



To Florida Veterinarians:

As Phase I of the smallpox vaccination program nears, questions have surfaced regarding whether domestic animals could be secondarily infected with vaccinia virus after contact with the vaccination site of a person receiving smallpox vaccine. The National Association of State Public Health Veterinarians has searched the literature for published articles related to this question. Attached is a synopsis with references and recommendations relevant to preventing the transmission of the live vaccinia virus to pets and livestock - "Protecting pets and other animals," adapted from the Washington State Department of Health. This is being sent out through our Health Alert Network via Blast FAX to 1,700 licensed veterinarians in Florida to test the system. This is a test. There is no need to respond to this FAX. In the event of a bioterrorist act releasing a biological warfare agent, you will be notified in this manner of the suspected agent, clinical symptoms in each species, who to contact, specimens to collect for laboratory submission, and personal protection procedures. Veterinarians with email addresses recorded with the Florida Board of Veterinary Medicine will also receive notification by email.

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THE POTENTIAL FOR TRANSMISSION OF SMALLPOX VACCINE FROM PEOPLE TO ANIMALS

Although the laboratory-derived current vaccinia virus (actually closer to buffalo pox than cow pox) shows evidence of being able to self replicate in a broad range of hosts when deliberately inoculated, evidence of person-to-animal or animal-to-animal spread under natural conditions is an extremely low risk and largely theoretical. Nothing in the reviewed literature suggests otherwise. The precautions in place for protecting household members should be sufficient for protection of pets and livestock. Risk communication should advise that the vaccinee should carefully follow the precautions for care of the site whether there are other humans or pets in the household and other situations of close contact. Even though the risk is remote, it seems logical to make recommendations concerning pets (e.g., prevent contact with vaccination sites, scabs, trash cans, bandages). See the attached "Protecting Pets from Smallpox," adapted from the Washington State DOH. Below are extractions from the scientific literature that serve to reinforce the recommendation:

"Data for the viruses of vaccinia, cowpox and milker's nodule (pseudo cowpox) are not well differentiated. The confusion was due primarily to the similarity in the clinical symptomology of the infection caused by the vaccinia and cowpox viruses in both man and cows. The human vaccinia virus infection contracted from cows was almost exclusively a disease of milkers. Outbreaks of the disease have been described in several Latin American countries. The source of infection for cattle was persons who had been recently vaccinated against smallpox. By scratching the lesion and then milking the animal, the milker inoculated the virus into the animal with his fingers and fingernails. The infection was passed from one cow to another during the milking process, and other milkers could contract the disease from cows with lesions. In addition to cattle, guinea pigs and hamsters are very susceptible to the [vaccinia] virus." ¹

"Cowpox virus is occasionally isolated from skin infections in humans and carnivores, including domestic cats, when no direct contact with cattle can be established. In view of these observations, it has been suggested that a rodent or similar animal reservoir exists in which cowpox infection is probably subclinical. Outbreaks of mammillitis in cattle associated with vaccinia virus have occurred throughout the world. The source of infection of these outbreaks has invariably been the smallpox vaccination of the farmer or a member of his family." ²

"Cowpox virus infection in cats primarily causes skin lesions, but occasional respiratory or ocular signs may be seen. The reservoir hosts of cowpox virus in Europe are small wild mammals, and cats occasionally become infected by contact through hunting. Other orthopoxviruses that may infect cats exist in other parts of the world. Theoretically, transmission of vaccinia virus (cowpox) from human to cat may be possible; however the risk is thought to be extremely low. Recommendations in place to prevent secondary transmission among human household members will also be sufficient to prevent transmission of vaccine vaccinia virus to household pets or other domestic animals." ³

"The best described and most common poxvirus infection of cats is cowpox, caused by an Orthopoxvirus, but infections with Parapoxvirus and uncharacterized poxviruses in India and North America have been reported. Although the domestic cat is the most frequently recognized incidental host, cowpox virus can also infect humans, cattle, and a variety of wild and captive exotic mammals. One case has been reported in a domestic dog. Rats and house mice also may be rare incidental hosts. Occasional cat-to-cat transmission occurs, as does cat-to-human transmission." ⁴ The first proven rat-to-human transmission of cowpox was recently reported in a 14-year-old girl who had cared for a clinically ill wild rat that later died. The cowpox

virus isolated from her ulcerative eyelid lesions showed complete homology with the cowpox isolated from the rat.⁵

"Many strains of vaccinia, known by different names, have been used by different producers during this and the past century, but little is known about their origins or passage histories. Jenner is believed to have used cowpox in vaccination, but the vaccinia virus strains used most recently are a different species of orthopoxvirus with distinctive DNA maps that are similar to each other but different from both cowpox and variola. That the vaccinia strains are not mutants of variola virus seems certain, but where the present vaccinia species arose is unknown. It may have arisen either as a hybrid of cowpox and another orthopoxvirus or through thousands of serial passages under artificial conditions of culture. It is also possible that the species represents a laboratory survivor of a now naturally extinct species of orthopoxvirus. Most vaccine now available for use is grown on the skin of a calf and harvested after sacrifice of the animal."⁶

Many species may be susceptible to vaccinia transmitted by recently vaccinated people. Infection of cattle, swine and horses seems to generally result in rather mild disease, but, of course, our concern would be the zoonotic potential during the 10 to 21 days that lesions are present. In horses, it seems that eruptions on the mouth and fetlock dermatosis (aka, "greasy heels") are typical findings. One disturbing issue with pox infections in livestock is the similarity of the vesicles and pustules to vesicular exanthema, vesicular stomatitis, and foot and mouth disease. "The prognosis is generally favorable for cases which run a normal course. In severe cases, particularly when the pharynx, larynx or nasal mucosa are involved, the disease is likely to be fatal."⁷

"Cows and water buffaloes were occasionally infected with vaccinia virus and humans could be infected from this source. Zoonotic infections of humans with cowpox and buffalopox (vaccinia) viruses are occupational diseases, and usually occur on the hands, through accidental contact with open lesions on the teats of an infected animal. Monkeypox virus is probably transferred from infected wild animals via abrasions in the mouth or elsewhere to persons handling or eating squirrels or monkeys. In cows, vaccinia virus formerly caused bovine vaccinia mammillitis, which was clinically indistinguishable from cowpox virus infection of the teats. Humans could be infected from such a source; for example, 22 persons and 450 cows were affected in an outbreak of vaccinia virus infection on a dairy farm in El Salvador in 1964. Calves that nurse from infected teats may get severe lesions of the tongue and lips that may be fatal because of interference with feeding."⁸

An outbreak of exanthem occurred in several cows and people in Brazil in 1999. A pox virus was isolated and gene sequencing showed up to 99.5% homology with the VACV strain used in the smallpox vaccine in Brazil in the 1970s. The theory is that the vaccine VACV strain has been circulating in wildlife and the environment for many years, acquiring mutations or plasmids, and now has now emerged as this new virus (named Cantagalo or Aracatuba virus)."^{9, 10}

Standard texts note that vaccinia virus is to a great degree different or distinct from cowpox virus and pseudocowpox virus. "Vaccinia infections in cattle are caused by exposure to recently vaccinated milkers."¹¹ "The disease in cattle is similar to cowpox with lesions restricted to the teats and udder. The first lesions are small papules which progress to pustules with surrounding reddened areolas. The centers of the pustules develop umbilications and later are covered with dark brownish scabs. The individual lesions heal in 10 to 14 days after onset, however, progressive lesions will develop in various areas on the teats and udder resulting in the presence of pustules and scabs for several weeks in one animal."^{12, 13} (Note: These

references [11-13] are from a period that predates widespread use of vacuum milking machines. Hand-to-udder contact with milking machines would be considerably less than milking by hand.)

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