THE DISCOVERY OF
ANGIOSTRONGYLUS CANTONENSIS
IN HUMANS IN HAWAI’I AND
EARLY EPIDEMIOLOGICAL FINDINGS

Gordon D. Wallace
Hawai‘i 1960
Eosinophilic meningitis

1958 – epidemic of eosinophilic meningitis

- no fatal cases
- assumed a parasite
- 2-4 week incubation period
- transmission
  - pelagic fish??
  - freshwater shrimp ??
Oahu, Hawaii - 1958

- Patient #1: Filipino male – 50 years
  - Memory loss and abnormal behavior
  - 5% eosinophilia
  - No parasites or ova in feces
- 1959 – developed bronchopneumonia and coma
- 1960 – spinal tap → 92% eosinophils
  → 73% eosinophils
• **Patient #1: Autopsy**

• Leptomeningitis

• Nematode in the brain
  - At least 7 nematodes recovered
  - 2 dead and 5 alive
Oahu, Hawaii - 1959

• Patient #2: Filipino male – 70 years
  – Unusual behavior, including confusion and disorientation
  – Cardiac arrhythmia
  – Normal WBC count with 1% eosinophils
  – No parasites or ova in feces
• Died – 25 December 1959
  • Bronchopneumonia
  • Brain: diffuse eosinophilic meningoencephalitis
  • Lesion in grey matter with multi-nucleated giant cells around a foreign body
  • Consistent with the remains of a nematode
State Mental Hospital  - 1961

- 23% of rats were positive for lung worm

- 1,150 patients
- 81 autopsies
- 70 spinal fluid

- No evidence of lung worms

- Thus, the two cases were rare events.
- Assumed the patients had eaten snails.
Question:
Were these cases of rat lung worm infections isolated cases OR was this parasite responsible for the hundreds/thousands of cases of eosinophilic meningeitis in French Polynesia and other Pacific Islands?

Leon Rosen established the Pacific Research Section, Laboratory of Parasitic Diseases, NIAID, NIH, at Queen’s Hospital
Raw Tuna Thought to be the Source of Serious Brain Disease

- Wrong species of fish
- Sashimi in Hawaiʻi is OK
Prevalence of *A. cantonensis* on Pacific Islands

Surveyed 2,500 rats on Hawaiian and Society Islands
- *R. norvegicus*
- *R. rattus*
- *R. exulans*
Prevalence of *A. cantonensis* in Rats collected from the Hawaiian and Society Islands

<table>
<thead>
<tr>
<th>Island</th>
<th>No. Rats Examined</th>
<th>% Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hawaiian Islands</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oahu</td>
<td>120</td>
<td>39</td>
</tr>
<tr>
<td>Kauai</td>
<td>36</td>
<td>83</td>
</tr>
<tr>
<td>Hawaii</td>
<td>475</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total/Average</strong></td>
<td>631</td>
<td><strong>42%</strong></td>
</tr>
<tr>
<td><strong>Society Islands</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tahiti</td>
<td>160</td>
<td>77</td>
</tr>
<tr>
<td>Moorea</td>
<td>124</td>
<td>32</td>
</tr>
<tr>
<td>Huahine</td>
<td>69</td>
<td>23</td>
</tr>
<tr>
<td>Raiatea</td>
<td>36</td>
<td>64</td>
</tr>
<tr>
<td>Tahaa</td>
<td>68</td>
<td>47</td>
</tr>
<tr>
<td>Bora Bora</td>
<td>39</td>
<td>36</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>496</td>
<td><strong>50%</strong></td>
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<tr>
<td><strong>Grand Total</strong></td>
<td>1,127</td>
<td><strong>45%</strong></td>
</tr>
</tbody>
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Wallace and Rosen. 1965. *Am. J. Epidemiology*
Number of rats examined on islands where *A. cantonensis* was not found

<table>
<thead>
<tr>
<th>Area</th>
<th><em>R. norvegicus</em></th>
<th><em>R. rattus</em></th>
<th><em>R. exulans</em></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majuro, Marshall Islands</td>
<td>0</td>
<td>47</td>
<td>200</td>
<td>247</td>
</tr>
<tr>
<td>Viti Levu, Fiji</td>
<td>50</td>
<td>80</td>
<td>111</td>
<td>241</td>
</tr>
<tr>
<td>Tongatapu, Tonga</td>
<td>71</td>
<td>22</td>
<td>17</td>
<td>110</td>
</tr>
<tr>
<td>Savaii, Western Samoa</td>
<td>19</td>
<td>22</td>
<td>25</td>
<td>66</td>
</tr>
<tr>
<td>Upolu, Western Samoa</td>
<td>109</td>
<td>27</td>
<td>115</td>
<td>251</td>
</tr>
<tr>
<td>Tutuila, American Samoa</td>
<td>33</td>
<td>40</td>
<td>125</td>
<td>198</td>
</tr>
<tr>
<td>Molokai, Hawaii</td>
<td>0</td>
<td>320</td>
<td>64</td>
<td>384</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>282</strong></td>
<td><strong>558</strong></td>
<td><strong>657</strong></td>
<td><strong>1,497</strong></td>
</tr>
</tbody>
</table>

Wallace and Rosen. 1965. *American Journal of Epidemiology*
Conclusion:

• Field work wasn’t always easy

• But “good old fashioned” shoe leather epidemiology established an association between the presence of rat lung worm, *A. cantonensis*, and cases of human eosinophilic meningitis.