



## A Review of Rocky Mountain Spotted Fever

By Roland Lucht

Rocky Mountain Spotted Fever (RMSF) is an illness caused by bacterial infection, most often acquired by being bitten by a tick carrying the disease. RMSF is marked by a sudden onset of fever, headache, and muscle pain, followed by a rash several days later. RMSF is difficult to diagnose in its early stages which is a serious problem, because the disease can be fatal if not treated promptly.

RMSF is so named because it was first identified in Idaho in 1896. In the late 19<sup>th</sup> and early 20<sup>th</sup> century, it was fairly common in the western United States, quite often fatal and acquired the nickname "black measles." The word spotted refers to the petechial rash and, of course, the word fever refers to the high fever exhibited in the early stages of symptom onset. The name is really a misnomer as RMSF is found over almost all of the United States.

RMSF is caused by the bacterium *Rickettsia rickettsii*, named so in honor of Dr. Howard T. Ricketts who first established the infectious nature of the disease and the role of ticks in its transmission. *R. rickettsii* is a very small bacterium with a size ranging from 0.2 x 0.5 micrometers to 0.3 x 2.0 micrometers. Due to its small size, *R. rickettsii* must live inside the cells of its host animal. In humans, this means that the bacterium is found most often in small to medium sized blood vessels.

Symptoms of RMSF begin to appear about 5-10 days after the bite of an infected tick. Initial symptoms may include fever, nausea, vomiting, severe headache, muscle pain, and loss of appetite. About 2-5 days after the onset of fever further symptoms develop, including rash, abdominal pain, joint pain, and diarrhea.

The characteristic rash of RMSF is called a petechial rash. This means that the rash consists of small round red spots caused by hemorrhages under the skin.

This happens because the *R. rickettsii* bacteria take up residence in and damages small to medium sized blood vessels. The rash begins on the wrist, ankles, and forearms, and then may progress to the palms and soles of the feet. In the early stages of illness, the rash may not be readily observed and some patients never develop the rash at all. This fact makes the diagnosis of RMSF more difficult, as the physician must rely on other clinical factors combined with epidemiological history to correctly identify the cause of illness.

Those most likely to get RMSF are exposed to ticks either by occupation or recreation. In the southeastern United States, children have the highest incidence of disease, while in the western United States, adult men are most likely to get RMSF.

Because *R. rickettsii* infects the cells lining blood vessels, severe illness can occur throughout the body. Severe manifestations may involve respiratory system, central nervous system, gastrointestinal system, and renal system. Host factors associated with severe or fatal cases of RMSF include advanced age, male, African-American race, chronic alcohol abuse, and glucose-6-phosphate dehydrogenase (G6PD) deficiency. The fatality rate of RMSF is 3 percent to 5 percent with appropriate treatment, while left untreated; the fatality rate may be as high as 25 percent.

RMSF is a zoonosis, which means that it is a disease naturally resident in animals that is transmissible to humans. Hard ticks are both the natural reservoir and vector for RMSF. The disease is transmitted to humans primarily by bite, though contact with crushed ticks to open wounds or mucous membranes can also transmit RMSF. After the tick has bitten a human and been attached for several hours, bacteria are transmitted from the tick to the human.

Hard ticks, specifically the American Dog Tick and the Rocky Mountain Wood Tick are the primary hosts of RMSF in the United States. The Rocky Mountain Wood Tick is found in the Rocky Mountain region of the country, while the American Dog Tick is found in

California and from the Great Plains all the way to the East Coast.

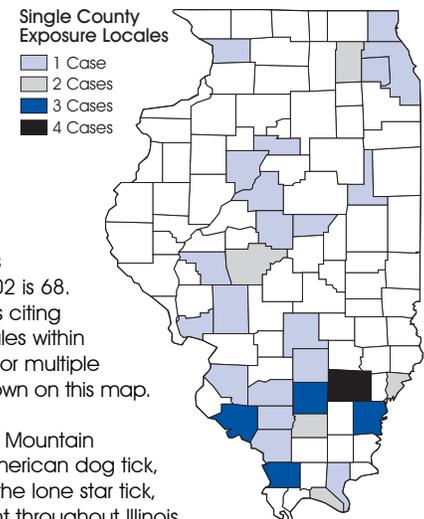
Unfortunately, there is no laboratory test that can provide definitive proof of RMSF in the early symptomatic phase. Serologic testing, specifically indirect immunofluorescence assay (IFA), is the test used by the Centers for Disease Control and Prevention (CDC) and most state laboratories. However, since an acute and a convalescent specimen are needed for optimal results, this cannot be considered a rapid test. Additionally, diagnostic levels of antibodies do not appear until a week or more after onset of symptoms.

Since there is no definitive test in the early stages of a symptomatic case of RMSF, treatment must not wait for laboratory confirmation. Diagnosis must be made on the basis of clinical and epidemiologic factors. In addition to the presence of symptoms described earlier, unusual laboratory findings in RMSF patients may include thrombocytopenia, or low platelet count, hyponatremia, or low sodium level in the blood, and elevated liver enzyme levels. The likelihood of exposure to ticks must also be a factor in the diagnosis. Doxycycline is the usual treatment, with chloramphenicol recommended as a second choice.

If exposure to tall grass or woods is anticipated, there are several steps recommended to prevent tick bites. Wear light-colored clothing to make spotting a dark-colored tick on your person much easier. Tuck pant legs into socks to prevent ticks from getting under clothing where they would be more difficult to find. Use of repellents is recommended; permethrin may be sprayed on clothing and shoes, while DEET can be applied to the skin, using caution when applying it to children. When done with the outdoor activity, check yourself, your children, and your pets for ticks.

In Illinois, RMSF cases have been reported with exposures in counties throughout Illinois, but have been more prevalent in the southern part of the state below Interstate 70. Between 1993 and 2002, 68 cases of RMSF were reported in Illinois. Only 46 of these had a definitive one county exposure, with the others having an unknown exposure location, or the possibility of being exposed in multiple counties. Of these 46 cases, 26 (56%) were exposed in southern Illinois, below Interstate 70. This is probably because of the more wooded nature of southern Illinois.

**Figure 1.**  
County of exposure for RMSF cases reported in Illinois, 1993-2002, that had only one county of exposure (n=46).



Total number of RMSF cases reported between 1993-2002 is 68. The total number of patients citing single county exposure locales within Illinois is 46 cases. Unknown or multiple exposure locales are not shown on this map.

The primary vector of Rocky Mountain spotted fever (RMSF), the American dog tick, and the secondary vector, the lone star tick, should be presumed present throughout Illinois.

## Recommendations Regarding Reptiles and Amphibians in Child-care Centers and Homes with Children

By **Lori Saathoff-Huber, M.P.H.** and **Connie Austin, D.V.M., M.P.H., Ph.D.**

The Centers for Disease Control and Prevention (CDC) has revised its recommendations for preventing transmission of *Salmonella* to humans. (1) Increasing evidence indicates that reptiles and amphibians, such as frogs, toads, newts and salamanders, are a source for *Salmonella* infection. Since children under the age of 5 are at increased risk for infection or serious complications from salmonellosis, the CDC suggests that reptiles and now amphibians should not be allowed in child-care centers or in households that include children less than 5 years of age.

Transmission of *Salmonella* from reptiles to humans has been recognized since the 1970s. Reptiles, such as lizards, snakes and turtles, are frequent carriers of the organism. In more recent years, surveillance data has implicated amphibians as another source of *Salmonella* infection.

Case studies also have highlighted the risk of infection in children who reside in a home with reptiles or amphibians or whose caregivers handle these animals frequently. Infants may become infected with the organism even if they do not have physical contact with an amphibian or reptile, if their caregivers fail to wash their hands or change their cloth-

ing after handling the animals. There also is evidence that cleaning reptile or amphibian equipment in food preparation areas, such as the kitchen sink, could expose children to the bacteria.



Many amphibian and reptile owners are not aware of the risk of owning these animals. The CDC recommends healthcare providers, veterinarians, and pet-store owners inform owners and possible purchasers of amphibians and reptiles about the risks and prevention of salmonellosis. Since

2001, Illinois pet stores selling reptiles are required to display a notice regarding safe handling of the animals and provide the notice to purchasers of reptiles. IDPH has "Reptile Rules" posters that can be obtained by contacting the Communicable Disease Section in Springfield at 217-782-2016. Additional educational materials are available from the Pet Industry Joint Advisory Council at 800-553-7387.

Amphibian and reptile-associated salmonellosis can be prevented by:

- washing hands thoroughly after handling an amphibian or reptile, its cage, or anything it has touched
- keeping the pet and its equipment out of food preparation areas
- not allowing the animal to roam freely throughout the home
- keeping these pets out of homes with children less than 5 years of age and out of child care centers

To view the revised CDC recommendations, visit <http://www.cdc.gov/mmwr/PDF/wk/mm5249.pdf>

References

1. CDC. Reptile-Associated Salmonellosis- Selected States, 1998-2002. MMWR 2003;52:1206-9.

**Factoid**

When a thermometer was dipped in a broth culture of *Salmonella dublin* and inserted lengthwise into sausages, it was shown that the *S. dublin* could survive gentle frying for as long as 15 minutes and the sausages appeared well cooked. This example illustrates the importance of internal temperature in keeping food safe from bacterial pathogens.

**County Corner**

**Local Health Department Reports of Outbreaks, Studies or Prevention Efforts**

**Nothing Kosher about Norovirus: An Outbreak Associated with a Bat Mitzvah Celebration**

**By Maria Chudoba, M.D., M.P.H., and Michael Vernon, Ph.D., Cook County Health Department; Shawn Cesario, R.N., Nurse Epidemiologist, Lake County Health Department**

On Oct. 18, 2004 the Cook County Department of Public Health (CCDPH) Communicable Disease Control Unit, received a call from a Lake County resident reporting gastrointestinal (GI) illness in several persons who attended a Bat Mitzvah celebration. The party was held at 1p.m. on Oct. 16 in a temple located in Lake County. Food was catered buffet style by a restaurant in Cook County. Approximately 250 people attended the party, 30 of whom developed vomiting and diarrhea within 48 hours of the event.

CCDPH contacted the Lake County Health Department (LCHD) Communicable Disease program and both departments agreed to the following response plan: CCDPH would conduct an environmental investigation and handle the food employees and LCHD would conduct the epidemiological investigation. Due to the fact that the suspect exposure occurred in Lake County and following a recently proposed multi-jurisdictional outbreak investigation protocol developed by the Northern Illinois Public Health Consortium, it was decided that LCHD would assume the lead role. CCDPH forwarded the hostess information and menu obtained from the caterer to LCHD. During the interview with the hostess, LCHD learned that there were 40 ill attendees out of 225 participants and one ill bartender. The hostess claimed all the ill attendees received drinks from the ill bartender.

LCHD created a questionnaire, interviewed nearly all ill participants, and developed a case definition that was met by 30 of the attendees. Interviews indicated that in addition to the buffet there was a dinner party, which occurred at another Lake County location at 5p.m. that same day. There was a different menu prepared and served by the same caterer

and employees, with the exception of the bartender who had gone home sick. The hostess also held a smaller family brunch the next day at home with an undisclosed but different food source. However, many sick individuals reported only attending the buffet. Fourteen well attendees were interviewed and identified as controls. Based on signs and symptoms, incubation (36 to 40 hours) and duration (~ 25 hours), a viral etiology was suspected and norovirus testing arranged with the Illinois Department of Public Health (IDPH) laboratory. Six specimens were submitted from cases and all were found to be positive for norovirus subtype G1 by PCR method. CCDPH requested LCHD to conduct an inspection of the temple's kitchen where the food had been delivered and stored by the caterer. No violations were found.

During the course of the restaurant inspection, it was discovered that one of the food handlers had reported GI symptoms to the manager on Oct. 18. This person was responsible for serving drinks during the event.

On Oct. 20, CCDPH contacted the food handler. She reported cramping on Oct. 15, followed by diarrhea of five hours duration the next day. She agreed to submit a stool specimen for analysis by the IDPH laboratory. This stool specimen was positive for the same Norovirus subtype G1.

Epidemiologic analysis of the outbreak revealed two food items were significantly associated with illness; ice (Risk Ratio 2.13;  $p < 0.001$ ) and Diet Coke (Risk Ratio 1.69;  $p = 0.01$ ). These items were served by two food handlers, one of whom was the aforementioned food handler who tested positive for Norovirus G1.

This investigation was conducted efficiently without complication and the two local health departments worked closely to communicate and share findings. There was no media coverage or legal involvement and the attendees and host were very cooperative with the public health activities. Overall, it was agreed by both departments that there should be flexibility built into outbreak investigation protocol that allow multiple counties to determine the lead agency and participant roles depending on the circumstances of the situation.

## Surveillance is Information for Action: Varicella (Chickenpox)

Stephanie Borchardt, M.P.H., Ph.D.

**Q:** What public health action is triggered when a case of varicella (chickenpox) is reported to a local health department?

**A:** Varicella is a febrile rash illness resulting from primary infection with the varicella zoster virus (VZV). Although varicella is usually a benign childhood disease, VZV may induce severe complications including, pneumonia, encephalitis, or secondary bacterial infection of the vesicles. Varicella severity and complications are increased among immunocompromised persons, neonates, children less than 1 year of age, and adults.

Since Feb. 1, 2002 cases of varicella occurring in persons  $\geq 20$  years of age have been reportable within 24 hours to local health departments in Illinois. Because cases of varicella and smallpox may have similar clinical presentations, reporting of adult varicella cases enhances surveillance for smallpox. This surveillance is supported by the Illinois Department of Public Health (IDPH) Division of Laboratories, which is prepared to perform rapid orthopox PCR testing, as indicated, in consultation with clinicians at hospitals, local health departments, and IDPH.

Uncomplicated cases of varicella in individuals less than 20 years of age are currently reportable within seven days by aggregate (i.e. by age group, sex, and week of onset). These reports generate surveillance data that are useful in monitoring the impact of varicella vaccine (licensed in 1995) on age specific varicella incidence in Illinois (Figure 1). Varicella incidence in Illinois has declined 85 percent from 1995 ( $N=24,813$ ) to 2003 ( $N=3,829$ ). Currently, the highest rates of disease are among children 5 to 9 years of age, representing 68 percent (16,938/24,813) of cases reported during 1995 and 59 percent (2,243/3,829) of cases reported during 2003. Children 1 to 4 years of age comprised 17 percent (4,199/24,813) of cases reported during 1995 and 13 percent (483/3,829) of cases reported during 2003.

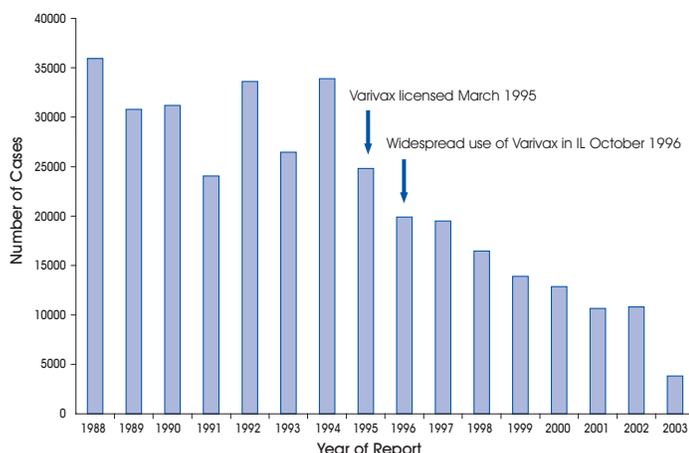
In order to better evaluate, target, and guide vaccination strategies as the United States moves towards the goal of varicella elimination, the Council of State

and Territorial Epidemiologists recently recommended *all* varicella cases be individually reported with information about age, vaccination status, and severity of disease.<sup>1</sup> Individual case reporting has become more feasible given the nationwide decline in varicella cases, and IDPH anticipates implementation of case-based varicella reporting in Illinois beginning in 2006.

Cases of severe disease (e.g. meningitis, encephalitis), unusual cases or clusters, and deaths due to varicella also are reportable. This reporting provides information that contributes to post-marketing evaluation of vaccine efficacy,<sup>2</sup> assists in identifying problems with vaccine storage and handling that may lead to vaccine failure, and enhances proper management of high-priority outbreaks, e.g. those associated with invasive group A streptococcal infections. Fatal cases became nationally notifiable in 1999.<sup>3</sup> Local health departments complete a Varicella Death Investigation Worksheet in consultation with the reporter when such cases occur.<sup>4</sup> Data from the National Center for Health Statistics indicate there is currently substantial under-reporting of varicella deaths via this mechanism.

Local health departments and IDPH also can provide consultation when telephone reporting of individual cases of varicella is accompanied by management questions. Issues that have arisen when inquiries have been made to IDPH staff include proper isolation of hospitalized patients, use of varicella zoster immune globulin, and post-exposure immunization.

Figure 1. Varicella cases by year of report, Illinois 1988 to 2003.



#### References

1. Council of State and Territorial Epidemiologists (CSTE). 2002 Position Statements. CSTE Annual Meeting, Kansas City, MO. Position Statements ID-06. 2002

2. Dworkin MS et al. An outbreak of varicella among children attending preschool and elementary school in Illinois. *Clin Infect Dis*. 2002;35:102-104
3. CDC. Evaluation of varicella reporting to the national notifiable disease surveillance system — United States, 1972-1997. *MMWR* 1999;48:55-58
4. Report forms for varicella deaths are available at [http://www.cdc.gov/nip/publications/surv-manual/app19\\_var\\_death\\_wksht.pdf](http://www.cdc.gov/nip/publications/surv-manual/app19_var_death_wksht.pdf)

## Article Alert

In an effort to keep you updated on published articles related to infectious diseases, please be aware of the following:

Borchardt SM, Yoder JS, Dworkin MS. Is the recent emergence of community-associated methicillin-resistant *Staphylococcus aureus* among participants in competitive sports limited to participants? *Clinical Infectious Diseases* 2005;40:906-907.

Watson JT, Jones RC, Siston AM, Diaz PS, Gerber SI, Crowe JB, Satzger RD. Outbreak of food-borne illness associated with plant material containing raphides. *Clin Toxicol* 2005;43:17-21.

## Kudos

IDPH Division of Infectious Diseases recognizes the LaSalle County Health Department, a veterinarian in their community, local hospitals, and the Illinois Department of Agriculture (IDOA) laboratory who worked together to diagnose and manage the public health response to a horse with rabies in December 2004. The astute veterinarian recognized that the ill horse was a suspect case of rabies and collected specimens for rabies testing at the IDOA laboratory. The local health department received the report after hours at the beginning of a weekend. They did excellent work to evaluate each exposed person to determine if rabies post-exposure prophylaxis was needed and to get enough rabies vaccine and rabies immune globulin from surrounding hospitals for treatment of 11 persons within 24 hours of the laboratory report. There was great collaborative public health work in responding to this situation on the part of the LaSalle County Health Department, the veterinarian, the Illinois Department of Agriculture laboratory and the hospitals.

## Upcoming Events

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2005 Illinois Immunization and Communicable Disease Conference and Downstate Bioterrorism Summit, Springfield, Illinois, June 13 -15  
For more information: Illinois Public Health Association at 217-522 5687 or ipha@ipha.com

Bioterrorism Summit 2005, Pheasant Run Resort St. Charles, Illinois, July 18-20, 2005  
For more information: Illinois Public Health Association at 217-522-5687 ipha@ipha.com

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## In Memorium

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Dr. Doug Passaro unexpectedly died on April 18, 2005. Doug was a faculty member at the University of Illinois School of Public Health in Chicago and was a tireless advocate for public health. He had trained in infectious diseases at Stanford and was a graduate of the Centers for Disease Control and Prevention's (CDC's) Epidemic Intelligence Service. He was an excellent teacher and assisted the Illinois Department of Public Health Rapid Response Team on several outbreak investigations as well as providing training to the team and to Illinois local health departments. His assistance to the Rapid Response Team was invaluable and all who had an opportunity to work with him had only praise and a new found friend. He will be sorely missed.



*Dr. Doug Passaro teaching IDPH and local health department personnel at a Rapid Response Team regional training in 2004.*