Meningitis and Radiculomyelitis Caused by Angiostrongylus cantonensis

To the Editor: Angiostrongylus cantonensis infection is endemic in regions such as Southeast Asia, China, the Pacific Basin, and the Caribbean, but international travel has spread the disease elsewhere, including Europe (1–10). Dissemination of the parasite to many regions has also occurred because of the ship-borne international migration of rats and the diversity of potential intermediate hosts. The target organ in humans is the central nervous system in which an eosinophilic reaction develops in response to dying larvae. We report a case of eosinophilic meningoencephalitis and lumbosacral myeloradiculopathy caused by A. cantonensis and present a review of cases of A. cantonensis infections from Europe.

A 47-year-old merchant seaman was admitted to the University Hospital of Infectious Diseases, Zagreb, Croatia, in March, 2006 on the 17th day of illness because of fever, headache, vomiting, and constipation. At the end of the first week of illness, paresthesias developed in his feet; on the 10th day of illness, he also noticed difficulties with urination. He had returned from a 1-month trip to Southeast Asia (Malaysia and Singapore) 35 days before the onset of symptoms and recalled eating vegetables and salads. He also consumed shrimp, salt water. On physical examination, we noticed increased muscle tone, tremor of the tongue and upper limbs, and decreased deep tendon reflexes of the lower limbs. He experienced urinary retention, and catheterization was required. Saddle anesthesia was observed. There was no neck stiffness, and the results of the rest of the physical examination were normal.

His blood leukocyte count was $11.5 \times 10^9/L$ with 80% neutrophils, 12% lymphocytes, 4% monocytes, 2% basophils, and 2% eosinophils. Cerebrospinal fluid (CSF) analysis showed 320 cells/μL with 6.5% eosinophils (21 eosinophils/μL). Results of CSF testing by PCR for herpes simplex virus 1 (HSV-1) and HSV-2 DNA were negative, as were cultures for bacteria, mycobacteria, and fungi. Results of serum and CSF antibody tests for Borrelia burgdorferi, Treponema pallidum, HSV-1, HSV-2, tick-borne encephalitis virus, Toxoplasma gondii, Toxocara spp., and Trichinella spp. were also negative. Results of stool examination for Ascaris lumbricoides, Trichuris trichiura, Taenia spp., Giardia intestinalis, Strongyloides spp., and Entamoeba histolytica were negative. The patient was also negative for HIV by ELISA. Magnetic resonance imaging scans of the brain and spine were unremarkable. A. cantonensis infection was diagnosed by immunoblot testing at the Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok. Antibodies against A. cantonensis 31-kDa antigen were detected in serum and CSF of the patient; antibodies against Gnathostoma spinigerum were not detected.

Treatment was symptomatic; to lessen the headache, 4 lumbar punctures were performed. After 1 month, the patient’s general condition was greatly improved; however, minor symptoms such as diminished concentration, slow thinking, and mild headache persisted. Urinary retention lasted for 38 days, and the patient had occasional mild headaches and paresthesia in his feet for the next 5 months.

Because large numbers of persons from Europe travel to destinations where angiostrongyliasis is endemic, it is somewhat surprising that the infection has been rarely described in Europe. In a Google and Medline

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Internet literature search, we identified 9 additional case reports and 1 report on a cluster of 5 *A. cantonensis* infections. The first report was in a 14-month-old child born in Tahiti who became ill in France in 1988 (7). Eight cases, as did our case, involved travelers returning to Europe after a visit to disease-endemic areas (2–9) (Table). Not all cases were serologically confirmed, most likely because antibody tests for *A. cantonensis* infection have not been widely available. In a retrospective cohort study, 5 French policemen, who returned from French Polynesia with severe headache and blood eosinophilia, were believed to have eosinophilic meningitis caused by *A. cantonensis* (10). However, CSF examination was performed in only 1 patient, and none of the cases were serologically confirmed.

Definitive diagnosis of angiostrongyliasis would require identification of larvae or young adults in human tissue, such as the brain, CSF, and eye chamber, which is rarely achieved. Thus, the diagnosis is usually made on the basis of serologic test results. Specific *A. cantonensis* antigens (29 kDa, 31 kDa, and 32 kDa) were identified; antibodies against these antigens can be detected by ELISA, dot-blot ELISA, or Western blot.

In most patients, *A. cantonensis* causes a benign and self-limiting disease; treatment is usually symptomatic. Data are limited, but mostly favorable, on the use of steroids, albendazole, and mebendazole. However, the administration of antihelmintics without steroids is not recommended because such treatment might elicit deleterious inflammatory responses to dying worms within the nervous system or ocular structures.

In summary, the presence of headache, fever, and paresthesias in travel-related patients should raise the possibility of *A. cantonensis* infection. In the absence of such history, eosinophilic meningitis may be a consideration. Definitive diagnosis requires specific antibodies. When antihelmintics are prescribed, steroids should also be administered. However, the treatment of eosinophilic meningitis due to *A. cantonensis* is still evolving.

### Table. Epidemiologic and clinical findings from 11 reported case-patients with *Angiostrongylus cantonensis* infection, Europe*

<table>
<thead>
<tr>
<th>Country, year of report</th>
<th>Patient age, y/sex</th>
<th>Possible country of origin</th>
<th>Suspected food</th>
<th>Clinical features</th>
<th>Diagnosis</th>
<th>Treatment</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>France, 1988</td>
<td>1/F</td>
<td>Tahiti</td>
<td>Not reported</td>
<td>Eosinophilic meningoencephalitis, lumbosacral myeloradiculitis, tetraplegia coma, hypertensive hydrocephalus, paresthesias</td>
<td>IFA</td>
<td>Mebendazole, steroids, ventriculoperitoneal catheter</td>
<td>(1)</td>
</tr>
<tr>
<td>Switzerland, 1995</td>
<td>46/F</td>
<td>Tahiti</td>
<td>Freshwater shrimp</td>
<td>Eosinophilic meningoencephalitis</td>
<td>Clinical</td>
<td>Supportive</td>
<td>(2)</td>
</tr>
<tr>
<td>France, 1996</td>
<td>25/F</td>
<td>Tahiti</td>
<td>Raw fish</td>
<td>Eosinophilic meningitis, paresthesias (left lower leg)</td>
<td>Clinical</td>
<td>Supportive</td>
<td>(3)</td>
</tr>
<tr>
<td>France, 2002</td>
<td>16/M</td>
<td>Tahiti</td>
<td>Not reported</td>
<td>Eosinophilic meningoencephalitis, cranial palsy (n. abducens), cerebellar syndrome, paresthesias</td>
<td>IFA</td>
<td>Ivermectin</td>
<td>(4)</td>
</tr>
<tr>
<td>Switzerland, 2004</td>
<td>26/M</td>
<td>Cuba</td>
<td>Not reported</td>
<td>Eosinophilic meningitis, generalized hyperesthesias</td>
<td>WB</td>
<td>Supportive</td>
<td>(5)</td>
</tr>
<tr>
<td>Germany, 2006</td>
<td>27/F</td>
<td>Dominican Republic</td>
<td>Not reported</td>
<td>Eosinophilic meningitis, paresthesias (right elbow, right thigh)</td>
<td>WB</td>
<td>Albendazole, steroids</td>
<td>(6)</td>
</tr>
<tr>
<td>Italy, 2007</td>
<td>30/M</td>
<td>Dominican Republic</td>
<td>Freshwater shrimp</td>
<td>Eosinophilic meningitis, generalized paresthesias</td>
<td>Clinical</td>
<td>Mebendazole,† steroids</td>
<td>(7)</td>
</tr>
<tr>
<td>UK, 2007</td>
<td>30, F</td>
<td>Thailand</td>
<td>Snails</td>
<td>Eosinophilic meningitis, cranial nerve palsy (right n. abducens), altered sensation (lateral border of right leg)</td>
<td>Serologic‡</td>
<td>Supportive</td>
<td>(8)</td>
</tr>
<tr>
<td>Belgium, 2008</td>
<td>22/F</td>
<td>Costa Rica, Ecuador, Chile, Argentina, Fiji Islands</td>
<td>Sashimi, ceviche (raw fish), salads</td>
<td>Eosinophilic meningitis, paresthesias (left hemithorax, feet)</td>
<td>WB</td>
<td>Albendazole, steroids</td>
<td>(9)</td>
</tr>
<tr>
<td>France, 2008§</td>
<td>26–36/M</td>
<td>French Polynesia</td>
<td>Uncooked freshwater prawns</td>
<td>Eosinophilic meningitis¶</td>
<td>Clinical</td>
<td>Ivermectin (1 patient) or albendazole; steroids (1 patient)</td>
<td>(10)</td>
</tr>
<tr>
<td>Croatia</td>
<td>47/M</td>
<td>Malaysia, Singapore</td>
<td>Vegetables, salads, shrimp</td>
<td>Eosinophilic meningitis, lumbosacral myeloradiculitis (conus medullaris syndrome), generalized paresthesias</td>
<td>WB</td>
<td>Supportive (repeated lumbar puncture)</td>
<td>This study</td>
</tr>
</tbody>
</table>

*Ref., reference; IFA, immunofluorescent antibody assay; WB, Western blot.
†One dose only.
‡Method not specified.
§Five French policemen.
¶Diagnosis confirmed by cerebrospinal fluid analysis in only 1 patient.
†The patient thought he consumed saltwater shrimp but was uncertain.  

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ers returning from disease-endemic areas should alert clinicians to the possibility of eosinophilic meningitis caused by *A. cantonensis*. With growing international travel, physicians may encounter *A. cantonensis* infection more frequently.

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**References**


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