Emerging Anaplasmosis in the Upper Hudson Valley, New York, USA
Jessica A. Kumar1, Ellis Tobin2, Alan Sanders2, Susan Wong3, Linda Gebhardt3, P. Bryon Backenson3, Jennifer White3, Gary Lukacik3, Philip Palmeri2, Anita Kiehl2, Kristina Roddy2


Introduction
*Anaplasmosis is a tick-borne illness transmitted by Ixodes scapularis, the vector of Babesia microti and Borrelia burgdorferi.

*Anaplasmosis, formerly known as Human Granulocytic Ehrlichiosis is caused by the bacterium Anaplasma phagocytophilum.

*Lyme disease, babesiosis and anaplasmosis are endemic to predominantly the Lower Hudson Valley (LHV) of New York, and rates have steadily increased since 2008.

*From May to September 2011, there was a dramatic increase of anaplasmosis in the Upper Hudson Valley (UHV).

*This study characterizes the demographics, clinical and laboratory features of 15 hospitalized patients with anaplasmosis from the UHV who required hospitalization.

Methods
*We designated the UHV to include Albany, Schenectady, Saratoga, Rensselaer and upper Greene and Columbia counties (see map).

*Case definition of Anaplasmosis includes:
-Hospitalized patients with a clinically compatible illness and at least one confirmatory laboratory test
-Morulae seen in the cytoplasm of neutrophils on peripheral smear
-Anaplasma positive PCR of whole blood or serum
-Fourfold rise in paired acute and/or convalescent serological titer

*Continuous and categorical variables were described.

*Selected demographics and clinical features and laboratory results were analyzed.

Results

Clinical Results In Hospitalized Patients

<table>
<thead>
<tr>
<th>Age (years) (n=15)</th>
<th>Mean: 78.5</th>
<th>Median: 67</th>
<th>Range: 42 to 95</th>
</tr>
</thead>
</table>

Common Co-morbidities*

<table>
<thead>
<tr>
<th>Heart Disease</th>
<th>Degenerative Joint Disease</th>
</tr>
</thead>
</table>

Tick Bite History

| 7 patients recalled |

Common Symptoms**

| Fever, Myalgias | Intense Fatigue, Chills, Headache |

Duration of Symptoms Prior to Hospitalization (days)

| Mean: 11.9 | Median: 7 | Range: 1 to 28 |

Duration of Hospitalization (days)*

| Mean: 6 | Median: 4 | Range: 2 to 27 |

Empiric Antibiotics Prior to Hospitalization

| 14 patients received antibiotics that lacked anti-Anaplasma activity |

*No immunosuppression, **Flush was absent in all cases, *One patient required intensive care.

*Three patients had co-infections.

*One each with Lyme, Babesia and Epstein-Barr Virus

*There were no fatalities.

*Once anaplasmosis was suspected doxycycline therapy resulted in rapid clinical improvement.

*Defervescence within 24 to 72 hours.

*Resolution of cytopenias within 7 days.

*Fatigability lasting several weeks was a common sequela.

Laboratory Results In Hospitalized Patients

| White Blood Cell Count x 10^3/L | Initial Mean: 5.1 | Initial Range: 2.1-11.5 |
| Atypical Lymphocytes % (n=14)* | Mean: 3.4 | Range: 0.8 |
| Platelet Count x 10^12/L | Initial Mean: 120.0 | Initial Range: 22-284 |
| AST U/L | Initial Mean: 54.3 | Highest Mean: 131.2 |
| ALT U/L | Initial Mean: 50.9 | Highest Mean: 106.6 |
| Morulae on Smear (n=12)** | 5 patients |
| Anaplasma PCR (n=10) | 10 patients |
| Acute Serology (IgG) (n=6)* | 5 patients |
| Convalescent Serology (n=6) | 4 patients |

*Data not available in one patient, **Five patients with (-) smears had (+) PCR, *Data not available for one patient.

*Early laboratory abnormalities included pancytopenia, atypical lymphocytosis, and elevated liver enzymes.

*In those patients presenting within 1 week of illness onset PCR was the most sensitive diagnostic modality.

*The sensitivity of morula detection could not be established from this analysis.

*Morula detection was not sought prospectively

*Serologic analysis was useful when it was obtained most specifically during the convalescent phase of illness.

Conclusions

*There was a significant expansion in the geographic range of anaplasmosis to the UHV.

*Adults >42 years of age were at increased risk for a more severe form of illness.

*Non-specific fever, malaise and fatigue were common presenting symptoms.

*Leukopenia, thrombocytopenia, and elevated liver function tests were common presenting laboratory abnormalities.

*Atypical lymphocytosis was present in 87% of patients.

*Testing should include analysis of peripheral smear, PCR and both acute and convalescent serologies.

*Anaplasmosis should be considered in patients presenting with the above clinical symptoms and laboratory findings during the seasons of Ixodes activity.