flab gene was targeted by using multiplex qPCR according to a previous described protocol (*1*). For quality control of qPCRs, we included positive and negative controls. Sequences of qPCR products were analyzed and compared with sequences available in GenBank.

B. miyamotoi was detected in 7 ticks: 2 (1.59%) of 126 males, 2 (0.68%) of 296 females, and 3 (6.52%) of 46 nymphs. *A. phagocytophilum* was detected in 16 ticks: 1 (0.79%) of 126 males, 11 (3.72%) of 296 females, and 4 (8.70%) of 46 nymphs. *Candidatus* N. mikurensis was detected in 25 ticks: 5 (3.97%) of 126 males, 18 (6.08%) of 296 females, and 2 (4.35%) of 46 nymphs. Overall prevalences were 1.50% for *B. miyamotoi*, 3.42% for *A. phagocytophilum*, and 5.34% for *Candidatus* N. mikurensis. Prevalences of each pathogen in specific varied by locality (Table). No co-infections were detected.

We analyzed *flab*, *msp2*, and *groEL* gene sequences obtained by qPCR. These sequences showed 99%–100% identities with gene sequences of *B. miyamotoi* (GenBank accession no. KJ847050), *A. phagocytophilum* (accession no. KP164415), and *Candidatus* N. mikurensis (accession no. FJ966365).

In Romania, the density of *Ix. ricinus* ticks is high and their host diversity is extensive (*7*). However, data for effects of tickborne pathogens on public health are scarce in this country. In this study, we detected *B. miyamotoi*, *A. phagocytophilum*, and *Candidatus* N. mikurensis in questing *Ix. ricinus* ticks in Romania, which confirms the emerging trend of these pathogens in Europe. Because of the scarcity of information on human infections with these pathogens in Romania, serologic and molecular investigations and their implementation are needed for diagnosis, which might help in assessing the effect of these pathogens on public health.

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Suspected Rabies in Humans and Animals, Laikipia County, Kenya

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To the Editor: Dog bites are a serious public health problem because of the associated risk for rabies virus exposure in countries to which the virus is endemic (*1*,*2*).

Human rabies can be prevented by administration of postexposure prophylaxis (PEP). However, PEP rabies vaccine may be unavailable or prohibitively expensive (*3*). Delay in or failure to receive PEP after possible rabies virus exposure contributes to increased incidence of human rabies deaths (*3*).

We performed a retrospective investigation of animal bites and postbite treatment in Laikipia North sub-county, Kenya, during January 2013–February 2014. Laikipia North is 1 of 3 sub-counties in Laikipia County and has a population of 32,726 (*4*). Our investigation was instigated by 3 suspected human rabies deaths that were informally reported to the Kenya Government Zoonotic Disease Unit (ZDU) during early 2014. We reviewed animal bite records from sub-county health facilities and veterinary offices and administered a structured household questionnaire to determine outcomes, knowledge of rabies, bite management, healthcare-seeking behavior, and economic costs. This public health response was government coordinated and approved; no personal identifiers were retained.

During January 1, 2013–February 10, 2014, a total of 106 bites were recorded by 6 government-run health facilities in Laikipia North. Median reported bite incidence per month was 24 bites/100,000 persons (range 6–45 bites/100,000 persons). The median age of bite victims was 13 years (range 1–81 years); 61 (58%) bites occurred in males. Of all bites recorded, 94 (88%) were by dogs, 8 (8%) by scorpions, and 4 (4%) by humans.

The deaths of 3 humans reported to the ZDU occurred in November and December 2013. To assess whether these cases were part of an exposure cluster, we followed up on bite cases during November 1–December 31, 2013. During this period, 17 additional animal bite cases were recorded. Of these 20 bite cases, we successfully traced the households of 11 (55%) case-patients, including 2 of the 3 who died from rabies. Bites were predominantly received from owned pets (82%), and most bites (82%) were reported to be unprovoked. All bites were inflicted on extremities, and almost all (91%) were single-bite injuries (Table 1).

Of 11 animals that bit case-patients, 7 had unknown histories of rabies vaccination and 4 were not vaccinated (Table 1). Four of the 11 animals were suspected to be rabid, including 1 cat and 3 dogs. All the suspected rabid animals were reported to exhibit aggressive or abnormal behavior, drooling or salivation, vocalization, and roaming tendencies (*5*; online Technical Appendix Table 1, http://wwwnc.cdc.gov/EID/article/22/3/15-1118-Techapp1.pdf). Three of the animals reportedly died; status was unknown for 1.

Of the 11 traced bite case-patients, 9 washed their wound before going to a healthcare facility and 8 were prescribed PEP. The median time from bite to reporting to a health facility was 1 day (range 0–3 days). Four respondents delayed in starting PEP: 3 after 3 days, and 1 after 2 days. Reasons given for delay included the high cost of PEP by 3 (including 1 who died); a health facility being too far away by 1, who died; and vaccine unavailable at nearest health facility by 2, 1 of whom died. Of 8 respondents who received PEP, 7 traveled >10 km to reach the nearest health facility. PEP availability was inconsistent at the sub-county hospital and local dispensaries; 6 of 8 respondents seeking PEP visited multiple facilities to receive PEP, including a county referral facility that was >100 km away. The World Health Organization's 5-dose PEP regimen is recommended in Kenya (*1*). However, only 3 case-patients were prescribed and

Table. Responses to questionnaire interview of 11 animal bite victims assessed for rabies, Laikipia County, Kenya, 2014*

Variables/categories	No. (%) case-patients
Time of bite	
Evening	6 (55)
Morning	4 (36)
Afternoon	1 (9)
Part of body bitten	
Legs	8 (73)
Arms	3 (27)
Circumstances of bite	
Unprovoked	9 (82)
Animal provoked	2 (18)
Type of animal	
Dog	10 (91)
Cat	1 (9)
Ownership of biting animal	
Owned	9 (82)
Stray	2 (18)
Rabies vaccination history of biting animal	
Unknown	7 (64)
Not vaccinated	4 (36)
Outcome of biting animal	
Alive and normal	7 (64)
Deceased	4 (36)
Wound washed after bite	
Yes	9 (82)
No	2 (18)
Treatment at healthcare facility	
Anti-tetanus	9 (82)
PEP rabies vaccination	8 (72)
Pain killers	5 (46)
Distance from nearest PEP facility, km	
>10	7 (64)
5–10	3 (27)
0–5	1 (9)
Source of PEP	
Government facility	5 (63)
Chemist	2 (25)
Private hospital	1 (13)
Costs of PEP, US$†	
No. doses of PEP administered	23
Cost categories	Average (range)
Cost/dose of PEP	≈8 (2–15)
Total cost of PEP doses	≈23 (8–50)
Direct medical cost	≈65 (2–500)
Indirect medical cost	≈34 (4–100)
Average cost for obtaining 1 dose of PEP	≈45 (8–120)

*PEP, postexposure prophylaxis.
†Average annual exchange rate during 2013 was 1 Kenya shilling/$0.011586 US.

received 5 doses. Five respondents were prescribed 3, 4, or 6 doses (online Technical Appendix Table 2). This finding indicates large inconsistencies in the PEP prescribing practices in this region of Kenya, a pattern that is similar in other parts of East Africa (*6*).

Respondents bore all medical costs without subsidy. Direct medical costs were ≈$2 $500 (US) per bite victim, and indirect medical costs were ≈$4 $100. The average cost of obtaining a single dose of PEP ranged from $8 to $120 (Table; online Technical Appendix Table 2).

All respondents had heard of rabies. Nine (82%) knew it was transmitted to humans through a bite from a rabid dog, and 4 (36%) knew that rabies among dogs could be prevented through vaccination.

During 2014, at least 3 suspected human rabies deaths and 4 domestic animal deaths were associated with this cluster. Postbite care, including PEP, is a heavy economic burden on this community, moreso because rabies vaccine is not always locally accessible. Dog vaccination rates are low in this region and rabies in suspected animals is rarely definitively diagnosed, increasing risks for human rabies virus exposures and the economic burden of PEP administration. We recommend implementation of regular and comprehensive mass dog vaccination campaigns, in line with Kenya's National Rabies Elimination Strategy (*7*), and further detailed studies on the epidemiology of rabies in this ecosystem, which supports human, wildlife, and domestic dog populations.

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Generalized Cowpox Virus Infection in a Patient with HIV, Germany, 2012

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To the Editor: In October 2012, a 35-year-old man with clinical category C HIV infection was admitted to the intensive care unit at the University of Duisburg–Essen, Essen, Germany. The man had severe respiratory distress syndrome with septic shock, and he was infected with hepatitis B and C viruses and Epstein-Barr virus. Standard infection-control procedures were followed: the patient was placed in a single room; healthcare providers wore personal protective equipment (gown, face shield, mask, and gloves); and a closed system was used for endotracheal suctioning.

Physical examination of the patient revealed multiple skin lesions on his right forearm and right leg. In the following days, more skin lesions appeared on his abdomen and head. The skin lesions were inflamed macules with central livid, hemorrhagic ulceration (1–2 cm in diameter) and raised edges. Kaposi sarcoma was suspected initially, but on hospital day 5, a skin biopsy showed large intracellular eosinophilic inclusion bodies pathognomonic for infection with cowpox virus (family *Poxviridae*, genus *Orthopoxvirus*). To confirm the diagnosis of cowpox virus infection, we conducted biopsies of 3 skin lesions on hospital day 7. Despite antimicrobial drug and supportive therapy, the patient died that day from septic shock.

The 3 biopsy samples obtained on hospital day 7 were cultured on African green monkey kidney (MA104) cells, and within 2 days, many plaques were observed. DNA extracted from homogenates and virus isolated from the biopsy material were tested by orthopoxvirus real-time PCR (*1*); results were positive for all 6 samples. We confirmed the presence of cowpox virus DNA in all samples by sequencing the hemagglutinin gene.

Serum obtained from the patient on day 2 after admission, when the first lesions were noted, was also positive for

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Suspected Rabies in Humans and Animals, Laikipia County, Kenya, 2014

Technical Appendix

Technical Appendix Table 1. Questionnaire based on 6 clinical criteria studied to assess the rabies status of 4 suspected rabid animals that bit humans, Laikipia North sub-county, Kenya, 2014

1) Age of the dog? a) Less than 1 month ----------> not rabies b) One month or more or not known -----> (go to 2)
2) State of health of the dog? a) Normal (not sick) or sick more than 10 days ---> not rabies b) Sick less than 10 days or not known -----> (go to 3)
3) How did the illness evolve? a) Acute onset from normal health --------> not rabies b) Gradual onset or not known ----------> (go to 4)
4) How was the condition during the clinical course in last 3-5 days? a) Stable or improving (with no treatment) --> not rabies b) Symptoms and signs progressing or not known --> (go to 5)
5) Does the dog show the sign of "circling"? *(It stumbles or walks in a circle and hits its head against the wall as if blind.)* a) Yes ----------> not rabies b) No or not known ----------> (go to 6)
6) Does this dog show at least 2 of the following signs or symptoms during the last week of life? a) Yes ----------> rabies b) No or showing only 1 sign ----------> not rabies 1. Drooping jaw 2. Abnormal sound in barking 3. Dry drooping tongue 4. Licking its own urine 5. Abnormal licking of water 6. Regurgitation
7) Altered behavior
8) Biting and eating abnormal
9) Aggression
10) Biting with no provocation 11. Running without apparent reason 12. Stiffness upon running or walking 13. Restlessness 14. Appearing sleepy 15. Imbalance of gait

Direct and Indirect Costs of Rabies Post-exposure Prophylaxis

For this investigation, the costs recorded included the direct medical costs, i.e. cost of biological agents (in this case only rabies vaccines, since rabies immune globulin was not administered to persons in the investigation area) and the costs associated with wound care, such as antibiotics, tetanus immunizations and disinfection. The indirect costs included out-of-pocket expenses for patients, such as transport costs to and from health facilities, accommodation and subsistence cost while seeking PEP. Market prices or local fares were used to estimate travel costs. Average cost per dose was defined as the average amount of cash spent by bite victims patients and their care giver(s) in receiving a single PEP dose. Therefore only patients who

sought and successfully obtained at least one dose of PEP were included in this calculation. This was estimated by summing all cash costs spent on obtaining PEP and dividing by the total number of doses delivered.

Technical Appendix Table 2. Costs associated with treatment of bite among 11 residents of Laikipia North sub-county in US dollars, 2014

Patient	PEP prescribed	Doses of PEP prescribed	Doses of PEP received	Cost/dose of PEP	Total cost of PEP doses	Other medical costs	Total direct costs	Total indirect costs	Total costs	Average cost of 1 PEP dose
1	Yes	4	4	$2	$8	$2	$10	$53	$63	$16
2*	Yes	5	5	$10	$50	$450	$500	$100	$600	$120
3	Yes	4	4	$10	$40	$10	$50	$58	$108	$27
4	Yes	1	1	$11	$11	0	$11	$14	$25	$25
5	Yes	3	3	$15	$45	0	$45	$35	$80	$27
6	No	0	0	0	0	$14	$14	$6	$20	0
7	No	0	0	0	0	$10	$10	$10	$20	0
8	Yes	5	5	$2	$10	$2	$12	$30	$42	$8
9†	Yes	5	5	$2	$10	$90	$50	0	$50	$10
10	No	0	0	0	0	$2	$2	0	$2	0
11	Yes	6	1	$10	$10	0	$10	$4	$14	$14

*Fatal case; high direct and indirect costs due prolonged hospitalization and burial expenses.
†Fatal case.