**Title**: *Strongyloides stercoralis*: Uncommon yet not to be missed cause of eosinophilia

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**Abstract**

*Strongyloides stercoralis* is a soil-transmitted nematode that is estimated to infect millions of people per year worldwide. However, cases are less commonly seen in the United States. This report highlights the importance of when to include *Strongyloides stercoralis* in the differential diagnosis of patients presenting eosinophilia within the United States.

**Introduction**: *Strongyloides stercoralis* is a soil-transmitted nematode that is estimated to infect between 3 million to 100 million people per year worldwide, particularly in South-East Asia, African, and Western Pacific regions of the world2-3. In the United States (US), the majority of confirmed cases are seen in immigrants4. However, cases have been seen in areas of Southeastern United States, particularly where poor sanitation provides a suitable environment for *Strongyloides stercoralis*4. Patients may present with cutaneous or gastrointestinal symptoms. Additionally, patients can be asymptomatic in up to 60% of cases. In such cases, often the only clinical clue is eosinophilia. Asymptomatic carrier state increases the risk of developing *Strongyloidiasis* hyperinfection syndrome leading to systemic sepsis and end-organ failure5. Due to the overall low prevalence of disease in the United States and unique geographical distribution within the US, physicians may overlook *Stronglyoidies steroralis* as a possible diagnosis. This oversight could result in delay of appropriate treatment and adverse patient outcomes.

**Case History/Examination**: 73-year-old Hispanic male with significant past medical history of alcohol dependence, thiamine deficiency, and B12 deficiency is brought to the emergency department by his ex-wife due to abnormal behavior. She states that the patient has been talking to himself and hallucinating, making statements like “there are dead people inside me”. Per secondary report, the patient has been experiencing audiovisual hallucinations and responding to internal stimuli, often seen talking to himself and swatting in the air.  In addition to the psychiatric symptoms, a ROS significant is significant for weigh loss of 20 pounds over the past 3 months. He reports decreased appetite, fatigue, and difficulty sleeping. He denied any abdominal pain, nausea, diarrhea, melena, or hematochezia. He denied cough, dysphagia, early satiety. He admits to cocaine and methamphetamine use for the past 3 years and drinking several beers daily. Pertinent additional past medical history is significant for a cerebral vascular accident (CVA) in 2020 with residual memory and cognitive deficits exacerbated his chronic cocaine methamphetamine use. Chart review revealed no history of psychiatric diagnosis or treatment for polysubstance abuse.

On examinations vital signs are unremarkable. Pertinent physical exam findings included a cachectic Hispanic male with poor dentition. Cardiopulmonary exam was unremarkable. Neurological exam displayed clear and coherent speech with no gross neurological deficits. He was alert and oriented to person, place, and time. He was alert and oriented to person, place, and time. Psychiatric exam revealed appropriate mood and affect.

**Differential Diagnosis, Investigation, and Treatment**

A workup was conducted for acute polysubstance abuse with a urine drug screen revealing patient was positive for cocaine and amphetamine use. Computed tomography (CT) without contrast was taken of the head revealing chronic microvascular changes, but no acute intracranial process. Due to chronic alcohol intake, patient was started on folate and thiamine supplementation. Initial complete blood count (CBC) revealed a hemoglobin count of 12.9 and platelet count of 145. With recent weight loss and malnutrition, a CT scan of chest, abdomen, and pelvis was obtained to evaluate for malignancy. Scans revealed a 3mm right upper lung (RUL) nodule and nonspecific wall thickening in the cecum and proximal ascending colon [Figure 1]. It was recommended at that time to have follow-up CT scan in twelve months and referral for outpatient colonoscopy. White blood count (WBC) was elevated at 13.0 (ref 4.8 – 10.8) with differential revealing eosinophil percentage of 22% (ref 0-4) and absolute eosinophil (ABS) eosinophil count of 2.9 (0-0.4). Chart review discovered chronic eosinophilia since 2013. Hematology was consulted for evaluation of eosinophilia. HIV test, malignancy workup to include peripheral blood smear and FISH, as well as infectious workup including stronglyoides antibody were ordered which were pending at time of discharge.

**Outcome and Follow-up:**

Patient was discharged on vitamin supplementation along with follow-up with primary care, mental health, and gastroenterology. One-week following discharge stronglyoidies antibody returned positive and patient was informed of his diagnosis and prescribed Ivermectin. Patient follow-up with infectious disease and finished his course of treatment. At 3-month follow-up patient absolute eosinophil count decreased from 2.9 to 1.2 and he reported a resolution of shortness of breath, diarrhea, and abdominal pain.

**Discussion**:

Eosinophilic disorders include a board differential of etiologies with presentations ranging from asymptomatic and incidental findings upon routine evaluation to fulminant and fatal outcomes. Eosinophilia is defined as an upper limit of absolute eosinophil count (AEC) around 500 /mm3 to 1500 /mm3 while hypereosinophilia is defined as an AEC greater than 1500 /mm3[8]. Eosinophilia can further be classified as either primary or secondary.  Secondary causes are more common and include etiologies such as infection, hematologic malignancies, and allergies [3]. Due to the heterogenic and, at times indolent, nature of eosinophilic related diseases certain diagnosis can often be overlooked. Such was possibly the case in this patient with *Stronglyoidies steroralis* infection.

When a patient presents with eosinophilia the first step in evaluation after excluding signs of end-organ damage is to exclude common causes of eosinophilia. This includes work-up for allergies, infections, and autoimmune disorders [5]. After laboratory confirmation, treatment should be promptly initiated. However, if basic work up returns negative, a hematology consult should be considered to evaluate for other causes, such as primary hyperinfection syndromes.

Due to low prevalence of *Stronglyoidies steroralis* in the United States, particularly in non-immigrant Americans, diagnosis can be easily missed. The majority of patients will be asymptomatic other than peripheral eosinophilia [8]. If symptomatic, patients may present signs of infection that include dyspnea, abdominal pain, and diarrhea.  Further, some patients~~,~~ will present with disseminated *Stronglyoidies* which includes shock, disseminated intravascular coagulation, meningitis, renal failure, and/or respiratory failure. Disseminated *Stronglyoidies* is a difficult diagnosis to establish and requires a high level of suspicion [4].  Patients who are at high risk for fulminant disease include those that are immunocompromised, have travelled to an endemic region, or those affected by poor sanitation [7].

While clinicians may not suspect *Stronglyoidies steroralis* in their initial differential of eosinophilia, we hope to demonstrate the importance of clinical suspicion in a patient with risk factors. This not only includes immigrants and immunocompromised patients but can also be seen in patients with chronic alcoholism and environments with poor sanitation. This was the case in our patient. Prompt treatment in patients with positive serologic evidence of Stronglyoidies with Ivermectin is important in preventing disseminated disease and potentially fatal outcomes.

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**Conflicts of Interest**

The authors have no conflicts of interest to declare

**Author Contributions**

AC, JB cared for the patient, conducted research, and prepared the manuscript.  DW assisted with preparation of the manuscript, case review, and research review.

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**Imaging:**

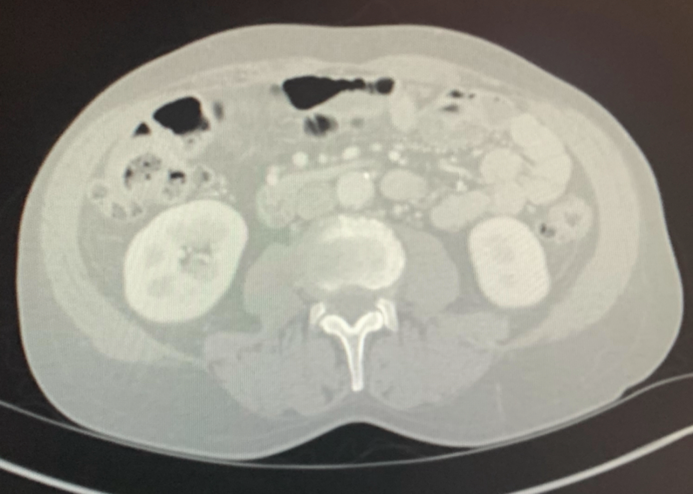


Figure 1(A) - Computed tomography (CT) axial view of abdomen showing nonspecific wall thickening in the cecum and proximal ascending colon

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Figure 1(B) - Computed tomography (CT) coronal view of abdomen showing nonspecific wall thickening in the cecum and proximal ascending colon