Response to Potential Challenges of Re-emerging Rabies in Taiwan

Jyh-Jye Yuan, D.V.M, MS
Deputy Director, Animal Health Inspection Division
Bureau of Animal and Plant Health Inspection and Quarantine (BAPHIQ), Council of Agriculture

December 19th, 2013
Content

- Background
- Current situation
- Control measures
- Conclusion
Background

Since 1961, Taiwan had been recognized as one of the ten Rabies-free countries.

The Council of Agriculture (COA) has implemented Rabies surveillance programs on dogs and bats and no rabies was found.
- 7,266 dog samples since 1999
- 347 bat samples since 2008

<table>
<thead>
<tr>
<th>Species</th>
<th>Samples from 1999 to 2012</th>
<th>Samples in 2013 (Jan.~Jun.)</th>
<th>Rabies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog</td>
<td>6,841</td>
<td>425</td>
<td>0</td>
</tr>
<tr>
<td>Bat</td>
<td>322</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>
Wildlife disease surveillance programs -

- Considering that many emerging diseases have been found from wild animals, the OIE has called on Member Countries to conduct wildlife disease surveillance programs.

- Since 2012, BAPHIQ of the COA has supported National Taiwan University (NTU) and National Pingtung Polytech University to conduct disease surveillance in wildlife.

- In 2013, the target wildlife pathogen surveillance was launched to obtain information about rabies.
NTU received a case from Nantou. Encephalitis was diagnosed; Canine distemper (CD) was suspected but tested negative.

Background (cont.) - Rabies in ferret-badger

Case found  Re-test  RT-PCR  Case reported  Re-test  Case confirmation

Samples were sent to Animal Health Research Institute (AHRI) for diagnosis, including Impression Smear, RT-PCR, & FAT, etc. Rabies specific Ag and RNA was found.

In combination of the previous two cases found in May. and Nov. of 2012, all 3 cases were negative for CD & pseudorabies.

NTU reported to BAPHIQ.

Rabies was confirmed in all 3 cases by the Rabies Diagnostic Group and the relevant report was sent to the OIE on Jul. 17.
### Test results of Animals

**Updated: Dec. 9, 2013**

<table>
<thead>
<tr>
<th>Animals</th>
<th>No. of tests 1999-2013</th>
<th>No. of Positive incidences</th>
<th>No. of tests 2013</th>
<th>No. of Positive incidences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dogs</td>
<td>6,841</td>
<td>0</td>
<td>1,467</td>
<td>1*</td>
</tr>
<tr>
<td>Cats</td>
<td>5</td>
<td>0</td>
<td>103</td>
<td>0</td>
</tr>
<tr>
<td>Bats</td>
<td>322</td>
<td>0</td>
<td>63</td>
<td>0</td>
</tr>
<tr>
<td>Carnivores</td>
<td>--</td>
<td>--</td>
<td>971</td>
<td>258</td>
</tr>
<tr>
<td>Other wildlife</td>
<td>--</td>
<td>--</td>
<td>335</td>
<td>1**</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7,168</td>
<td>0</td>
<td>2,939</td>
<td>260</td>
</tr>
</tbody>
</table>

* A puppy of 1.5 month old who bitten by a rabid ferret-badger and had conformed being infected by rabid after 24 days under quarantine.

** * * : A house shrew was confirmed to be rabies positive and was considered to be infected through the bite of rabid ferret-badger.
Common Carnivores in Taiwan

- **Ferret-badger** (*Melogale moschate subaurantiaca*)
- **Formosan gem-faced civet** (*Paguma larvata*)
- **Small Chinese civet** (*Viverricula indica pallida*)
- **Golden Weasel** (*Mustela sibirica taivana*)
- **Crab-eating mongoose** (*Herpestes urva*)
- **Leopard cat** (*Prionailurus bengalensis chinensis*)
## Current Situation (cont.)

### Test results of wild Carnivores*

<table>
<thead>
<tr>
<th>Animals</th>
<th>No. of testing</th>
<th>No. of positive incidences</th>
<th>Animals</th>
<th>No. of testing</th>
<th>No. of positive Incidences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferret-badger <em>(Melogale moschate subaurantiaca)</em></td>
<td>792</td>
<td>258</td>
<td>Formosan gem-faced civet <em>(Paguma larvata)</em></td>
<td>153</td>
<td>0</td>
</tr>
<tr>
<td>Small Chinese civet <em>(Viverricula indica pallida)</em></td>
<td>3</td>
<td>0</td>
<td>Golden weasel <em>(Mustela sibirica)</em></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Crab-eating mongoose <em>(Herpestes urva)</em></td>
<td>16</td>
<td>0</td>
<td>Ferret <em>(Mustela putorius furo)</em></td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

*Confirmed by AHRI*
Current Situation

Wild carnivores - 258 positive/971 cases (including ferret-badger 258/792); dog & cat 1/1141 until December 9.

- 31 cases of ferret badger in Taichung
- 15 cases of ferret badger in Yunlin
- 13 cases of ferret badger in Chiayi
- 17 cases of ferret badger in Tainan
- 14 cases of ferret badger in Kaohsiung
- 54 cases of ferret badger in Nantou
- 3 cases of ferret badger in Hualien
- 102 cases of ferret badger, 1 house shrew & 1 dog in Taitung
- 9 cases of ferret badger in Pingtung

Circle: Where the new positive case was found
Delta: Retrospective cases
Star: Positive case of dog
Current Situation (cont.)
Positive results / total tests - 258/792
(Until December 9, 2013)

The known Distribution of ferret-badger

Townships with confirmed Rabies cases

Townships with negative cases

Image made by Dr. Lee, NTU.
Current Situation (cont.)

-- Phylogenetic analysis

- The comparison of Rabies virus for 3 groups in Taiwan
- Divided by geographical location (by County)
  - Nantou & Taichung
  - Yunlin, Tainan & Kaoshiung
  - Taitung
- The similarity
  - Glycoprotein (G-protein): 91.5~99.9%
  - Nucleoprotein (N-protein): 91.5~100%
- All belongs to Lyssavirus genotype I

- The comparison of Rabies virus was conducted between Taiwan and China/USA/Mexico, whereas the similarity between Taiwan and China is the highest.
  - G-protein: 87.8~89.6%
  - N-Protein: 87.7~91.3%
In total, 158 house shrews (26 samples from Taitung County) were tested with one rabies positive case from Taitung County.

According to the WHO, the role of rabies transmission in rodents or insectivora animals is not significant.

One puppy was bitten by a rabid ferret-bedger at home and had developed rabies symptoms during quarantine. It was confirmed to be rabies positive by FAT after euthanasia.
Control Measures

- Emergency Import of Vaccines: 2.29 million doses of animal vaccine has been imported within 2 months after the disease outbreak.

- Improve rabies vaccination coverage, the vaccination coverage of pet dogs and cats is estimated over 90% in high-risk area and about 66% nationwide.

- Safeguard of Human -- vaccination for 3,500 frontline staff
Control Measures (cont.)

Target: no epidemiologic case from cats and dogs

Rabies prevention

- Emergency vaccine storage
- Study & research
- International cooperation
- Border quarantine
- Public communication & awareness
- Support laboratory
- Safeguard of human
- Dogs & Cats management
- Increasing vaccination rate
- Animal surveillance
- Increasing vaccination rate

Target: no epidemiologic case from cats and dogs
Survey the cases of downer wild animals, dogs, cats, bats and those bite human.
Investigate the distribution, density, behavior and rabies prevalence of wild animals, and develop the oral vaccine for ferret badgers.
Vaccination on Companion Animals

- Reach the vaccination rate of 90% on pet dogs and cats in the high risk area, like rabies-positive or mountainous area. Cooperate with local clinic veterinarians on vaccination, increase the vaccination rate to 70% in other areas.

- Prohibition
  - Since 2014, the owner whose pets have no rabies vaccination would be fined.
Dogs & Cats Management

- Reduce the animal reproduction: encourage the owners to neutralize their pets.
- Encourage the registration of pets and do public education, and reinforce the responsibility of the owners.
- Develop animal protection NGOs, and establish private animal shelters.
- Cooperation with clinic veterinarians and the local veterinarian associations to increase vaccination coverage.
Safeguard of Humans

- Since the outbreak of rabies, the pre-exposure vaccinations have been injected on 3,500 people whose occupation has high risk for rabies exposure.
- We will continue to reinforce the pre-exposure vaccination on the high risk population.
Support Laboratory

- Support the research institutes and veterinarian colleges to set up rabies-monitoring laboratories. And AHRI is responsible for the tested of the human-bitten animals, makes the final diagnosis.

- Invite experts from CDC(USA) to help the Council of Agriculture to establish the technique of animal serum surveillance for oral vaccination development and evaluation.
Emergency Vaccine Storage

Build up the rabies vaccine stock of 250,000 doses for emergency response, the purchase mechanism will start if the stock is below 150,000 doses.
Study and Research

- Animal tests:
  - Conduit the animal tests for the rabies pathogenicity on host animal under the 3R principle (reduce, replacement, refinement)

- Feasibility study on Oral Rabies Vaccine (ORV):
  - To evaluate the feasibility, safety, and efficacy of using ORV for wildlife (including ferret-badgers) as well as the impacts and hazards on non-target animals, ecosystem, and human beings. Moreover, the delivery mechanism of ORV and the way of follow-up evaluation will be studied.

- Epidemiological surveillance:
  - Continue to survey the companion and wild animals, set the trap cages to investigate the distribution, density, habit and rabies prevalence of carnivores, including ferret badgers, it will help to identify if there exists other species infected by the rabies virus. The result would be compared with the rabies virus genome sequence analysis to build the epidemiology report.
International Cooperation and Border Quarantine

- Consult the rabies prevention guidelines offered by the WHO and OIE, and invite international experts to provide the opinions about prevention strategies and oral vaccination.
- Strengthening the quarantine measures for imported animals.
- Preventing illegal smuggling of animals.
Public Communication and Awareness

- Generally propagating “Two Nots and One Do”
  - do Not abandon pets
  - do Not catch or contact with wild animals
  - Do pet vaccination

- Immediate Public Health Response
- Media (including TV, website, radio, and print media etc.)
- Community activities
- School education
- Training for instructors
Strategies for Disease Control

Animal surveillance
- Dead or sick wild animals.
- Survey the small carnivores.
- Dogs & Cats surveillance.
- Bats surveillance.

Companion animal management
- Animal-adoption
- Pets registration
- Stray dogs
- Public discussion

Ability of lab. diagnostic increase
- Supporting Lab.
- Diagnostic Lab.

Study and research
- Animal experiment
- Oral vaccination
- Epidemiology
Conclusion

The condition of rabies is stable and under control and the work of disease prevention has turned into mid-to-long term management.

Consult the rabies prevention guidelines offered by the WHO and the OIE, and invite international experts to provide the opinions about prevention strategies and oral vaccination.

We are still striving to find any opinion on surveillance, animal tests, oral vaccination and pet registration.
Thank you for your attention.