Passage of *Meloidogyne* Eggs in Human Stool: Forgotten, but Not Gone

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Recently, we were involved in a project to train staff from the Atoifi Adventist Hospital (AAH) in East Kwaio, Malaita, Solomon Islands, in applied research and laboratory methods. The project, run by AAH, included the performance of a cross-sectional survey for soil-transmitted helminths in two remote villages (ethical approval: AAH Ethics 008). In 3 (0.5%) of 586 samples, helminth eggs measuring between 95 and 115 μm by 47 to 56 μm and similar in morphology to *Trichostrongylus* species were observed (Fig. 1). These were identified as belonging to species of *Meloidogyne*, a root-knot nematode of plants and spurious parasite of human beings. The three participants with these eggs were a 51-year-old male, a 29-year-old female, and a 54-year-old female from different households.

The genus *Meloidogyne* is an obligate nematode parasite of plants causing root-knot disease and contains more than 90 described species, with the four most commonly occurring species in agricultural crops being *M. incognita*, *M. arenaria*, *M. javanica*, and *M. hapla* (1). In the Pacific, root-knot disease has been reported in taro, yam, and sweet potato (2). Eggs of *Meloidogyne* are attached to the surface of such vegetables and pass through the alimentary canal of humans when eaten (3). Root vegetables such as these form a large part of the diet in Melanesia, and so it is unsurprising that eggs of this nematode would be commonly passed by people in the Solomon Islands. Eggs are on average between 82 and 120 μm long by 24 to 43 μm wide, elongate, and thin shelled with rounded ends and may be asymmetric, being curved to one side. Eggs may contain a simple morula, be in the early stages of cleavage, or be fully larvated (Fig. 1). These features serve to differentiate eggs of this nematode from other nematode parasite eggs of similar size which might be seen in human fecal samples (Table 1).

The passage of *Meloidogyne* eggs in human feces was first noted during a hookworm survey of American troops during the First World War (4). A total of 429 (0.3%) of 140,000 soldiers screened were found to be passing these eggs. It was at the time incorrectly identified as a novel species of pinworm and named *Oxyurus incognita*. Some years later, Sandground proved by experimentation that this was a spurious parasite and that the true source of these eggs was ingestion of eggs of plant nematodes (5). Over the proceeding 40 years, cases of *Meloidogyne* egg passage were noted in surveys of human parasites and unusual or spurious parasites found in clinical laboratory practice were reported with ever-decreasing regularity (6–19). There has been no further mention since 1970 (19).

Where did *Meloidogyne* spp. in human fecal specimens go? This spurious parasite is described in some modern parasitology atlases (3), and the phenomenon of its passage by humans has been adequately described. Perhaps the apparent disappearance of *Meloidogyne* spp. from humans is partially attributable to the gradual loss of morphological skills as helminth infections have become less prevalent in the industrialized world and to potential misdiagnosis as another parasite with similar morphology. The absence of recent case reports in parasitological surveys may simply reflect a modern reticence to report spurious parasitoses in such surveys. Another possibility is that passage of *Meloidogyne* eggs occurs less often in the modern world than it did in previous decades. There has been a general decrease in the consumption of raw root vegetables, and modern consumers in industrialized nations selectively avoid the consumption of damaged or diseased vegetables. These factors have combined to reduce the rates of root knot nematode egg passage in modern society. However, given the ubiquitous nature and worldwide distribution of these nematodes in plant roots, the recent increased interest in “Paleo” diets and organic vegetables may see a return of *Meloidogyne* egg passage in clinical laboratories. Those performing clinical parasitology screening should be familiar with this spurious parasite to avoid mistakes of identification and unnecessary treatment of patients.

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TABLE 1 Size comparison of hookworm-like eggs reported from human feces

<table>
<thead>
<tr>
<th>Nematode</th>
<th>Breadth (μm)</th>
<th>Width (μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physaloptera spp.</td>
<td>44–65</td>
<td>32–45</td>
</tr>
<tr>
<td>Strongyloides fuelleborni/S. kelly</td>
<td>45–55</td>
<td>30–35</td>
</tr>
<tr>
<td>Gongylonema pulchrum</td>
<td>50–70</td>
<td>25–37</td>
</tr>
<tr>
<td>Anclylostoma spp.</td>
<td>55–65</td>
<td>36–40</td>
</tr>
<tr>
<td>Necator americanus</td>
<td>60–75</td>
<td>36–40</td>
</tr>
<tr>
<td>Oesophagostomum spp.</td>
<td>58–69</td>
<td>39–47</td>
</tr>
<tr>
<td>Haemonchus contortus</td>
<td>75–85</td>
<td>41–48</td>
</tr>
<tr>
<td>Ternidens deminutus</td>
<td>70–94</td>
<td>47–55</td>
</tr>
<tr>
<td>Trichostrongylus spp.</td>
<td>75–95</td>
<td>40–50</td>
</tr>
<tr>
<td>Ostertagia spp.</td>
<td>80–100</td>
<td>40–50</td>
</tr>
<tr>
<td>Mammomonogamus laryngeus</td>
<td>85–90</td>
<td>50</td>
</tr>
<tr>
<td>Meloidogyne spp.</td>
<td>82–120</td>
<td>24–56</td>
</tr>
<tr>
<td>Mecistocirrus digitalis</td>
<td>95–120</td>
<td>56–60</td>
</tr>
<tr>
<td>Nematodirus abnormalis</td>
<td>150–260</td>
<td>65–110</td>
</tr>
<tr>
<td>Marshallagia marshalli</td>
<td>180–200</td>
<td>75–100</td>
</tr>
</tbody>
</table>

* Data are from references 3, 20, 21, 22, 23, 24, and 25.

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