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Address for correspondence: Timothy M. Straub, Pacific Northwest National Laboratory – Chemical and Biologic Sciences, PO Box 999, MS P7–50, Richland, WA 99352, USA; email: timothy.straub@pnl.gov

Anthrax in Red Deer (*Cervus elaphus*), Italy

To the Editor: Anthrax is hypoendemic in Italy; a few outbreaks occurred yearly involving unvaccinated herbivores on pastures in central and southern regions and the major islands. Multiple-locus variable-number tandem-repeat analysis (MLVA) with 8 variable-number tandem repeats (VNTRs) of Italian isolates of *Bacillus anthracis* has identified 9 genotypes belonging to cluster A1a (*1*). An isolate of cluster A3 has been identified recently in Sardinia, which suggests that such a strain could have been introduced into Italy from another country (*1*).

A total of 37 anthrax outbreaks occurred in a 41-day period from August 28 to October 3, 2004, in a restricted area of Pollino National Park (Basilicata region in southern Italy) and resulted in the deaths of 124 domestic or wild animals. Two suspected cases of cutaneous anthrax in humans were recorded. Pollino National Park contains several species of feral animals. Since 1990, there has been a program for reintroduction of red deer (*Cervus elaphus*) into this park from Tuscany, Italy, and Carinthia, Austria. The animals are kept in quarantine in a corral by the veterinary services of the park and given an electronic tag before their release. At the time of the anthrax outbreaks, the red deer population of the park was 45, of which 10 were living in the corral. These outbreaks killed 8 deer (4 free-ranging and 4 confined animals).

Each carcass was examined by the veterinary officer, who collected clinical samples that were examined for *B. anthracis* by using standard procedures of the Istituto Zooprofilattico Sperimentale of Puglia and Basilicata. DNA from the suspected colonies was analyzed by PCR with primers specific for *B. anthracis* (*2*) and subsequent genotyping by using MLVA with 8 VNTRs (*3*). All *B. anthracis* isolates belonged to cluster A1a, genotype 1 (A. Fasanella, unpub. data). This genotype was also identified in subsequent outbreaks that involved farm animals in the same area and resulted in the deaths of 116 domestic animals, including 81 cattle, 15 sheep, 9 goats, and 11 horses. Red deer showed the highest mortality rate during these outbreaks (Table). An ELISA (*4*) performed with 27 serum samples obtained from deer in the park detected low levels of antibodies to *B. anthracis* in 22% of the examined animals. This seroprevalence is consistent with levels found in unvaccinated livestock reared in areas endemic for anthrax (A. Fasanella, unpub. data).

A vaccination program was then instituted for farm animals, but the deer population in the park was excluded because no experimental data were available on the safety and efficacy of Carbosap vaccine (Istituto Zooprofilattico Sperimentale of Puglia and Basilicata, Foggia, Italy) in wild ruminants. Extensive vaccination limited the outbreaks in livestock and red deer, which probably prevented further spread of infection from farm animals to free-ranging deer.

These anthrax outbreaks in southern Italy suggested that red deer are highly susceptible to infection with *B. anthracis* and that the mortality rate in these deer could be even higher than that observed in domestic animals. Although epidemiologic data are limited and need to be supported experimentally by assessment of the 50% lethal dose of *B. anthracis* in red deer, the ecologic effect on deer populations in parks should not be underestimated. Moreover, concerns for public health may arise in parks in disease-endemic areas, where susceptible wild animals could represent an amplification factor for *B. anthracis* spores, which increases the probability of outbreaks in domestic animals and in humans living near, working in, or visiting the parks. This article stresses the need for evaluating the safety and efficacy of *B. anthracis* vaccines in deer and for including wild ruminants in the anthrax prophylaxis programs.

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Antonio Fasanella,*
Lucia Palazzo,*
Antonio Petrella,*
Vincenzo Quaranta,*
Bruno Romanelli,*
and Giuliano Garofolo*

Table. Mortality rates during anthrax outbreaks, Italy, 2004

Animal	Population of area	No. (%) dead animals
Cattle	≈7,000	81 (≈1.15)
Sheep	≈20,000	15 (≈0.075)
Goats	≈13,000	9 (≈0.069)
Horses	≈600	11 (≈1.83)
Red deer	45	8 (≈17.77)

*Istituto Zooprofilattico Sperimentale of Puglia and Basilicata, Foggia, Italy

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Address for correspondence: Antonio Fasanella, Istituto Zooprofilattico Sperimentale of Puglia and Basilicata, Anthrax Reference Institute of Italy, Via Manfredonia, 20, 71100 Foggia, Italy; email: a.fasanella@izsfg.it

Invasive Freshwater Snail, China

To the Editor: *Pomacea canaliculata*, an invasive freshwater snail native to South America, was first introduced as a food to Taiwan in1979 and then to Mainland China in 1981 (*1*). It adapted well to the environment, particularly to the southern parts of the Mainland, spreading rapidly to more than 10 provinces (Figure) and causing tremendous damage to agriculture and the ecosystem (*1*,*2*). Thousands of hectares of rice, vegetables, and other crops in these provinces were destroyed (*2*).

Even more alarming were the multiple outbreaks of a severe brain disease (angiostrongyliasis) in Taiwan that were linked to *P. canaliculata (3,4)*. Angiostrongyliasis is caused by *Angiostrongylus cantonensis*, a lung nematode of wild rodents, commonly known as the rat lungworm. In Mainland China, epidemiologic evidence also indicates that *P. canaliculata*, because of its high susceptibility to *A. cantonensis*, is becoming the most important natural intermediate host for this parasite *(5)*. Previously, other terrestrial snails like *Achatina fulicia*, and some species of slugs such as *Philomycus bilineatus* were regarded as the major intermediate hosts for *A. cantonensis* (*6*). Epidemiologic survey results from 1997 to 1999 demonstrated that 20.8%–69.4% of *P. canaliculata* were infected with *A. cantonensis* in some regions of Guangdong, Zhejiang, and Fujian Provinces (*5*). Even in provinces where the snail is not found, a high incidence and prevalence of infection occur because of its widespread distribution, high susceptibility to *A. cantonensis*, and growing popularity as a food. In 1997, 2002, and 2002, ingestion of raw or undercooked *P. canaliculata* meat led to 3 outbreaks of angiostrongyliasis infecting >100 patients (*6,7*). A 2006 outbreak in Beijing infected 131 persons *(8)*. Based on the biologic characteristics of *P. canaliculata*, blocking its life cycle is one of the most effective methods to limit the outbreak of angiostrongyliasis. However, the current widespread distribution of *P. canaliculata* in China and the lack of a highly effective control method make the disease extremely difficult to eliminate (*9*). More outbreaks associated with ingestion of this snail will likely occur if food safety rules are not strictly enforced. Citizens must also be educated to avoid eating raw, undercooked snail meat or raw vegetables from regions that may be contaminated with infective mucous trails deposited by these snails (*10*).

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Figure. Distribution of *Pomacea canaliculata* in China. The dark triangles indicate the regions where angiostrongyliasis outbreaks were reported due to ingestion of raw or undercooked *P. canaliculata* snails.