

## Controlling Rabies at its Source: The Texas Experience - Oral Rabies Vaccination Program

I spent the first decade of my post-graduate work in the trenches of public health at the Texas Department of State Health Services (DSHS) (formerly the Texas Department of Health) Bureau of Laboratories and Zoonosis Control Division (ZCD). It was a tremendous experience that allowed me to hone my skills as a clinical microbiologist and would prove beneficial to my eventual career switch in 2002 to the Clinical Laboratory Science (CLS) Program at Texas State University – San Marcos. I had the

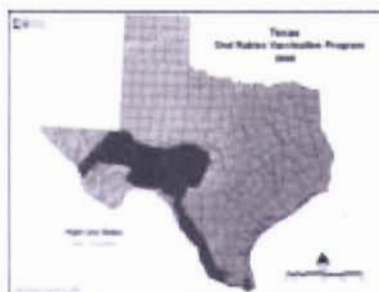


Figure 1

fantastic opportunity at the DSHS to keep one career "foot" in the laboratory and the other "foot" in the world of molecular epidemiology. After I contributed a rabies review article in 2007 (Rohde, 2007), *ASCLS Today* offered me the opportunity to share my experiences with the statewide public health

campaign and how it remains embedded in my CLS career today. Two rabies epizootics (epidemics in animals) began in Texas in 1988, one involving coyotes and dogs in South Texas and the other in gray foxes in West-Central Texas (Figure 1). The South Texas epizootic resulted in two human deaths and led to several thousand people receiving post-exposure rabies treatment. In 1994 the public health threat created by these two expanding epizootics prompted the governor to declare rabies a public health emergency in Texas. The two epizootics expanded to involve a total of 74 Texas counties by 2007.

In February 1995, the Texas DSHS initiated the Oral Rabies Vaccination Program (ORVP) as a multiyear program to create zones of vaccinated coyotes (and followed in 1996 with gray foxes) along the leading edges of the epizootics to halt the spread of the virus. The ORVP is a cooperative program involving DSHS; Texas Cooperative Extension Wildlife Services; U.S. Department of Agriculture Wildlife Services; Texas National Guard; U.S. Centers for Disease Control and Prevention; Merial Ltd.; Dynamic Aviation Group; U.S. Army Veterinary Laboratory at Fort Sam Houston, San Antonio; Texas A&M University System; and other local, state and federal agencies (Fearneyhough, et al., 1998).

The 2008 aerial distribution (Figure 2) of vaccine involved about 250 separate flights by five King Air aircraft from the Dynamic Aviation Group (Figure 3). Each year, the distribution of vaccine results in a total flight distance equaling approximately four times around the world. Since 1995, the program has been



Figure 2

responsible for distributing almost 31.23 million individual doses of oral rabies vaccine (Figure 4) over more than 420,500 square miles of Texas.

I was fortunate to be involved with critical components of the ORVP. First, I was asked to help develop the means to differentiate between the rabies virus variants found in Texas. Texas has a number of rabies virus variants – the Domestic dog/coyote (DDC), Texas fox (TF), Sonora dog (SD), South Central skunk (SCS), Hog-nosed skunk

(HNS), San Saba Skunk (SSS), and various bat-associated rabies viruses that circulate within the state. The ORVP needed to be able to distinguish between the canine rabies virus variant (DDC versus TF) to help with the actual placement of the different types of bait on the ground. The target animals (coyote and fox) "fancy" their own specific type of bait so it's critical to know where these living mobile "rabies carriers" were located geographically.

Prior to 1990, rabies virus variants were typed using a panel of monoclonal antibodies that could place the different variants into categories – canine, skunk, or bat rabies (Smith et al., 1986). The monoclonal method was not able to distinguish between the DDC and TF variants specifically. In 1994, I was able to collaborate with the Centers for Disease Control Rabies Laboratory to develop a molecular method to help distinguish between DDC and TF rabies variants. Briefly, it required the use of polymerase chain reaction (PCR) to amplify a conserved region of the rabies genome followed by a specific restriction digestion that created unique fragment patterns (Figure 5) to easily differentiate between the DDC and TF rabies virus variants (Rohde et al., 1997). The powerful molecular technology eventually helped with the establishment of the Texas DSHS Rabies Regional Typing Laboratory. Today, my colleagues at the Rabies Laboratory in Austin, Texas, are able to assist other states and countries with specific identification of rabies virus variants of many types via PCR and sequencing platforms (Rohde et al., 2004).



Figure 4

Results from the surveillance program conducted after the 2007 bait drop show 93 percent of coyotes tested were positive for the biomarker that indicates bait acceptance. Of the coyotes tested from the primary surveillance area, 49 percent developed an immune response to the vaccine. Canine rabies cases in South Texas have declined from 122 reported in 1994 (before the first year of the program) and 142 in 1995 to 20 in 1996, 6 in 1997, 5 in 1998, 10 in 1999, none in 2000, 1 in 2001, none in 2002 and 2003, 1 in 2004, and none in 2005 through 2007.

The gray fox program has shown similar success with 244 cases reported in 1995 (before the first program year), 101 in 1996, 24 in 1997, 36 in 1998, 66 in 1999, 58 in 2000, 20 in 2001, 65 in 2002,

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61 in 2003, 22 in 2004, 8 in 2005, 45 in 2006 and 62 in 2007. Of foxes tested in the gray fox post-vaccination surveillance program in 2007, 61 percent were positive for the biomarker that indicates

bait acceptance and 72 percent developed an immune response to the vaccine.

The Texas ORVP has achieved a level of success that could not have been anticipated during early development work done in 1993 and 1994 (Sidwa et al., 2005). The South Texas ORVP has moved to a maintenance strategy that can help prevent reintroduction of the virus. All available resources for the West-Central Texas ORVP will be applied in such a manner as to achieve the most

effective and efficient outcome for the control of the rabies epizootic in gray foxes and the protection of the public's health.

I continue to volunteer with the ORVP program each January when my academic schedule allows it. Public health and CLS blend nicely with my research agenda in my current position at Texas State University. I can't overemphasize to all CLS professionals how critical it is to collaborate with your state and federal public health agencies, not to mention the many clinical affiliates that we work with daily. The opportunities afforded me by these collaborations have allowed me to develop a research agenda that keeps me focused in my research while allowing me to involve my students in the exciting world of undergraduate research. Indeed, if we are going to "grow our own" and create new leaders in CLS (both in academia and the private work force) then I urge you to investigate possible ventures with other agencies.

For more information about the Texas ORVP, visit [www.txstate.edu/~rr33](http://www.txstate.edu/~rr33) or <http://www.dshs.state.tx.us/idcu/disease/rabies/orvp/>.

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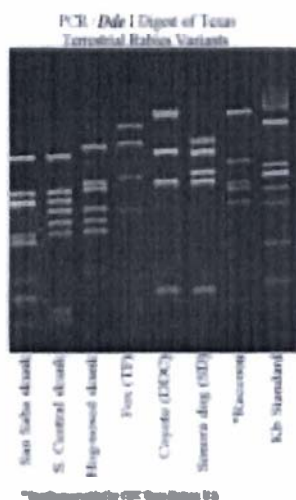


Figure 5