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Objective—To evaluate the effectiveness of intervention efforts to halt 2 wildlife rabies epizootics from 1995 through 2003, including 9 oral rabies vaccination campaigns for coyotes and 8 oral rabies vaccination campaigns for gray foxes.

Design—Retrospective study.

Animals—98 coyotes during prevaccination surveillance and 963 coyotes and 104 nontarget animals during postvaccination surveillance in south Texas, and 699 gray foxes and 561 nontarget animals during postvaccination surveillance in west-central Texas.

Procedures—A recombinant-virus oral rabies vaccine in edible baits was distributed by aircraft for consumption by coyotes and gray foxes. Bait acceptance was monitored by use of microscopic analysis of tetracycline biomarker in upper canine teeth and associated bone structures in animals collected for surveillance. Serologic responses were monitored by testing sera for rabies virus–neutralizing antibodies by use of the rapid fluorescent focus inhibition test. The incidence of rabies in the distribution area was recorded via active and passive surveillance activities; tracking of rabies virus variants in confirmed rabid animals was used to determine the number and type of rabies cases before and after distributions of the vaccine.

Results—The expansion of both epizootics was halted as a result of the vaccine bait program. The number of laboratory-confirmed rabid animals attributable to the domestic dog-coyote rabies virus variant in south Texas declined to 0, whereas the number of laboratory-confirmed rabid animals attributable to the Texas fox rabies variant in west-central Texas decreased.

Conclusions and Clinical Relevance—Data indicated that oral rabies vaccination resulted in protective immunity in a sufficient percentage of the target wildlife population to preclude propagation of the disease and provided an effective means of controlling rabies in these species. (J Am Vet Med Assoc 2005;227:785–792)
tine was enacted in 1995 that prohibited the movement of species of foxes indigenous to North America, coyotes, and raccoons (Procyon lotor) into, within, or out of Texas. The purpose of the quarantine was to prevent intra- and interstate translocation of DDC rabies virus variant from south Texas and TF rabies virus variant from west-central Texas. Additionally, the Texas Department of State Health Services (formerly the Texas Department of Health) Zoonosis Control Group implemented the Oral Rabies Vaccination Program (ORVP) for coyotes in south Texas in 1995. The goal of the program was to distribute an oral rabies vaccine in a palatable bait for coyotes to halt expansion of the canine rabies epizootic. After evaluation of the epidemiologic features of rabies in the area, results of serologic testing, and bait acceptance in target animals, it was concluded that the first year of the ORVP had successfully affected the canine rabies epizootic, and the program was implemented on an annual basis. An analogous program was executed to address the gray fox rabies epizootic by the following year.

Criteria for Selection of Cases
All confirmed cases of canine or gray fox rabies within the 2 study areas from 1995 through 2003 were included, as were 2,425 animals that were obtained for surveillance purposes.

Procedures
Rabies cases—All animals with confirmed cases of rabies were tested by use of a panel of monoclonal antibodies to identify the antigenic variant. Identification of most rabies virus variants may be accomplished with such panels of monoclonal antibodies, but the DDC and TF variants associated with the epizootics in Texas, the north-central US skunk variant, and the Sonora dog variant (endemic in the region of the Texas-Mexico border and southward) are antigenically indistinguishable with this testing method. Thus, animals with confirmed cases of rabies from the canine and gray fox rabies epizootics or suspected translocations from the epizootic areas were tested via polymerase chain reaction assay and restriction fragment polymorphism analysis to determine the causative rabies virus genetic variant. The latitude and longitude of the collection sites of rabid animals with the DDC and TF variants were recorded to determine the geographic location and activity of the epizootics. The use of a global positioning system enhanced accurate tracking of the epizootics.

Vaccine units—Each vaccine unit had 2 mL of suspension containing a minimum concentration of $10^7.4$ virus particles/mL. The vaccine was a recombinant form of vaccinia virus expressing the immunogenic glycoprotein fraction of the rabies virus.

The vaccine was contained in a soft polyethylene plastic sachet that was held in a cavity in a cube of bait by low-temperature sealing wax. Originally the bait for coyotes measured $5 \times 3.2 \times 1.9$ cm ($2 \times 1.25 \times 0.75$ inches), was composed of a dog food– or fish meal–based formula with a synthetic polymer binder, and weighed 40 g (1.4 oz). However, fish meal was determined to be a better attractant for coyotes, and the dimensions of the bait were reduced to $3.2 \times 3.2 \times 1.9$ cm ($1.25 \times 1.25 \times 0.75$ inches) and a weight of 24 g (0.85 oz). The latter were the same dimensions and weight of the bait designed for gray foxes; however, the bait for foxes was composed of a molasses-dog food–based formula with a synthetic polymer binder. Each bait contained approximately 150 mg of tetracycline hydrochloride. Ingested tetracycline is rapidly deposited in bones and teeth during the process of mineralization and can therefore be used as a time-specific biomarker. Each bait had a warning label that included contact information printed on its surface in nontoxic ink.

Target area—The goal in south Texas was to create a geographic zone of vaccinated coyotes along the leading edge of the epizootic and constrict the area each year. The target area varied per year (Figure 1) because vaccine distribution sites were chosen on the basis of the location of DDC rabies cases during the previous year. For years during which there was reported rabies activity, a 32-km (20-mile) buffer zone beyond the northernmost case was incorporated into the distribution area.

The approach used in west-central Texas was to create a geographic zone of vaccinated gray foxes along the leading edges of the epizootic. The control and eradication strategy was designed to provide a 16- to
24-km (10- to 15-mile) -wide buffer zone of immunized animals to the east and north of the epizootic zone (during years of reduced resources, the buffer zone was concentrated). It was intended that each year, the leading edge of the zone would move west and south; the area of distribution would then be reduced and pulled inward in a purse string-like manner during subsequent years. In years when resources were available, the immunized barrier zone encircled the epizootic zone. Temporal and spatial distribution of cases observed during the months preceding the annual vaccine distribution dictated movement of peripheral vaccination zones toward the center of the epizootic area (Figure 2). The strategy was formulated on the basis of availability of resources, human population densities, and concern that the epizootic could spill over into the red fox population of east Texas.

**Distribution plans**—During the first year of the ORVP in south Texas, the distribution rate of the vaccine units varied from 19 to 27 doses/km² (50 to 70 doses/mile²). During subsequent years, the rate was 27 doses/km². During different years of the ORVP in west-central Texas, the distribution rate of the vaccine units varied from 27 to 39 doses/km² (70 to 100 doses/mile²), with 39 doses/km² ultimately established as the distribution rate of choice.

**Implementation**—During the first 7 years of the program in south Texas (and the first 6 years of the program in west-central Texas), a contract between the Texas Department of State Health Services and the Ontario Ministry of Natural Resources provided that personnel and aircraft from Ontario would supply logistic support for the project during the aerial vaccine distribution phase. Each aircraft was equipped with an automated delivery system consisting of mechanized distribution equipment linked to computer-assisted navigation and data collection systems. Flight plans were developed through the integration of digital maps, geographic information system software, and global positioning system navigation equipment. The aircraft flew at a mean ground speed of 140 knots and an altitude of 152 m (500 feet). In 2002, this contract was awarded to Dynamic Aviation Group, which possessed an advanced automated dispersal system and used a different type of aircraft.

In south Texas, a maximum of 14 flights were completed daily, resulting in a mean distribution rate of 3,300 doses/flight hour, including flight time to and from the base of operations. Aerial distribution over the 390,052-km² (150,600-mile²) target area resulted in 9.35 million vaccine units being distributed during a 9-year period. Flight lines were at 800-m (0.5-mile) intervals; calculated distance between vaccine units ranged from approximately 64 m at 19 doses/km² (211 feet at 50 doses/mile²) to 46 m at 27 doses/km² (151 feet at 70 doses/mile²).

In west-central Texas, a maximum of 16 flights were completed daily, resulting in a mean distribution rate of 5,100 doses/flight hour, including flight time to and from the base of operations. Aerial distribution over the target area, which consisted of 351,714 km² (135,800 mile²), resulted in 10.6 million vaccine units being distributed during an 8-year period. Flight lines were at 800-m (0.5-mile) inter-

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Figure 2—Illustration of target areas of an oral rabies vaccination program for gray foxes in west-central Texas.
vals; calculated distance between vaccine units ranged from approximately 46 m at 27 doses/km² (151 feet at 70 doses/mile²) to 32 m at 39 doses/km² (106 feet at 100 doses/mile²).

After the first year, vaccine distribution was conducted annually in January starting in south Texas and occasionally extending into early February for operations conducted in west-central Texas if delays occurred in the schedule from inclement weather that prohibited flights. The program was implemented during winter months because the extreme heat in south and west-central Texas during summer months could have negatively impacted the effectiveness of the vaccine in establishing immunity in the target animals, fire ants (Solenopsis invicta) competed against coyotes and gray foxes for baits during the summer, and it was believed that decreased availability of food for coyotes and gray foxes in the winter would increase the likelihood of the baits being consumed.

**Surveillance**—Postvaccination surveillance measures commenced 30 to 45 days after completion of each vaccine distribution. This interval was chosen with the aim of collecting blood samples at the time of peak serum antibody concentrations, taking into consideration the rate of consumption of vaccine units by the animals. Animals were collected via hunting. Surveillance was conducted in a range of counties from the areas in which vaccine was distributed each year (Figures 1 and 2). Procedures to assess effectiveness of the program included collection of dental and serum specimens.

Specimen collection in south Texas included 963 coyotes, 66 feral hogs (Sus scrofa), 16 bobcats (Lynx rufus), 14 raccoons, 2 badgers (Taxidea taxus), 2 gray foxes, 2 collared peccaries (Tayassu tajacu), 1 armadillo (Dasypus novemcinctus), and 1 jackrabbit (Lepus californicus).

Specimen collection in west-central Texas included 699 gray foxes, 280 raccoons, 173 coyotes, 45 skunks (Mephitis mephitis), 32 bobcats, 12 ringtailed (Bassariscus astutus), 5 red foxes (Vulpes vulpes), 5 feral cats (Felis catus), 4 opossums (Didelphis virginiana), 3 collared peccaries, and 2 badgers.

Additionally, information on all cases of rabies attributed to the DDC and TF virus variants was available through passive monitoring of submissions to the Texas Department of State Health Services Lab.
rabies via fluorescent antibody procedures on brain tissues, and all tissues had negative results.

**Epidemiologic evaluation**—The rabies epizootic caused by the DDC variant had been progressing northward at a mean rate of 72 to 80 km/yr (45 to 50 miles/yr) and encompassed 21 contiguous counties in south Texas by 1996; expansion ceased after implementation of the program. The waning number of cases per year in south Texas revealed the effectiveness of oral vaccination efforts, with 122 cases reported in 1994 (before implementation of the program), 142 in 1995, 6 in 1996, 5 in 1997, 10 in 1998, 0 in 1999, 1 case in 2000, 1 case in 2001, and no cases reported through 2003.

A waning course in the number of confirmed cases per year in west-central Texas, which included 50 contiguous counties by 2000, revealed the effectiveness of the oral rabies vaccination efforts in containing that epizootic, with 244 cases reported in 1995 (before implementation of the program), 101 in 1996, 24 in 1997, 36 in 1998, 66 in 1999, 58 in 2000, 20 in 2001, 65 in 2002, and 61 cases in 2003.

**Biomarker analysis**—The rate of tetracycline detection in coyotes from south Texas for all age classes from all years was 70% (575/824 tested coyotes). The rate of detection in 2003 was 83% (25/30 tested), a figure that was similar to those in previous years, including 39% in 1995, 57% in 1996, 87% in 1997, 82% in 1998, 71% in 1999, 66% in 2000, 75% in 2001, and 78% in 2002 (Table 1).

The tetracycline detection rate in gray foxes from west-central Texas for all age classes from all years was 39% (270/699 tested gray foxes). The 2003 detection rate of 36% (47/129 tested) was similar to that of previous years, including 37% in 1996, 47% in 1997, 14% in 1998, 51% in 1999, 35% in 2000, 58% in 2001, and 35% in 2002 (Table 2).

**Serologic evaluation**—For all canine rabies vaccination campaigns combined, blood samples were obtained from 1,067 animals representing 9 species in the south Texas target area, including 963 coyotes. All samples were submitted for serum neutralizing antibody testing. Of the 963 coyotes, 541 (56%) had a serum antibody titer ≥ 1:5 (Table 1). Although it is not known whether a serum titer of ≥ 1:5 is protective in animals, it is an indicator of a serologic response.9 Of the other species tested over all years of the program, feral hogs (27/66 [41%]) tested, raccoons (4/14), bobcats (2/16), gray foxes (1/2), collared peccaries (0/2), badgers (0/2), and jackrabbits (0/1; Table 3) were seropositive.

For all gray fox rabies vaccination campaigns combined, blood samples were obtained from 1,260 animals representing 11 species in the west-central Texas target area, including 699 gray foxes. All samples were submitted for serum neutralizing antibody testing. Of the 699 gray foxes, 433 (62%) were seropositive, with a serum titer ≥ 1:5 (Table 2). Of the other species tested, raccoons (119/280 [41%] tested), coyotes (77/173 [45%]), skunks (23/43 [51%]), bobcats (33/2 [9%]), ringtails (6/12), and red foxes (0/5), oppos-

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Table 2—Results of tetracycline biomarker and serologic testing for gray foxes in various distribution areas of an oral rabies vaccination program in west-central Texas.

<table>
<thead>
<tr>
<th>Year</th>
<th>Biomarker positive (%)</th>
<th>RFFIT positive (%)</th>
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</thead>
<tbody>
<tr>
<td>1996</td>
<td>29/78 (37)</td>
<td>45/78 (58)</td>
</tr>
<tr>
<td>1997</td>
<td>36/77 (47)</td>
<td>65/77 (84)</td>
</tr>
<tr>
<td>1998</td>
<td>14/98 (14)</td>
<td>36/98 (37)</td>
</tr>
<tr>
<td>1999</td>
<td>52/102 (51)</td>
<td>78/102 (76)</td>
</tr>
<tr>
<td>2000</td>
<td>19/94 (20)</td>
<td>65/94 (69)</td>
</tr>
<tr>
<td>2001</td>
<td>42/73 (58)</td>
<td>53/73 (73)</td>
</tr>
<tr>
<td>2002</td>
<td>31/88 (35)</td>
<td>46/88 (52)</td>
</tr>
<tr>
<td>2003</td>
<td>47/129 (38)</td>
<td>88/129 (68)</td>
</tr>
</tbody>
</table>

See Table 1 for key.

Table 3—Results of serologic testing of nontarget species (No. positive/No. tested) in various distribution areas of an oral rabies vaccination program in south Texas.

<table>
<thead>
<tr>
<th>Year</th>
<th>Species</th>
<th>1995*</th>
<th>1996</th>
<th>1997</th>
<th>Total</th>
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<tr>
<td>Feral hog</td>
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<td>10/16</td>
<td>15/26</td>
<td>27/66</td>
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<td>Raccoon</td>
<td>2/10</td>
<td>0/2</td>
<td>2/2</td>
<td>4/14</td>
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<tr>
<td>Bobcat</td>
<td>0/5</td>
<td>0/1</td>
<td>0/1</td>
<td>0/6</td>
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<tr>
<td>Gray fox</td>
<td>0/0</td>
<td>0/0</td>
<td>0/2</td>
<td>0/2</td>
<td></td>
</tr>
<tr>
<td>Collared peccary</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>Badger</td>
<td>0/2</td>
<td>0/0</td>
<td>0/0</td>
<td>0/2</td>
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</tr>
<tr>
<td>Armadillo</td>
<td>0/1</td>
<td>0/0</td>
<td>0/0</td>
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</tr>
<tr>
<td>Jackrabbit</td>
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<td>0/1</td>
<td>0/0</td>
<td>0/1</td>
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</tbody>
</table>

See Table 1 for key.

Table 4—Results of serologic testing of nontarget species (No. positive/No. tested) in various distribution areas of an oral rabies vaccination program in west-central Texas.

<table>
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<tr>
<th></th>
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<td>Raccoon</td>
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<td>22/33</td>
<td>6/54</td>
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<td>0/1</td>
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<td>Ringtail</td>
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<td>1/2</td>
<td>1/4</td>
<td>1/1</td>
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<td>0/1</td>
<td>0/12</td>
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</tr>
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<td>Red fox</td>
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<td>0/0</td>
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<td>0/0</td>
<td>0/1</td>
<td>0/0</td>
<td>0/5</td>
<td></td>
</tr>
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<tr>
<td>Opossum</td>
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<td>0/0</td>
<td>0/0</td>
<td>0/1</td>
<td>1/4</td>
<td></td>
</tr>
<tr>
<td>Collared peccary</td>
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<td>0/0</td>
<td>0/0</td>
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<td>0/0</td>
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<tr>
<td>Badger</td>
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<td>0/0</td>
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</table>

See Table 1 for key.
Discussion
On the basis of the cessation of detection of the DDC rabies virus variant in reported cases of rabies, the canine rabies epizootic in south Texas appears to have ceased. The single rabid dog detected in 2001 was thought to have been a translocation case. That case was situated 8 km (5 miles) north of the US-Mexico border; the dog had been in Mexico, where it was allegedly vaccinated, but the vaccination status of the dog could not be substantiated. Therefore, the definitive site of exposure in that instance remains undetermined. On the basis of the decrease in reported rabies cases in which the TF rabies virus variant was identified and the cessation of the east- and northward expansion of the epizootic, the gray fox rabies epizootic in west-central Texas appears to have been contained by the ORVP.

The program involved a population that is not well-defined (an accurate number of animals living in the affected areas has not been established), and the duration of immunity following oral administration of a vaccine has not been established, so several epidemiologic concerns must be considered in theoretical terms. For most diseases, herd immunity plays an important role in controlling or eliminating the disease. The mass action principle is the theoretical foundation for the phenomenon of herd immunity. The principle was introduced in the 1900s and aids in understanding the dynamics of disease epidemics. As infection spreads during an epizootic, the number of infected animals in successive time periods increases initially, whereas the number of susceptible individuals in the population decreases; a point is reached at which susceptible individuals become sparse and the number of new cases decreases. Finally, susceptible animals are scarce enough that there is no more than 1 new case for each case in the previous time period, and the epizootic ends although a number of susceptible animals were not infected. The objective of the ORVP is to create herd immunity. Herd immunity in this instance was defined as the resistance of a group to infection and spread of the rabies virus as a result of resistance to infection of a high proportion of individuals in the group. Resistance to rabies is a product of the number of susceptible animals and the probability that a susceptible animal will come into contact with an infected animal.

Although the figure is not precise, on the basis of records of confirmed rabies cases in a given area and time frame, herd immunity against the DDC rabies variant appeared to be achieved when 50% to 60% of the coyotes in a representative sample of the population mounted an immune response. The life expectancy of the gray fox has been approximated at 3 to 4 years, so it is possible that a single oral vaccination could provide lifelong immunity. There were too many variables to accurately ascertain a specific value, but it appeared that a 40% to 50% vaccination rate was sufficient to break the disease cycle in the gray fox population.

The effects of natural attrition of infected animals through death and the protective immunity elicited by oral vaccination created herd immunity and halted the epizootic. Factors such as the disease latent period, size of individual animals' home range, species dispersion patterns, birth rate, length of the period after birth in which young animals have maternal antibodies, death rate, and loss of immunity are all influencing factors.

Depopulation is 1 technique used to control rabies epizootics. It is possible that the removal of animals for surveillance through hunting may have enhanced the effectiveness of the ORVP, but the removal of 963 coyotes for surveillance purposes occurred over 390,043 km² (150,600 mile²) of south Texas, which represents 1 coyote/405 km² (156 mile²), and the removal of 699 gray foxes for surveillance purposes occurred over 351,714 km² (135,800 mile²) of west-central Texas, which represents 1 gray fox/503 km² (194 mile²). This sampling was considered to have had a low impact on population dynamics.

Although the tetracycline biomarker can be deposited and detected in teeth within 24 hours, depending on the age of the animal, the serum antibody response is influenced by multiple factors, including immune competence of the animal, the time of sampling relative to consumption of the vaccine (the best window of detection is 4 to 8 weeks after ingestion), the dose of the vaccine (even if the animal consumed the bait or part of the bait, it is possible that not all of the vaccine from the inserted sachet was consumed), and degradation of the vaccine as a result of severe ambient temperatures. Dilution of the vaccine dose by concurrent consumption of other food and water and previous exposure to orthopox viruses, which could affect vaccinia replication, may also have influenced serum antibody responses.

A possible explanation for the finding in some surveillance years that the percentage of animals with positive RFFIT results exceeded the percentage of animals with positive biomarker results is that when older animals were exposed to the baits, the biomarker was not readily deposited in tissues because of the slower rate of mineralization and incorporation of tetracycline. The age structure of the south Texas coyotes indicated that the population was relatively stable, with some animals living to at least 11 years of age.

Variation in the number of vaccine units consumed by individual animals may have resulted more from the pattern of unit distribution than from the number of units distributed in the area. When flight lines were too far apart, the home ranges of some animals fell between the lines, and those animals had no opportunity for contacting a vaccine unit. In contrast, many of the 2- to 8-year-old coyotes in south Texas had multiyear tetracycline lines, indicating they had been exposed to vaccine units in previous years. Yearly booster doses should result in high serum antibody titers in such animals if the booster year was recent.

Reasons for individual animals having positive biomarker results but no serum titer include the vaccine unit being consumed close to the time of death. This would result in marking of the teeth but would be within the 2- to 3-week period required for antibody formation. Another possibility is that the animal may have been successfully vaccinated in previous years.
and was resistant to infection, but at the time of testing, the serum concentration of antibodies had declined to undetectable concentrations. Animals may also have eaten only the matrix of bait surrounding the vaccine, which would result in biomarker uptake with no serum antibody titer.11

The vaccine had been tested in foxes in Europe and in raccoons in the United States. It was licensed by the USDA for use in raccoons in 1997 and was the first recombinant virus vaccine approved for field use in North America. Initially approved for conditional use, after evaluation of the ORVP in Texas the vaccine was licensed for use in coyotes in 2002. It has been proven safe when administered to more than 60 species of animals and has been given at 200 times the recommended dose to raccoons with no detrimental effects. The vaccine and bait are safe if ingested by domestic animals; a domestic animal's annual rabies vaccination can be safely administered even if the animal recently ingested a dose of oral rabies vaccine. As a public safety precaution, reported contacts between the vaccine unit and humans or domestic animals were logged and investigated by Zoonosis Control staff. There is a slight possibility of complications resulting from human exposure to vaccinia, particularly in persons who are immunocompromised or have dermatologic conditions such as eczema.19

There have been 3 rabies virus variant epizootics in Texas: the TF, DDC, and south-central skunk epizootics. Although the coyote and gray fox vaccination campaigns were effective, certain aspects of the results were dissimilar. Rapid implementation of the program was emphasized for the coyote project over the gray fox project because the DDC rabies virus variant posed a more imminent threat to the human and susceptible domestic pet populations. Distribution of vaccine over the entire affected area was accomplished by the fourth year of the coyote project. This stage has not been reached in the gray fox project and is not projected to occur for approximately 4 years. Encircling the gray fox epizootic modified the epidemiologic features of the disease in the periphery of the region, where vaccine was deposited, and left the interior untouched. Moreover, the effectiveness of the gray fox project was undermined in 2000 and 2001 by lack of resources, temporarily limiting the project goal to simply preventing eastward expansion of the epizootic. By the time adequate resources once again became available, most animals in the target population were immunologically naive because of natural turnover. Additionally, variations in species’ home ranges, eating habits, population dynamics, geographic considerations, and differences in immune response dictate that oral rabies vaccination programs must be tailored to the epizootic. For example, the home range and eating habits of gray foxes require that different food baits and more dense distribution patterns be used, and although coyotes inhabit flat open areas, gray foxes prefer high hilly terrain. The expense of additional vaccine and baits required to ensure adequate spacing and placement inside individual gray fox home ranges has caused the campaign against this variant to progress at a slower rate than the coyote campaign.

The costs of implementing the programs in south and west-central Texas were a mean of $3.8 million/y. This is in contrast to the initial projected cumulative human health care costs of $63 million through the year 2004. Given the program's success and cost-effectiveness, the ORVP in south Texas has continued at maintenance level since 2000, when the number of annual reported cases decreased to zero. The target distribution area of the ORVP for gray foxes in west-central Texas continues to undergo redefinition, but the program remains a cost-effective method for addressing the situation. It is expected that the efficacy of the program in west-central Texas will continue and accomplish the same success as the program in south Texas, including preventing the propagation of rabies in the gray fox population. The achievement of the goals for the ORVP program may lead to the vaccine's conditional use status being upgraded to full licensure for use in gray foxes. Future activity in rabies control in Texas may include preparing an ORVP in east Texas to counter westward expansion of raccoon rabies from the eastern United States, exploration of viable vaccine and baits for use in the ongoing skunk rabies epizootic, and advancement in technology for addressing enzootic bat rabies.

Addendum

During 2004, there was 1 reported case of a dog with the DDC rabies virus variant; that case occurred in the same border county in which the single case in 2001 was reported. In program year 2004, a total of 730,000 vaccine units were distributed over 33,669 km² (13,000 mile²) of south Texas. The target area was identical to that of the previous year, which has created a 64-km (40-mile)-wide vaccine distribution zone along the US-Mexico border. Serologic and tetracycline biomarker testing were performed on 100 coyotes from the target area for postvaccination surveillance methodology. Of those, 50 (50%) were seropositive for rabies-neutralizing antibodies and 80 (80%) had uptake of tetracycline biomarker. No nontarget species were sampled.

During 2004, there were 22 reported cases of animals with the TF rabies virus variant. In program year 2004, a total of 1,990,000 vaccine units were distributed over 56,202 km² (21,700 mile²) of west-central Texas. The target area was similar to that of the previous year, but it was moved 16 km (10 miles) toward the center of the epizootic. Serologic and tetracycline biomarker testing were performed in 136 gray foxes from the target area for postvaccination surveillance. Of those, 88 (65%) were seropositive for rabies-neutralizing antibodies and 72 (53%) had uptake of tetracycline biomarker. Forty-two coyotes were the only nontarget species sampled; 9 (21%) were seropositive.

References


