Bite Fighting Tips
Preventing tick bites is the best way prevent tick borne illnesses. Teach patients to prevent tick bites by:

- Using insect repellents that contain DEET (follow package directions carefully) when in tick habitats (areas with long grasses, underbrush and leaf litter).
- Wearing long pants and long sleeved shirts. Tuck pants into socks when in areas of high grass, brush and wooded areas.
- Wearing light colored clothing so you can see ticks.
- Checking body (and children’s bodies) for ticks after being outside.
- Removing any attached ticks right away. Disinfect skin and tweezers used to remove ticks and wash hands. Note the date of the bite on the calendar to tell physician if symptoms develop.
- Treat outdoor pets for fleas and ticks at least once a month.

Immunization Rules Changes: Tdap and MMR

Recommendations from the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices has led to recent changes in the NC administrative rule 10A NCAC 41A.0401. These changes, effective January 1, 2008, are designed to reduce the incidence of pertussis and mumps.

Tdap
A booster dose of Tdap will now be required for the following:

- All public school children entering 6th grade on or after August 1, 2008 if 5 or more years have passed since their last dose of tetanus/diphtheria toxoid.
- All children 12 years of age on or after August 1, 2008 who are in private, non-traditional, or home schools if five or more years have passed since their last dose of tetanus/diphtheria toxoid.

Mumps
Individuals are now required to have a second dose of mumps vaccine prior to enrolling in school, college or university for the first time. Most children have already had 2 doses of MMR by age 4 so this will primarily affect children who have only received single antigen doses of the vaccines. Beginning in the Fall of 2008, students entering school for the first time will need to have these vaccines prior to entry.

- 2 doses of measles
- 2 doses of mumps and
- 1 dose of rubella vaccine

Physicians are encouraged to take advantage of these required vaccine visits to complete a physical exam on pre-teens and teens and offer other recommended vaccines such as a booster dose of varicella, and the vaccines for meningitis and HPV.

For additional immunization information, provider resources, and patient education materials regarding these immunization changes, visit Immunize North Carolina at http://www.immunize.com/Rule%20Change.htm.

Tick Fighting Tips

Tick Talk
Spring is here and people are heading outside again, meaning that “Tick Season” has begun.

Ticks are considered arthropods (the largest animal phylum), an incredibly diverse group that includes insects, crustaceans, spiders, scorpions, and centipedes. There are over 800 species of ticks worldwide, and ticks are second only to mosquitoes as the vectors that cause the most human disease in the world. Important tick-borne infections to be aware of in Wake County include:

- the Rickettsial diseases (Rocky Mountain spotted fever (RMSF), human monocytic ehrlichiosis (HME), human granulocytic anaplasmosis (HGA), and the Borrelloses — Lyme disease and the newly emerging “southern tick–associated rash illness” (STARI)).

- Ehrlichiosis and Anaplasmosis
- Lyme Disease
- Southern Tick Associated Rash Illness
- Tick Fighting Tips
- Immunization Rule Changes

tick-borne disease of greatest concern in North Carolina is Rocky Mountain spotted fever (RMSF). North Carolina is the state with the most number of reported cases in the United States. Wake County new averages over 93 RMSF cases per year and has had more cases than any other county in North Carolina over the past several years.

Rickettsia rickettsii is the intracellular bacteria that causes RMSF, living primarily in cells that line blood vessels. The American Dog tick is most commonly identified as the species responsible for transmitting R. rickettsii to humans in North Carolina (1%-3% of the tick population carries R. rickettsii). It is transmitted through saliva while a tick is feeding and usually requires 6-12 hours of attachment and feeding before transmission to the host can occur.

The rash begins as small, blanching pink macules on the ankles, wrists, and forearms, often spreading to the soles of the feet and palms of the hands, and can progress to petechiae in more severe cases. Leukopenia, thrombocytopenia, and mildly elevated liver enzymes are common in cases of RMSF. E. coli serology is considered the gold standard, and acute and convalescent samples should be taken, since initial titers may be low.

The most important element for a clinician in North Carolina to remember is that antibiotic treatment should be initiated immediately if RMSF is suspected. Therapy should not be delayed while waiting for test results to come back.

Rocky Mountain Spotted Fever

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Tick Testing

Patients who have removed a tick often wonder if they should have it tested for disease. As this is often not helpful in clinical decision-making, Wake County does not currently offer this type of tick testing.

Tick Testing

continued on page 2
Lyme Disease

Lyme disease is caused by the spirochete, *Borrelia burgdorferi*, and is passed to humans via the bite of the blacklegged tick (deer tick). The disease is most prevalent in North Carolina. The presence of the spirochete has been confirmed in more than 7,000 ticks collected from all of the 100 North Carolina counties.

B. burgdorferi is the organism that causes human mononucleosis (HME), while *Anaplasma phagocytophilum* is responsible for causing ehrlichiosis and anaplasmosis (HGA). The bacteria that cause ehrlichiosis and anaplasmosis are small, gram-negative bacteria that primarily invade monocytes or granulocytes, respectively.

The lone star tick is most commonly identified as the species responsible for transmitting B. burgdorferi, A. phagocytophilum, and *Ehrlichia chaffeensis* to humans in North Carolina, while the blacklegged tick is the primary vector for carrying *A. phagocytophilum*. In Wake County, there were 10 cases of HME for 2007 (averaging 5-6 cases over the past several years), but Wake County only has averaged 0-1 cases of HGA yearly. Transmission, symptomatology, and treatment of symptoms of HME and HGA are very similar to RMSF, with the exception that a rash is some what more uncommon in patients with HME and HGA (children are more likely to develop a rash and is rarely reported with HGA).

Most major medical reference laboratories offer testing for RMSF, HME, and HGA. In addition, the State Laboratory of Public Health also offers this battery of testing at no charge. For specific questions on shipping specimens call Special Serology at 919-807-8623 or visit http://phil.state.nc.us/Virology/Serology/SpecialSerology/default.asp.

In North Carolina, prophylactic treatment is not recommended for an asymptomatic tick bite. Lyme disease treatment has recently been defined by the Infectious Disease Society of America. Please go to http://www.cdc.gov/Ticks/publications.pdf for more information.

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American Dog Tick


Selected Features of Rocky Mountain spotted fever, human monocytic ehrlichiosis, human granulocytic anaplasmosis

<table>
<thead>
<tr>
<th>Disease</th>
<th>Primary vector</th>
<th>Incubation period (days)</th>
<th>Common initial signs and symptoms</th>
<th>Common laboratory abnormalities</th>
<th>Rash</th>
<th>Case-fatality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Rickettsia rickettsii</em> (Rocky Mountain spotted fever)</td>
<td>Dermacentor variabilis (American Dog Tick)</td>
<td>2-14</td>
<td>Fever, nausea, vomiting, myalgia, anorexia and headache</td>
<td>Thrombocytopenia, mild hypotension, and mildly elevated hepatic transaminase levels</td>
<td>Maculopapular rash approximately 2-4 days after fever onset in 50%-80% of adults (&gt;90% in children); might involve palms and soles</td>
<td>5%-10%</td>
</tr>
</tbody>
</table>

**Ehrlichia chaffeensis**

*Amblyomma americanum* (lone star tick) 5-14

Fever, headache, malaise, and myalgia

Leukopenia, thrombocytopenia, and elevated hepatic transaminase levels

Rash in 30% of adults and approximately 25% of children

2%-3%

**Anaplasma phagocytophilum**

*Ixodes scapularis* (blacklegged tick) 5-21

Fever, headache, malaise, myalgia, vomiting

Leukopenia, thrombocytopenia, elevated hepatic transaminase levels

Rash in a few patients and absent in others

<1%

Source: Diagnosis and Management of Tickborne/Rickettsial Diseases: Rocky Mountain spotted fever, ehrlichiosis, and anaplasmosis—United States. MMWR, Recommendations and Reports March 31, 2006 55 (rr4); p.27

Common initial signs and symptoms include malaise, myalgia, headache, fever, nausea, vomiting, and anorexia. The rash, which is usually a circular rash called erythema migrans (EM), with a bull’s-eye appearance, observed in over 80% of Lyme disease patients at the site of a tick bite after a period of 3 to 7 days. People may also experience fatigue, chills, fever, headache, arthralgias, myalgias, and/or lymphadenopathy. Untreated, within weeks to months, the patient may progress to early disseminated Lyme disease, producing a potential array of symptoms, including Bell’s palsy, severe headaches, radiculopathies, meningitis, heart palpitations, and dizziness. Over months to years, many of these symptoms will resolve, even without treatment. However, some patients with untreated infections may begin to recur, brief attacks of objective joint swelling in one or a few joints, sometimes, gram-negative arthritis in one or more joints (large joints are most often affected, particularly the knees). In addition, up to 5% of untreated patients may develop neurological complaints, which could include shooting pain, numbness or tingling in the hands or feet, and problems with concentration and short term memory. Interestingly, some patients have more generalized symptoms, with a higher encephalopathic presentation. The Centers for Disease Control and Prevention (CDC) strongly recommends a two-test approach for active disease and for previous infection through use of an ELISA or IFA followed by a Western blot as the algorithm of choice. If the IFA or IFA is negative, it is highly unlikely that the person has Lyme disease and no further testing is recommended. If the Western blot is negative after a positive ELISA or IFA, it suggests that the first test was a false positive. Often, both IgM and IgG Western blots are performed. Patients who are positive by IgM Western blot but not IgG should have the test repeated several weeks later, and if they continue to be only IgM positive (and have been ill longer than one month), then this is most likely a false positive. If a patient with suspected early Lyme disease has a negative serology, serological evidence of infection is best obtained by testing of paired acute- and convalescent-phase serum samples. Serum samples from persons with disseminated or late-stage Lyme disease almost always have a strong IgG response to *Borrelia burgdorferi* antigens. The State Laboratory of Public Health also offers the Lyme battery of testing at no charge, although it will be routed to the CDC for actual testing. For specific questions on shipping specimens call Special Serology at 919-807-8623 or visit http://phil.state.nc.us/Virology/Serology/SpecialSerology/default.asp.

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Rocky Mountain Spotted Fever con’t.

Factors associated with severe or fatal Rocky Mountain spotted fever include advanced age, male sex, African-American race, chronic alcohol use and glucose-6-phosphate-dehydrogenase (G6PD) deficiency. The CDC-quoted case-fatality rate is approximately 5%-10%.

There may be a few reasons why Wake County’s death rate appears to be much lower than that. First, our physicians develop symptoms, or have an illness so mild they do not seek medical attention.

Lastly, *Rickettsia amblyomnii*, a recently discovered bacterium very closely related to *R. rickettsii*, may actually be causing some of the illness that is thought to be RMSF. Soon-to-be-published data supports this emerging disease from North Carolina State University Department of Entomology lends support to this hypothesis.