANIMAL HEALTH RESEARCH INSTITUTE, COUNCIL OF AGRICULTURE, EXECUTIVE YUAN

Animal Health Research Institute
UNIT: Biologics division

PROFICIENCY TEST REPORT

INTER-LABORATORY TEST FOR RABIES DIAGNOSIS

Session: 2022

Final report - Version 1

	Name, First name	Function	Date	Signature
TECHNICAL WRITING	Yu-Chia, Chang	Assistant researcher of AHRI	23 Aug. 2022	Tu-Chia, Chang
REVIEW APPROVAL	Al-Ping, Hsu	Associate Researcher of AHRI	24 Aug. 2022	Al-Ping, Hsu
AUTHORIZATION FOR DISTRIBUTION	Chwei-Jang Chiou	Director General of AHRI	22. Aug. 2022	Chwei-Jang Chiou

This proficiency test report is distributed by AHRI exclusively to proficiency testing participants and AHRI declines the whole responsibility for the utilization of this documents by the third party. Participants are the only responsible for its use.

Animal Health Research Institute, Council of Agriculture, Executive Yuan
No. 376, Zhongzheng Rd., Tamsui Dist., New Taipei City 23138, Chinwei, Taiwan (R.O.C.)
Tel: +886-2-26212111, Fax: +886-2-26225345

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Development of proficiency testing organization for rabies diagnosis in Asian region

- The discussion meeting for the proficiency testing activity (2022).
- 22 participants from WOA and 9 countries (Cambodia, France, Japan, Indonesia, Laos, Malaysia, Philippines, Taiwan and Thailand).

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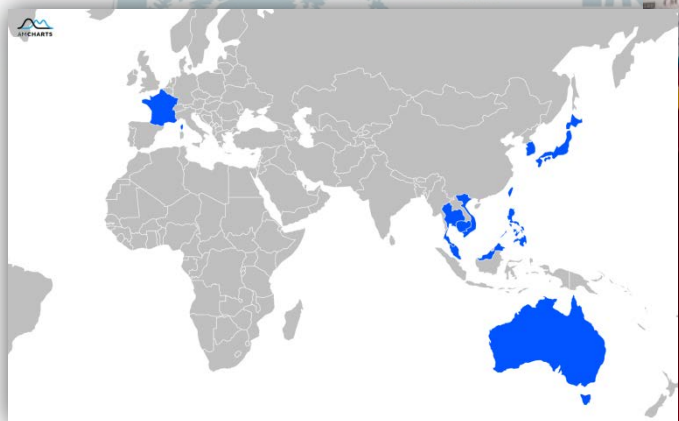




Disseminating information

- Opening Meeting of WOAH Twinning Project for Rabies (2018)

- This physical meeting gathered a total of 119 participants from France, Australia, Cambodia, Japan, South Korea, Malaysia, Philippines, Singapore, Thailand, Vietnam and Taiwan.



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Disseminating information

- Opening Meeting of WOAH Twinning Project for Rabies (2018)

- An unveiling ceremony of “Laboratory Proficiency Testing for Rabies Diagnosis within Asian Network” was jointly taken by distinguished guests





Disseminating information

- Opening Meeting of WOHATwinning Project for Rabies (2018)

- After the discussion session, the opening meeting was ended with a group photo of all attendees wearing a meeting limited edition T-Shirt



WOAH Twinning Project for Rabies between Anses-Nancy and AHRI



Disseminating information

- The Asian Symposium and Workshop on Quality Improvements for Rabies Serology Testing (2019)

- This meeting gathered a total of 83 participants from Cambodia, France, Japan, Malaysia, Thailand and Taiwan).



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Disseminating information

- The Asian Symposium and Workshop on Quality Improvements for Rabies Serology Testing (2019)

- This workshop gathered a total of 14 participants from Cambodia, France, Japan, Malaysia, Thailand and Taiwan).





Disseminating information

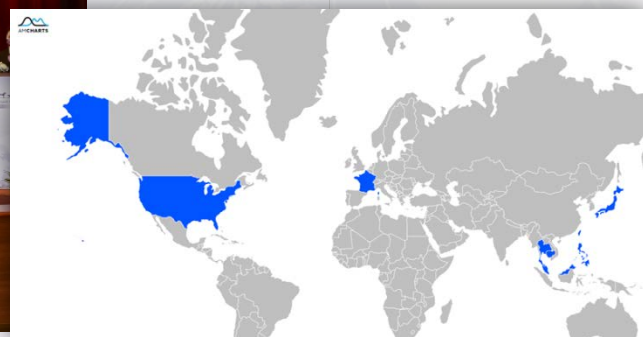
- Closing Meeting of WOAHP Twinning Project for Rabies (2022)

- This physical/online meeting gathered a total of 112 participants from France, Japan, U.S.A., Philippines, Thailand, Cambodia, and Malaysia and Taiwan



g Project for
AHRI

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WOAHP Twinning Project for Rabies between Anses-Nancy and AHRI



Disseminating information

- Closing Meeting of WOHATwinning Project for Rabies (2022)

- The rite of passage was designed as the symbolization to passage the spirit and experience of rabies expertise to Taiwan from WOHAT and Anses-Nancy.







Acknowledgments



World Organisation
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- World Organisation for Animal Health and Regional Representation for Asia and the Pacific, WOAHA
- Nancy Laboratory for Rabies and Wildlife (Anses-Nancy)
- Council of Agriculture, and Bureau of Animal and Plant Health Inspection and Quarantine, COA.
- Our supervisors, and all the AHRI staff who devoted for this mission
- Scientists who kindly transferred the rabies virus strains
 - Nancy Laboratory for Rabies and Wildlife (Anses-Nancy): Dr. Florence Cliquet and Dr. Emmanuelle Robardet.
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 - AMCHARTS: <https://www.amcharts.com/> 
 - PlotDB: <https://plotdb.com/> 
 - RESHOT: <https://www.reshot.com/> 