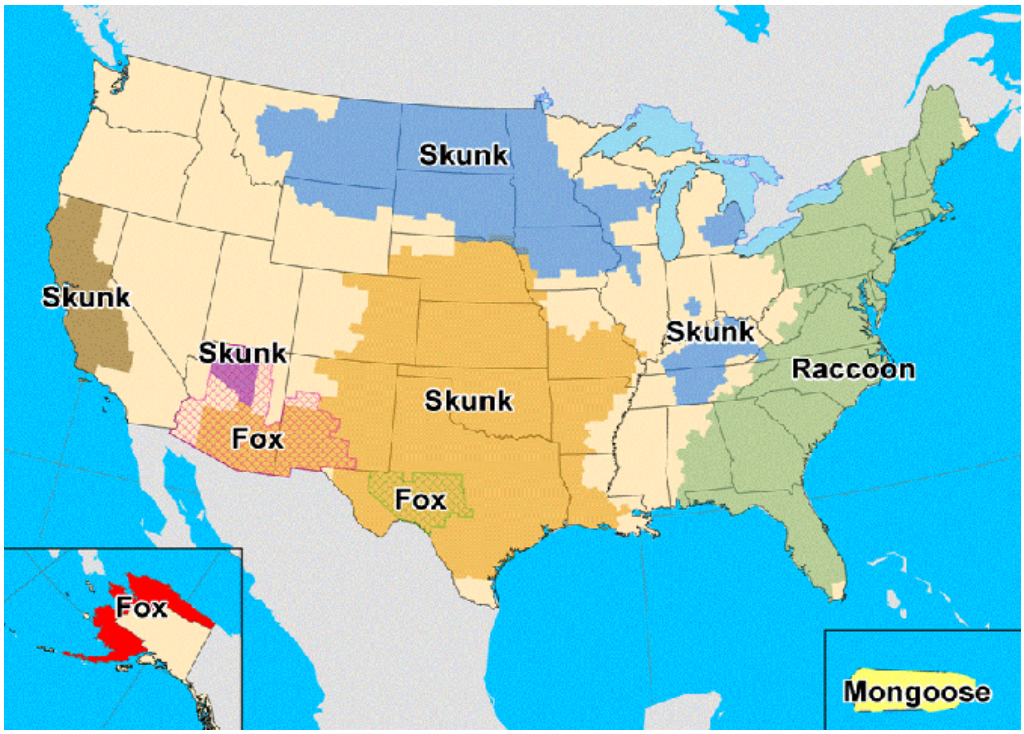


# Epi notes Fall 2013

RABIES WILDLIFE RESEVOIRS (CENTERS FOR DISEASE CONTROL AND PREVENTION, 2010)

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## Rabies! The 2013 Update and Guidance for Local Health Departments

By Carl Williams, DVM and Marilyn Goss Haskell, DVM

2013 has been a busy year for rabies and rabies related activities so far. The N.C. Veterinary Public Health Program is providing this update on recent events as background along with links and references for additional information should they become necessary.

**Human Rabies Case Investigation.**

In February 2013, the first human rabies case in North Carolina since 1955 was retrospectively identified.[1] The patient died in September 2011 in Florida while attending military training. The patient died 17 days after symptom onset and his death was attributed to complications of severe gastroenteritis, however, his symptoms were consistent with viral encephalitis. The patient was an organ donor whose kidneys, heart, and liver were harvested for recipient patients in four states. All organs were transplanted in September 2011. In February 2013, one of the kidney recipients developed progressively worsening symptoms and died 26 days after symptom onset. Diagnostic tests revealed the cause of his death was rabies and, because the patient had no known animal contact, the possibility of transplant-associated rabies was investigated.

Saved tissues from the donor were evaluated and rabies infection was confirmed in the donor 18 months after his death. Genetic analysis between the donor and recipient indicated that both were infected with an identical virus variant; the Eastern Raccoon Variant of rabies virus circulating in east-central North Carolina.

The three other organ recipients were provided post-exposure prophylaxis and none have succumbed to rabies. Investigation of the donor revealed he was an avid small game hunter and trapper and had several identified raccoon bites 18 and seven months prior to symptom onset, but did not seek medical intervention for either bite. These cases highlight several features of rabies that are atypical in comparison to most rabies cases:

1. This is only the third reported instance of rabies transmission through solid organ transplantation.
2. The incubation periods were very long. The organ recipient had an incubation period of about 17 months and the organ donor had an incubation period that may have been as short as seven months, or as long as 18 months. (This is based on reported exposures only). Most human rabies cases in the United States are due to bat variant rabies virus and the incubation period is about 50 days.[2]
3. These cases represent only the second and third reported human cases to have died due to raccoon variant rabies.[3] Despite the abundance of rabid raccoons in North Carolina and

the eastern United States, identified cases of human infection with raccoon variant rabies remains rare.

*What does this mean for North Carolinians?* This occurrence highlights the care and respect that must be shown for wildlife. Persons should be advised to seek prompt medical attention for any animal bites. Exposures to wild carnivores and bats pose a particular risk. As we approach the season for small game hunting (http://www.ncwildlife.org/Hunting/SeasonsLimits.aspx) hunters should be educated and advised of the potential risk for zoonotic disease transmission from wildlife. Several years ago hunter-associated cases of brucellosis led to the call for cross-agency collaboration to reduce the risk of illness through contact with infected animals, and this case reiterates the need for collaboration to control zoonotic diseases.[4]

**Bats in Buildings, Homes and Summer Camps.**

The South Carolina Department of Health and Environmental Control also recently reported their first human rabies case in more than 50 years in 2011. Published this year, that case investigation highlighted the essential need for collaboration among public health, local animal control and wildlife agencies and private entities involved in wildlife removal to ensure that the public is informed about risks associated with bats, and is referred for timely assessments and treatment. [5] Although the patient had called a local government agency to inquire about what to do when she found bats in the living space of her home, she was not advised of the health risks associated with bats nor was she referred for a public health consultation, despite the clear guidance about risks from bats published by the ACIP.[6] The patient succumbed to bat variant rabies several months after seeking guidance from county authorities about bats in her home.

In North Carolina the responsibility and authority to examine, investigate and control rabies rests with the local health director (NCGS 130A-41). While certain functions are often legally delegated to animal control agencies, it is important that the local health departments provide regular oversight and guidance to animal control agencies regarding rabies. In addition to providing guidance to animal control officers (ACOs), local health departments (LHDs) should encourage all animal control agencies in their jurisdiction to become members of the North Carolina Animal Rabies Control Association (www.ncarca.org) and/or the North Carolina Animal Federation http://www.ncanimalfederation.org as well as join the UNC Animal Control Law email listserve at: http://www.sog.unc.edu/node/239. These contacts will introduce ACOs to their colleagues across the state and provide resources not otherwise available.

During the summer of 2013, several mass exposures to rabies occurred due to the presence of bats in summer camp housing. Each year DPH works with the Division of Environmental Health and local Environmental Health Specialists to ensure that officials at summer camp facilities are reminded to inspect camp facilities for bat infestation prior to camper arrival and, if bats are identified, the buildings should not be used to house children until the problem is remediated. Despite these efforts, mass exposures to bats still occur each year. We encourage all LHDs, especially those in the western part of the state, to actively engage camp staff with the goal of minimizing bat exposures. Information on how to reduce bat exposures at summer camps is available in the 2013 NC Rabies Control Manual at: (http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/human.html).

**Non-Human Primate Bites.**

This summer there were several incidents of bites to people by pet non-human primates (NHP). NHPs are not native to North Carolina (or the United States for that matter) and many organizations including the American Veterinary Medical Association, the United States Department of Agriculture, and the National Primate Research Centers strongly advise against keeping these animals as pets. Of primary concern is the potential for communicable disease transmission to humans and the sometimes unpredictable and potentially dangerous behavior of NHPs. Despite this, North Carolina is one of only a few states that has no statewide laws or rules that regulate or prohibit the ownership of NHPs. Recognizing the inherent danger posed by keeping these animals as pets, many counties in North Carolina have created ordinances that regulate or prohibit the ownership/possession of NHPs.

While prohibitions against NHP ownership are beneficial, exposures to NHPs still occur. Zoonotic diseases associated with NHPs include herpes B virus, *Shigella*, *Salmonella*, *Mycobacterium tuberculosis* complex (that cause tuberculosis), yellow fever virus and possibly rabies and Ebola virus. Of particular concern with monkeys of genus *Macacca* is herpes B virus. While infection with B virus is extremely rare in humans; it can result in severe neurologic impairment or fatal encephalomyelitis if the patient is not treated soon after exposure.

Assessing the risk of rabies transmission from NHP bites can be difficult and there are no established observation periods for rabies viral shedding in exotic and wild animals. This stands in contrast to bites and injuries from domestic dogs, cats and ferrets, for which the response is well understood by both the medical and public health community. *Due to the risk of disease transmission, in addition to public safety concerns, it may be necessary to euthanize biting NHPs to facilitate rabies testing based on the individual circumstances of the case.*

Counties planning to develop an ordinance pertaining to ownership of non-human primates may consult the following resource published by the UNC School of Government: "North Carolina Guide to Animal Control Law" that can be viewed at: http://www.cdc.gov/ncezid/dfwed/PDFs/national-stec-surv-summ-2011-508c.pdf.

**Feral Cat Colonies and TNVR.**

In 2013, several counties have contacted the veterinary public health program to seek advice regarding the creation of local ordinances that are permissive of feral cat colonies and or Trap-Neuter-Vaccinate-Release (TNVR) programs. NC DPH has no formal position endorsing or opposing the creation of managed feral cat colonies. However, there are some issues we recommend be discussed when considering adopting a feral cat ordinance (or modifying the animal control ordinance):

1. *Public Health and Safety*
   a. Rabies vaccination of cats: it is essential that all cats be vaccinated against rabies. All owners of cats, dogs and ferrets are required by NCGS 130A-185 to have the animals vaccinated by 4 months of age. Generally a local ordinance that is permissive of feral cat colonies will define a colony caretaker that is responsible for caring for the cats including maintaining current rabies vaccinations, as well as other veterinary care issues (deworming, other vaccinations, etc.).
   b. Rabies vaccination of colony caretakers: the need for rabies pre-exposure vaccination for the caretakers should be discussed.
   c. Liability insurance: The colony caretakers should be required to have a minimum amount of liability insurance (or bond in surety in lieu of liability insurance) to cover medical costs of persons bitten or injured.
   d. There are concerns about the number of potential rabies exposures via feral cats and the inability of TNVR programs to reliably reduce feral cat populations.[7]
   e. The majority of cats that test positive for rabies are unvaccinated, stray or feral.

2. *Wildlife and Ecologic Impacts.* The feral cat issue is not solely a public health issue. The domestic cat is a non-native (invasive) species to North America and there are many wildlife/ecologic impacts to consider if a county is going to legally permit the existence of managed feral cat colonies. The Wildlife Society has developed information regarding the impact of feral cats on wildlife populations at: http://issuu.com/the-wildlife-professional/docs/feralcats and we encourage agencies to check with the NC Wildlife Resources Commission about the impact of feral cat colonies before adoption of an ordinance or policy that legally permit the existence of feral cat colonies.

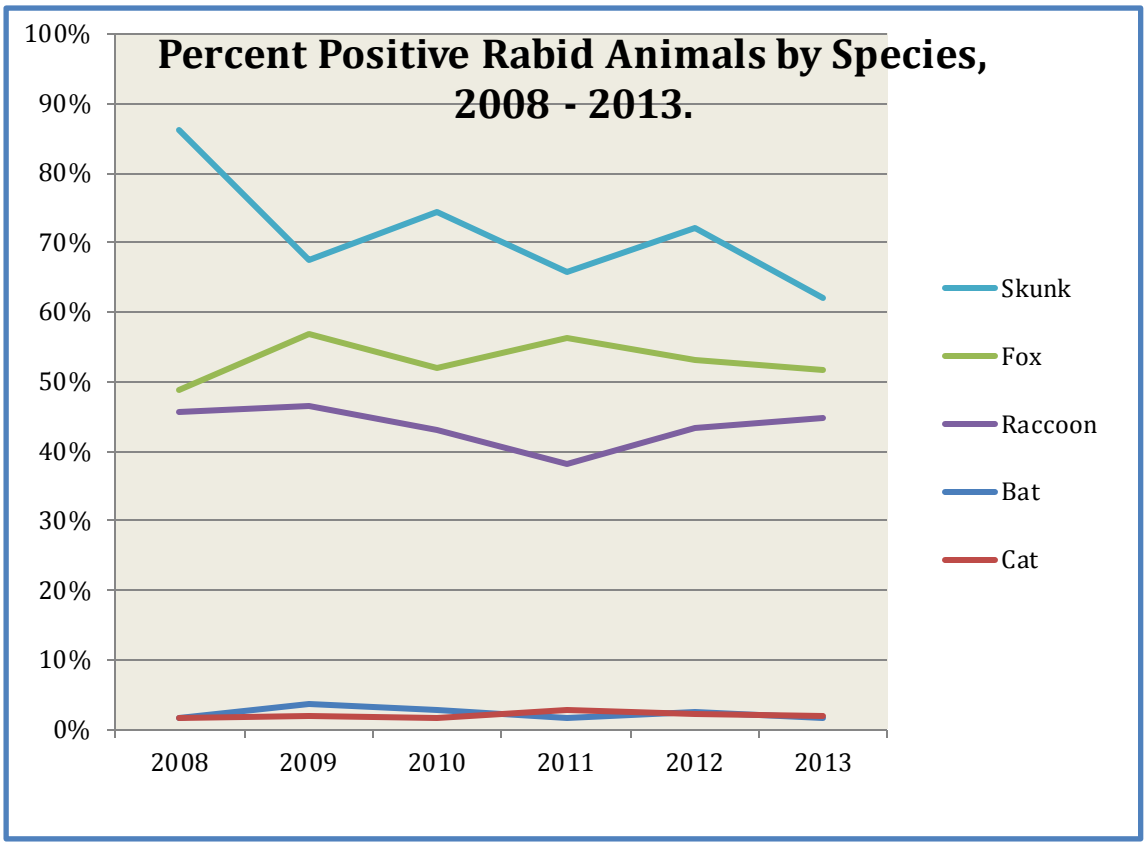
3. *Effectiveness of TNVR Programs.* The goal of most TNVR programs is to manage the colony to extinction. If additions to the colony are controlled or regulated, the number of feral cats would approach zero over time. Data on the location and census of the colonies should be required to evaluate whether or not the program is effective. A recent study demonstrated that some TNVR programs are relatively cost ineffective and it may take decades to actually extirpate feral cat colonies. [8]

**Oral Rabies Vaccination Program.**

The USDA Wildlife Services (WS) has been operating a collaborative rabies control program with multiple states since 1995. Since 2005, the service has been conducting Oral Rabies Vaccination in the state as a part of the Appalachian Ridge program to prevent the westward expansion of the eastern raccoon variant of rabies virus. In 2013, the service is projected to distribute approximately 220,000 rabies vaccine baits over 1520 $mi^2$ in North Carolina. Information on this program is available at: http://www.aphis.usda.gov/wildlife_damage/oral_rabies/oral_rabies_info_by_state/north_carolina/index.shtml.

The cost of operating a national wildlife rabies vaccination program is significant and the Wildlife Service committed almost $24 million in federally appropriated funds for rabies control in FY 2012 http://www.usaha.org/Portals/6/Resolutions/2012/resolution27-2012.pdf. This cost is justified when examined in light of the potential benefit derived from halting the westward expansion of

raccoon variant rabies virus. Economic assessments have shown that during rabies epizootics, costs of human post-exposure prophylaxis, pet vaccination, public health, and animal control spike. While costly, ORV programs can diminish these costs and yield benefit/cost ratios >1.0. [9]




The utilization of oral rabies vaccine (Vaccina Rabies Glycoprotein, VR-G) is restricted to use by the service in the context of the national ORV program. Implementation of an ORV program is complex and requires a systematic and coordinated approach to ensure appropriate use of vaccine in a cost effective manner. [10] As a result the DPH does not support the implementation of local or community ORV programs in the absence of consultation and collaboration with the Wildlife Service.

**Rabies Diagnostic Testing Details**

*State Laboratory of Public Health*
*4312 District Drive*
*Raleigh, NC 27607*

The State Laboratory of Public Health (SLPH) is the only laboratory that performs rabies diagnostic testing on animals in North Carolina. Complete instructions about shipping rabies specimens can be found on the SLPH website at: http://slph.ncpublichealth.com/virology-serology/rabies.asp including a step by step power point presentation on packaging and shipping that can be used for continuing education. A new DHHS form 1614 is available at http://slph.ncpublichealth.com/Forms/DHHS-1614.pdf.

During the first eight months of 2013, 3,145 animals were submitted to the SLPH for rabies testing and 9 percent of 3,113 animals tested rabies positive. The five-year average percent of submitted animals that tested positive (2008-2012) was 11.08 percent among an average of 3,949 animals tested for those five years. Of the animals submitted to the SLPH through August 2013, 17 bats (1.7%), 36 skunks (62.1%), 155 raccoons (44.7%), 57 foxes (51.8%) and 15 cats (2.0%) have tested positive for rabies. Wild animals typically represent more than 90 percent of the animals that test positive at the SLPH each year. These data do not represent the percentage of rabies positive animals for a particular wildlife species population in North Carolina. Remember that these animals were submitted because there was an unusual circumstance of exposure or potential exposure to a human or domestic animal; often these animals are sick or behaving unusually for the species. However, animals may be shedding rabies virus prior to developing clinical signs, therefore do not approach, feed or adopt any wild, stray or feral animals. Call local animal control to capture stray or feral domestic animals.

**Conclusion**

The new 2013 NC Rabies Control Manual is completed and is an excellent resource for local agencies. It is available online at http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/toc.html. However, if you have any questions for which you need to call personnel from the Medical Consultation Unit are always available at 919-733-3419 at any time including weekends and holidays.

***References***

1. Vora, N.M., et al., *Raccoon rabies virus variant transmission through solid organ transplantation.* JAMA, 2013. 310(4): p. 398-407.

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## Chemical Release Investigation Kit & Template (CRIKT)

**By Sara J. Smith, CHES**

The Chemical Release Investigation Kit & Template, also known as CRIKT, is the newest tool developed for local health departments to assist in public health preparedness and response to common chemical spills in North Carolina. Chemical releases are defined as "any uncontrolled or illegal release of a toxic substance known to cause adverse public health effects," which is based on the National Toxic Substance Incidents Program's (NTSIP) definition of a chemical release. The toolkit, modeled after the North Carolina Communicable Disease Manual, provides a step-by-step guide for local health departments on what to do and who to notify in the case of a chemical release.

### Importance

Chemical releases are a public health concern in North Carolina. There were a total of 854 toxic chemical releases in North Carolina from 2010 to 2012, and 208 individuals were injured as a result. Individuals are exposed to chemicals on a daily basis. While some exposures may not be harmful, others have the potential to cause serious health effects. Possible health effects from chemical exposures include difficulty breathing, confusion, organ damage, and cancer (ATSDR, 2013). CRIKT ensures that local health departments, specifically communicable disease nurses, preparedness coordinators and environmental health staff, are provided with guidance on how to respond in the event of a chemical release and how to help prevent or reduce harm to the public.

### Chemical Selection

The process for determining which chemicals to include in the CRIKT toolkit began by compiling a list of common chemical hazards. This list was then prioritized by type of chemical and frequency of release. The first chemicals to be included in CRIKT are ammonia, carbon monoxide, mercury, sodium hydroxide, sulfuric acid, hydrochloric acid, chlorine, methamphetamine, phosphoric acid, ethylene glycol, xylene, and polychlorinated biphenyls (PCBs).

### Components

CRIKT is comprised of three distinct parts: a step-by-step chemical guide, a one-page chemical fact sheet, and a line listing template. The step-by-step guide gives information on who to notify if a release is reported, common steps to take when conducting an investigation, control measures to prevent additional exposures, and recommendations for remediation. The fact sheet is a one-page description of the chemical agent that provides information on exposure symptoms, handling and storage guidelines and stability and reactivity information. The line listing template is intended to assist in implementing surveillance.

### Next Steps

Ammonia was selected as the first chemical agent for the toolkit due to its high occurrence in chemical releases in North Carolina. The response guidance for ammonia will be followed by guidance for carbon monoxide and mercury based on requests by local health department reviewers. Response guidance will then be developed for the remaining nine commonly released chemicals. CRIKT will soon be available on the Occupational and Environmental Epidemiology Branch's website: http://epi.publichealth.nc.gov/oee/index.html.

***References***


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# The Roles of NC DPH in Responding to Radiological Events

**By Ricky Langley, MD and Brian Combs**

The Occupational and Environmental Epidemiology Branch (OEEB) and the Public Health Preparedness and Response Branch (PHP&R) collaborate with the Radiation Protection Section (RPS) in the Division of Health Services Regulation in protecting the public from overexposure to ionizing and nonionizing radiation.

Ionizing radiation includes x-rays, gamma rays, alpha particles, beta particles, and neutrons that have sufficient energy to result in removal of electrons from atoms. Sources are naturally occurring – such as radon, cosmic rays, and decay of elements, or man-made – such as x-ray machines, radioisotopes used in smoke detectors or nuclear medicine, nuclear power plants, dirty bombs, and nuclear weapons. Nonionizing radiation includes visible light, ultraviolet radiation, lasers, radio waves, and infrared radiation that do not have enough energy to remove electrons from atoms. Examples of nonionizing radiation are tanning beds, cellular phones, power lines, microwave ovens, and radar.

NC DPH is involved with both routine and emergency radiation contamination and exposure events. OEEB advises the public on human health risks to both ionizing and nonionizing radiation contamination and exposures, whereas PHP&R coordinates the potassium iodide (KI) distribution program and maintains a supply of KI and other radiological countermeasure. During a radiological event NC DPH assists LHDs with risk assessment, human health surveillance, distribution of countermeasures and public messaging. The State Laboratory of Public Health (SLPH) routinely monitors certain laboratory equipment for radioactive contamination and occasionally tests water samples for uranium. OEEB performs a risk assessment of the water sampling results.

RPS's routine activities include inspections, licensing, consultations, education, and investigation of complaints. Specific duties include: inspections and licensing of x-ray and mammography equipment, tanning beds, lasers, and industrial radiography equipment; monitoring the environment around nuclear power plants; radioactive waste disposal; and evaluation of landfill and scrap yard radiation detectors. RPS's non-routine activities include the emergency response to intentional or accidental release of ionizing radiation into the environment.

There are several routine collaborative activities performed in the state. For example, RPS conducts routine specimen collection of milk, surface and finished water, air, and shellfish around nuclear facilities, all of which are then analyzed by SLPH. OEEB and PHP&R also coordinate with RPS to develop and exercise a medical response plan for offsite consequences of nuclear emergencies. Post-event, OEEB and RPS implement long term monitoring of individuals exposed to radiation. OEEB in collaboration with RPS recommends pharmacological countermeasures to emergency responders and the general public during an event at a nuclear power plant facility. Both agencies also work together in formulating recommendations for re-entry and return of the public to affected areas.

Both NC DPH and RPS field complaints and conduct investigations, but RPS refers health complaints to OEEB. RPS coordinates with public health to identify fixed and supporting medical care facilities willing to accept and able to treat radiation contamination victims. RPS and NC DPH, in addition to available local and regional hospitals, will coordinate with the Oak Ridge Radiation Emergency Assistance Center/Training Site to provide subject matter expert consultation and laboratory testing for care and treatment of cases of severe radiation exposure and/or contamination.

Both NC DPH and RPS assist the public with radiological concerns, but with two distinct missions. NC DPH provides assistance for the general public primarily on protecting human health in routine and emergent situations. RPS's public assistance functions include field sampling, equipment inspection, regulatory compliance, and response to emergencies.

***References***

Mission, services, guidance and duties performed by Radiation Protection Section available at: http://www.ncradiation.net/

## Epidemiology Section Employee of the Quarter

**Meghan Prewett**


Meghan Prewett began work with PHP&R as a temporary employee in 2010. One year later she was hired into a permanent position as the Branch's Business Services Coordinator. As Meghan's co-worker and now supervisor, I have observed her approach her responsibilities and office projects with enthusiasm and excellence.

Whether it's coordinating an office move, preparing and submitting staff's last minute purchase requests, or planning the office charity projects and staff appreciation days, Meghan demonstrates commitment in all that she does.

While assuming additional job duties for several months, Meghan planned the annual office holiday gathering in December 2012, including a charitable contribution to Army reservists. It was her suggestion that prompted the staff to collect toiletries, games and holiday goodies for troops overseas. She contacted local military personnel, collected and boxed the items, and shipped them off. In February, she trained new staff and began preparing for her maternity leave. She assisted in development of the annual budget, finalized equipment and supply purchases, and updated the computer inventory. And in March, Meghan came to work, checking off those final 'to-do' items, until just hours before delivering her baby girl.

When Meghan returned to work in May, as I expected, she hit the ground running and hasn't skipped a beat. I asked her to update the branch's administrative manual and days later it was on my desk. I asked her to update the PHCC call center manual and she said, "No problem". Staff from the regional offices contacted her with facility concerns and she immediately notified the leasing office and administration. She has even volunteered to assist in coordinating staff office relocation, all while, once again, assuming additional job duties while other staff take some much needed leave. To top things off, on July 25, I presented her with a major office reorganization project that required several work hours. She had the tasks of coordinating the 'Call Center Clean-Up' and 'Shaping up the Shared Drive.' This was not an easy project, as recruiting staff members for assistance proved to be somewhat challenging. By late August, PHP&R had a 'like new' Call Center and an orderly filing system. Being the hostess that she is, Meghan even managed to plan an ice cream social in the midst of this busy month.

Meghan's work is integral to the operations of the Preparedness and Response branch. With her service and teamwork, we have increased efficiency by reducing our shared drive folders from 100 to 20 main folders, gaining over 20GB of space. The organized cabinets allow for a quick visual inventory and staff have commented that they save time when retrieving program documents and administrative files.

Her bright ideas and volunteerism attests to her warm heart and concern for those around her. She adapts well to various circumstances and office dynamics, sometimes shifting from business services coordinator to the office's unofficial safety and wellness coordinator. You will find her throwing out outdated foods in the fridge or simply reminding a certain staff member that he is limited on his cupcakes or scoops of ice cream. And just when staff needs a dose of excitement, she emerges, as I like to refer to her as, the Sunshine Queen, often celebrating and reminding us of birthdays, holidays, and other special occasions.

**By Nikki Marshall**

EpiNotes Editor,
Aaron Fleischauer, PhD

We are no longer publishing disease tables in EpiNotes. The Communicable Disease Monthly Surveillance Reports are available at: http://epi.publichealth.nc.gov/cd/figures.html.

Dr. Megan Davies, State Epidemiologist

State of North Carolina | North Carolina Department of Health and Human Services

North Carolina Division of Public Health | Epidemiology Section

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| Public Health Preparedness and Response | 919.715.0919 |
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| **Rabies Emergency (Nights, Weekends, Holidays)** | **919.733.3419** |
| **Communicable Disease Emergency** | **919.733.3419** |