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### Rabies: The Epidemic Continues in Georgia

Rabies is perhaps the oldest known infectious disease (Rupprecht, 2002); its ancient history is evidenced by Greek and Chinese writings (Woldehiwet, 2002). Significant scientific progress, including the identification of virus strains in bats and the development of effective vaccines, has led to its current status as a completely preventable disease. Nonetheless, 55,000 people die of rabies each year across the world.

Although human rabies is extremely rare in Georgia, rabies risk assessments and the administration of post-exposure prophylaxis (PEP) are an everyday occurrence. Since 1991 there have only been two confirmed cases of human rabies infection in Georgia; both were fatal. There are many reasons for the high frequency of risk assessments and PEP in Georgia, including the increasing contact between human populations and wildlife in expanding suburban areas, hyper-endemic raccoon rabies, and the high number of animal bites reported.

#### The Virus

Rabies is caused by an RNA virus of the family Rhabdovirus, genus Lyssavirus. Typically, within a geographic area rabies viruses are maintained in a single wildlife reservoir species and spread primarily in intraspecies transmission cycles with occasional interspecies spillover. In Georgia, for example, the primary wildlife reservoir for rabies is the raccoon, with spillover of the raccoon rabies virus variant to other wildlife species (e.g. foxes, skunks, etc.) and domestic animals. Bat rabies virus variants are found all across the contiguous United States. Since rabies is an enveloped RNA virus, it does not survive in the environment (CDC, 2003; Johnson, 2006). Once outside the host, the virus is rapidly deactivated by drying and ultraviolet radiation, of positive animal rabies tests (Table 1). Bats are also a common rabies reservoir and associated with most human cases of rabies in the U.S. (CDC, 2003).

Several factors may explain the association of bats with human cases of rabies. It is often difficult to confirm a bat bite. The mouth of a bat may be less than 5mm across, and many people may not be aware that they have been bitten (Rupprecht, 2002). A person may wake up from sleep to find a bat in the room with them, or they may feel they were simply "brushed" by a bat. In addition, there is a lack of public awareness that bats are reservoirs of rabies virus.

Livestock (including horses) are considered a low risk of rabies transmission to humans because of low infection rates and the reduced probability of an aggressive manifestation of rabies infection in these species. Small rodents (squirrels, hamsters, chipmunks, rats, and mice) and lagomorphs (rabbits and hares) represent a very low risk of rabies transmission to humans, as they are rarely infected with rabies and have never been reported to transmit rabies to humans (CDC, 2003; Rupprecht, 2002). In 2006, at least 25 non-carnivorous species (i.e. squirrels, opossums, mice, moles, groundhogs, or otters) were submitted for rabies testing in Georgia; none were found to have rabies.

## Common Misperceptions about Rabies Exposures

The highest risk of rabies transmission is associated with a bite exposure from an infected animal, in particular terrestrial carnivores and bats. In addition, direct contact of an open cut with saliva or central nervous tissue from a rabid animal may result in rabies transmission. However, there are several misperceptions about rabies exposures.

A few of these are addressed below:

- Misperception 1: A person or animal that was exposed to blood, urine, or feces of a rabid animal is at risk for the disease.

Correction: No exposure to rabies occurs upon contact with blood, urine or feces of a rabid animal. Rabies can only be transmitted via direct contact with saliva or central nervous tissue.

- Misperception 2: A person who pets their dog after it was attacked by a rabid animal is at risk for rabies infection.

Correction: Rabies virus is not able to penetrate unbroken skin. In addition, the virus does not survive on the coat of an animal, so there is no risk to a person who has not had direct contact with the rabid animal.

- Misperception 3: A pet was attacked by a rabid animal a couple of days ago. The pet is unvaccinated, and now it licked the cut hand of its owner. The pet needs to be tested to see if it exposed its owner to rabies.

Correction: The incubation period of rabies is weeks to months. Consequently, a pet will be not be capable of exposing other pets or humans or test positive for rabies until it becomes sick with rabies—weeks to months after the attack.

- Misperception 4: A person found a bat in their child's room and it tested positive for rabies. However, post exposure prophylaxis (PEP) is not needed because no bite can be found on the child.

Correction: Assessing the risk for rabies transmission from bats can be difficult, because bat bites are very small. Consequently, if a person has spent the night in a room with a bat, or a bat is found in a room with an unattended child, rabies post-exposure prophylaxis should be initiated. Please see the Georgia Rabies Manual (available at <http://health.state.ga.us/epi/zvbd/zoonotic/index.asp>) for specific details on assessing rabies transmission risk.

## Clinical Course and Diagnostic Testing for Human Rabies

The incubation period of the rabies virus in humans is variable and often lengthy, ranging from 2 weeks to years with an average of 2-3 months. The long incubation period contributes to the effectiveness of PEP for individuals exposed to rabies by allowing ample time to stimulate immunity (Kahn, 2006).

A person infected with rabies may initially present with nonspecific symptoms such as malaise, fever, or headache, which may last for days. Discomfort or paresthesias (pain or itching) may be experienced at the site of viral entry. As the disease progresses, signs of encephalopathy will be observed, commonly manifested by anxiety, confusion, and agitation (CDC, 2003). The symptoms most consistent with rabies are acute behavioral changes and unexplained progressive paralysis (Kahn, 2006). The acute clinical phase of rabies lasts 2 to 10 days. With rare exceptions, once clinical signs are observed, the disease is fatal. Treatment given at this point is typically supportive (CDC, 2003).

Prior to the onset of clinical signs, there are no tests to determine whether humans have been infected with the rabies virus. Serological testing (RFFIT) measuring the presence of antibodies in humans cannot be used to determine infection status prior to symptom onset. Diagnostic testing for suspected rabies infection requires several tests; no single test is sufficient for confirmation. Samples used for testing include saliva, nuchal skin biopsies, serum, and cerebrospinal fluid. All testing must be coordinated by the Georgia Division of Public Health, Notifiable Disease Epidemiology Section (404-657-2588).

### Preventing and Treating Human Rabies

To prevent rabies, effective pre- and post-exposure prophylaxis regimens exist. Please see the Georgia Rabies Manual (available at <http://health.state.ga.us/epi/zvbd/zoonotic/index.asp>) for specific details regarding high risk sub populations and determining the need for PEP. If PEP is necessary, prophylaxis consists of administration of one dose of human rabies immune globulin--HRIG and 5 doses of rabies vaccine over a 28-day period (except if persons have previously received complete pre-exposure or post-exposure vaccination regimens). Whenever the animal is available for testing, PEP should not be started before animal rabies test results are available because of the limited availability of HRIG. Likewise, PEP should not be started if an animal is in a 10 day quarantine. Modern rabies vaccines do not require painful intra-abdominal inoculation and are well tolerated with few systemic side effects. Consequently, there should be minimal fear associated with receiving PEP. To date, there have been no cases of human rabies documented in the U.S. after PEP was administered in an appropriate and timely manner after an exposure (CDC, 2003).

### Animal Bite Surveillance

As a component of injury prevention and rabies control, animal bites are reportable in Georgia. Animal bites are reported to the local health department and the Notifiable Disease Epidemiology Section (NDES) of the Georgia Division of Public Health. Many other zoonotic diseases can be spread from animals to humans as a result of an animal bite (e.g. bartonellosis, pasteurellosis, and streptobacillosis). However, rabies is considered the most dangerous of the zoonotic diseases, resulting in an

encephalomyelitis that is essentially always fatal. There are two systems used by NDES for the collection of animal bite surveillance data. Bites are directly reported from local health departments via on-line or mail-in submissions, through the state electronic notifiable disease surveillance system (SendSSS) and indirectly reported by phone to the Georgia Poison Center (GPC) (404-616-9000 or 1-800-222-1222). GPC provides advice regarding wound treatment, post exposure prophylaxis (PEP) for rabies, and animal quarantine/testing. Often, emergency room and medical personnel report animal bites to GPC whereas animal control agencies and county environmental health specialists report via SendSS.

When an animal bites a human or domestic animal and is considered likely to be rabid, it is quarantined or submitted to the Georgia Public Health Laboratory for testing. Animals confirmed to be rabid are reported to NDES and entered into SendSS. Of the 867 documented rabid animals in Georgia during 2004-2006, 184 (21% of all submissions) were reportedly associated with a human exposure. The species of rabid animals that bit/exposed a human are shown in the table below.

### Animal Number of Confirmed Human Exposures

Raccoons 63 (34.2%)

Bats 35 (19%)

Cats 31 (16.8%)

Foxes 25 (13.6%)

Dogs 10 (5.4%)

Skunks 9 (4.9%)

Livestock 5 (2.7%)

Coyotes 3 (1.6%)

Bobcats 3 (1.6%)

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