

were almost identical; only 2 nt differences were found. No epidemiologic or geographic link connected these 2 patients. The only link was the date of sample collection. Both patients were ill during the summer, which suggests possible consumption of undercooked, or raw, contaminated food as the source of infection. The sequences from these 2 patients were most closely related to the sequences from patients involved in the outbreaks in France (Figure). These sequences all form a group with the HEV4 virus identified in the pig in Belgium in 2008, thereby suggesting a zoonotic origin.

Because Statens Serum Institut is the only laboratory in Denmark that offers diagnostic testing for HEV, we consider our national surveillance to be fairly complete. Prospective surveillance will show whether HEV4 becomes established within Denmark. To date, HEV4 has not been detected in animal populations in Denmark. In China, similarity of HEV4 data between strains from humans and other animals in the same geographic areas was high, which is highly suggestive of zoonotic transmission (3). Because of the rare detection of HEV4 in Europe, these types of data are not yet available for European countries. However, the close phylogenetic relationship between the strains from humans in Denmark and France and the strain from the pig in Belgium suggests a zoonotic origin for this genotype in these countries. This suggestion is further supported by the fact that some of the strains from France were associated with the consumption of pork liver sausage.

The emergence of autochthonous HEV4 infection in human populations in 4 European countries, and its detection in different years (2006/2007, 2008, 2009, 2011, and 2012), suggests that this genotype may be established in Europe. Thus, for the purpose of ensuring HEV4 detection, diagnostic and genotyping methods should be evaluated.

**Sofie Midgley,  
Hanne Thang Vestergaard,  
Camilla Dalgaard,  
Lone Enggaard,  
and Thea Kølsten Fischer**

Author affiliation: Statens Serum Institut, Copenhagen, Denmark

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Address for correspondence: Thea Kølsten Fischer, Department for Microbiological Diagnostics and Virology, Statens Serum Institut, Artillerivej 5, 2300 Copenhagen S, Denmark; email: [thf@ssi.dk](mailto:thf@ssi.dk)

## Tour Leaders' Knowledge of and Attitudes toward Rabies Vaccination, Taiwan

**To the Editor:** Tour leaders accompany and care for the health, comfort, and safety of travelers in group tours, which remain a popular method of international travel in Asian countries, including Taiwan (1). In addition to travel agents and physicians, tour leaders can also play a key role in the prevention and management of travel-related infectious diseases during group tours.

Rabies is a viral, vaccine-preventable, zoonotic, infectious disease that occurs throughout the world; it is almost always fatal (2, 3). According to records of postexposure prophylaxis, ≈0.4% of all travelers have experienced 1 animal (at-risk) bite per month of stay in a rabies-endemic country; in the past 10 years, at least 22 confirmed cases of rabies among travelers have been reported (4,5). Given that rabies-endemic countries include many popular tourist destinations, rabies has become one of the most serious travel-related infectious diseases (3). In 2011, nearly half of the 9 million

travelers from Taiwan participated in group tours to Southeast Asia, a highly rabies-endemic area. Thus, tour leaders might be in a position to influence rabies risk among group travelers to high-risk destinations.

To determine tour leaders' knowledge of and attitudes toward rabies vaccination, we conducted a cross-sectional survey among those working in international tourism in Taiwan. A self-administered questionnaire was given to 191 tour leaders who attended 6 seminars in Taiwan during May–October 2010. This questionnaire (online Technical Appendix, [wwwnc.cdc.gov/EID/article/20/1/13-0673-Techapp1.pdf](http://wwwnc.cdc.gov/EID/article/20/1/13-0673-Techapp1.pdf)) comprised 3 sections: demographic information; attitude toward rabies vaccination; and knowledge about general rabies-related information, prevention, and postexposure management. The questionnaire was based on a literature review. Statistical analysis was performed by using SPSS for Windows 11.0 (SPSS, Chicago, IL, USA) and  $\chi^2$  test and stepwise logistic regression analysis; *p* value was set at 0.05.

A total of 175 (91.6%) tour leaders completed the questionnaire. Respondent mean age ( $\pm$  SD) was 44.5  $\pm$  11.8 (range 20–71) years. Among them, 58.3% were women, and 82.3% had a college degree or above. A

positive attitude toward preexposure rabies vaccination was reported by >90% of tour leaders (Table). Tour leaders who intended to receive vaccination showed higher willingness to recommend vaccination to group travelers. Most (46.3%) tour leaders indicated that the main factor influencing their intention to receive vaccination was disease severity. However, the mean percentage of accurate responses to rabies-related questions was only 52.4% (Table). Most (49.1%) tour leaders incorrectly thought that it often takes 1 day to 1 week for symptoms of rabies to develop after a person is infected. Only 44.6% of respondents knew that the mortality rate for rabies is >99% after symptoms appear. Regarding the question “Where is rabies present?” the most often chosen incorrect answer was Southeast Asia and mainland China only (32.0%). A positive attitude toward rabies vaccination and poor knowledge were noted regardless of tour leader age and education level. Multiple logistic regression analyses showed that the response to the question about mortality rate was a significant predicting variable regarding tour leaders' attitudes toward vaccination. Tour leaders who understood the high mortality rate associated with rabies tended to receive preexposure rabies vaccination (odds ratio 5.578,

95% CI 1.190–26.170, *p* = 0.029) and would recommend vaccination to group travelers (odds ratio 15.931, 95% CI 1.840–138.090, *p* = 0.012).

Our study revealed that tour leaders in Taiwan had a positive attitude toward rabies vaccination but a relatively low level of knowledge about rabies. Knowledge was poor regarding clinical manifestations, rabies-endemic areas, prevention, and management. We believe that the poor knowledge reflects insufficient information or education about rabies provided to the public or to tour leaders in Taiwan, which is a rabies-free area. Previous studies revealed that most animal-bitten travelers did not receive postexposure prophylaxis consistent with World Health Organization guidelines (4,6), possibly because travelers and local health practitioners were unfamiliar with the disease (7,8). Therefore, tour leaders with adequate knowledge about rabies might be able to provide immediate information to exposed travelers.

Knowledge of the high mortality rate associated with rabies was an independent factor influencing tour leaders' attitudes toward preexposure rabies vaccination. This finding was consistent with previous study findings that low preexposure vaccination rates among travelers might result

Table. Respondent's attitude and knowledge of rabies and vaccination (n = 175), Taiwan, 2010\*

Survey section, questions	Response, %					
	Yes	No	No idea	Correct answer	Incorrect answer	Don't know
<b>Section II: attitude toward rabies vaccination</b>						
1. Do you intend to receive rabies vaccination before visiting a rabies-endemic area?	92.6	3.4	4.0	NA	NA	NA
2. Will you recommend rabies vaccination to travelers before they visit a rabies-endemic area?	94.3	1.7	4.0	NA	NA	NA
<b>Section III: knowledge about rabies</b>						
1. Transmission mode	NA	NA	NA	97.1	1.7	1.1
2. Infectious agent	NA	NA	NA	77.7	16.0	6.3
3. Particular symptom	NA	NA	NA	51.4	37.7	10.9
4. Incubation period	NA	NA	NA	25.1	65.8	9.1
5. Mortality rate	NA	NA	NA	44.6	34.3	21.1
6. Rabies-endemic area	NA	NA	NA	38.3	45.1	16.6
7. Preexposure vaccination protocol	NA	NA	NA	21.7	52.1	26.2
8. Postexposure vaccination protocol	NA	NA	NA	41.7	69.7	28.0
9. Postexposure management	NA	NA	NA	73.7	14.3	12.0

\*NA, not applicable.

from the lack of knowledge among the travelers themselves or among their pretravel health care providers (5,9). In recent years, the World Health Organization and the GeoSentinel Surveillance Network recommended that persons planning to visit rabies-endemic areas receive preexposure prophylaxis before traveling (6,10). Understanding the factors influencing acceptance of vaccination could help governments develop and institute strategies for disease prevention. Thus, the Taiwan government should enhance tour leaders' knowledge about rabies, especially regarding the high mortality rate. Education of tour leaders could, in turn, increase vaccination rates and help with prevention and management of rabies.

The results of this study are relevant for countries other than Taiwan because many Asian tourists participate in group tours. We suggest that governments place more emphasis on tour leaders' education concerning travel medicine. Such education could not only improve the quality of group tours but also help prevent travel-related infectious diseases.

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**Chiao-Yu Huang,<sup>1</sup>  
Hsien-Liang Huang,<sup>1</sup>  
Shao-Yi Cheng, Chia-Wen Lu,  
Long-Teng Lee, Tai-Yuan Chiu,  
and Kuo-Chin Huang**

Author affiliations: National Taiwan University Hospital, Taipei City, Taiwan (C.-Y. Huang, H.-L. Huang, S.-Y. Cheng, C.-W. Lu, L.-T. Lee, T.-Y. Chiu, K.-C. Huang); Cardinal Tien Hospital, New Taipei City, Taiwan (H.-L. Huang); Fu-Jen Catholic

University, New Taipei City (H.-L. Huang); and China Medical University, Taichung, Taiwan (K.-C. Huang)

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Address for correspondence: Kuo-Chin Huang, Department of Family Medicine, National Taiwan University Hospital, 7 Chung-Shan South Rd, Taipei, Taiwan 100; email: [bretthuang@ntu.edu.tw](mailto:bretthuang@ntu.edu.tw)

## ***Corynebacterium ulcerans* in Ferrets**

**To the Editor:** Infection with *Corynebacterium ulcerans* occurs sporadically throughout the world, and in the United Kingdom it has emerged as the most common cause of diphtheria-like disease (1). *C. ulcerans*, along with *C. diphtheriae* and *C. pseudotuberculosis*, can be lysogenized by diphtheria toxin-encoding bacteriophages; this process enables the organism to induce its characteristic sequela (the diphtheritic membrane) in the host. *C. ulcerans* in the environment has been a source of mastitis in cattle and a cause of diphtheria in humans who consume unpasteurized, contaminated milk. The organism has been isolated from various domestic, wild, and laboratory animals; additional definitive sources are dogs, cats, and pigs (2). *C. ulcerans* has been isolated from bonnet macaques with mastitis and from the cephalic implants of purpose-bred macaques used in cognitive neuroscience experiments (3,4). We report isolation of *C. ulcerans* from cephalic implants in 4 ferrets (*Mustela putorius furo*) and the oropharynx of 1 ferret, all used in imaging experiments in Massachusetts, USA, during 2007–2008.

All ferrets described here were purpose-bred, domestic ferrets, purchased from a commercial vendor. The index case occurred in a ferret with a cephalic implant. Microbiological culture of a purulent discharge

<sup>1</sup>These authors contributed equally to this article.

# Tour Leaders' Knowledge of and Attitudes Toward Rabies Vaccination, Taiwan

## Technical Appendix

### Questionnaire Survey about Rabies and Vaccination

#### Section I: Demographic information

Q. Age: What is your age? \_\_\_years old

Q. Gender: Are you Male or Female?

Male

Female

Q. Marital Status: What is your marital status?

Single

Married

Q. Education: What is the highest level of education you have completed?

Elementary school

Junior high school

Senior high school

College

Graduate school or above

#### Section II: Attitude towards rabies and vaccination

1. Do you intend to receive rabies vaccination before visiting a rabies-endemic area?
2. Will you recommend rabies vaccination to travelers before they visit a rabies-endemic area?
3. Which is the main factor influencing your intention to receive rabies pre-exposure vaccination?(Please sort it according to level of influence)
  - a. Disease severity
  - b. Disease prevalence
  - c. Vaccine efficacy
  - d. Vaccine cost

- e. Adverse effect of vaccine
- f. Promotion by government
- g. Past experience of immunization
- h. Self-assessed general health condition

### **Section III: Multiple choice questions**

1. How is rabies transmitted?
  - a. By mosquito bites;
  - b. By housefly contacts
  - c. Via food, Air transmission
  - d. By animal bites
  - e. Sexual transmission
  - f. I don't know
2. What is the pathogen for rabies?
  - a. Bacteria
  - b. Virus
  - c. Parasites
  - d. I don't know
3. What is the particular symptom of rabies in human at the later stage of infection?
  - a. Fever
  - b. A fear of water
  - c. Jaundice
  - d. Cough
  - e. Frequency of urine
  - f. I don't know
4. How long does it often take for symptoms of rabies to develop after a person is infected?
  - a. One day
  - b. One day to one week
  - c. One week to one month
  - d. One month to three months
  - e. Over three months
  - f. I don't know
5. What is the mortality rate of rabies once symptoms present?
  - a. Less than 5%
  - b. 5% to 50%
  - c. 50% to 99%

- d. Over 99%
  - e. I don't know
6. Where is rabies present?
- a. Europe
  - b. Southeast Asia and Mainland China
  - c. Africa
  - d. South Asia and India
  - e. All the regions above
  - f. I don't know
7. How many injections of rabies vaccine should be administered for the pre-exposure vaccination before travel?
- a. One dose
  - b. Two doses
  - c. Three doses
  - d. Four doses
  - e. Five doses
  - f. I don't know
8. How many injections of rabies vaccine should be administered once bitten by animals in rabies-endemic area for post-exposure prophylaxis if not previously immunized?
- a. One dose
  - b. Two doses
  - c. Three doses
  - d. Four doses
  - e. Five doses
  - f. I don't know
9. What should travelers do if they are bitten or scratched by an animal in a rabies-endemic area?
- a. Local treatment of the wound
  - b. Administration of RIG(Rabies Immunoglobulin)
  - c. Administration of rabies vaccine
  - d. All of above
  - e. I don't know

Questionnaire Survey about Rabies and Vaccination (as administered, in  
Mandarin)

台大旅遊醫學教育訓練中心問卷

一、基本資料：

1. 年齡：\_\_\_\_\_
2. 性別：男 女
3. 目前婚姻狀況：單身 已婚
4. 教育程度：小學 國中 高中 大學 研究所或以上

二、狂犬病及其疫苗相關問題：

1. 若即將要前往狂犬病流行地區，本身是否願意施打暴露前預防性的狂犬病疫苗？
2. 若民眾要前往狂犬病流行地區，是否願意建議民眾施打暴露前預防性的狂犬病疫苗？
- 3.

以下是可能影響您本身是否願意施打或建議民眾施打類似狂犬病疫苗等成人疫苗的相關因素的重要程度由影響最大排序至影響最小

- 甲、疾病嚴重度
- 乙、疾病流行率
- 丙、疫苗有效性
- 丁、疫苗花費
- 戊、疫苗副作用
- 己、政府政策有無鼓勵
- 庚、過去疫苗接種經驗
- 辛、自覺身體健康情形

三、單選題

1. 您認為狂犬病主要是如何傳染的？  
蚊子叮咬 蒼蠅 不乾淨的食物 飛沫 動物咬傷  
性交 不知道
2. 您認為狂犬病的致病原為何？  
細菌 病毒 寄生蟲 不知道
3. 以下何者是狂犬病發病後期較特異的症狀？  
發燒 恐水症 黃疸 咳嗽 頻尿 不知道
4. 若得到此疾病，大約經過多久會出現症狀  
一天 一天至一個禮拜 一個禮拜至一個月 一個月至三個月  
三個月以上 不知道

5. 若感染並出現狂犬病症狀，其致死率大約是多少？  
 <5%  5-50%  50-99%  99%  不知道
6. 您認為世界哪些區域有狂犬病病例？  
 歐洲  東南亞及中國大陸  非洲  印度及南亞  美洲  
 以上地區都有  不知道
7. 若為了預防狂犬病，而進行所謂的暴露前狂犬病疫苗接種總共需接種幾劑疫苗？  
 一劑  二劑  三劑  四劑  五劑  不知道
8. 若從未接種過狂犬病疫苗但被可能致病的動物咬傷，而要进行暴露後的狂犬病疫苗接種總共需接種幾劑疫苗？  
 一劑  二劑  三劑  四劑  五劑  不知道
9. 若在狂犬病流行地區被動物咬傷，最好進行那些處置以最低得病風險？  
 清理並消毒傷口  施打暴露後狂犬病疫苗  施打狂犬病免疫球蛋白  以上皆是