Comunicación Corta / Short Communication

Morphological differentiation of eggs from three trematode species in ruminants from Peru

Diferenciación morfológica de huevos de tres especies de trematodos en rumiantes del Perú

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Abstract

In Peru, domestic and wild ruminants may be parasitized by 3 species of trematodes, Fasciola hepatica, Paramphistomum ichikawai and Cotylophoron panamensis. These species could be present in the same animal and at the same geographic location, so it is necessary to know the characteristics of eggs in order to avoid diagnostic errors in routine stool examinations. Therefore, the morphology of the eggs of these species was performed in this study. A striking finding was that C. panamensis eggs showed fine striations in the surface of the shell by optical microscopy, supported by scanning electron microscopy.

Keywords: Fasciola hepatica | Paramphistomatidae | Microscopy, Electron.

Introduction

In Peru, trematodiosis is a parasitic disease mainly in cattle and sheep that causes significant economic losses. The etiological agents are Cotylophoron panamensis, C. cotylophorum, Paramphistomum ichikawai and Fasciola hepatica, whose eggs are very similar by microscopy.¹ The clinical diagnosis in cases of hepatic fascioliasis and paramphistomiasis in ruminants remains difficult and immunological diagnostic methods are quite often inconclusive,² but some of them maybe recognized in post...
mortal examination. Visualization of eggs by coprological tests is required to confirm the diagnosis. Since these 4 parasites may be found in the same geographic region in some areas of Peru, or even in the same animal, the visualization of a trematode egg can involuntarily be misdiagnosed with another parasitic specie with implications on the treatment. Therefore, the aim of this study is to describe in detail the morphological features of the eggs of these parasites in routine stool examinations.

*C. panamensis* and *P. ichikawai* eggs were obtained from the last portion of the uterus and stools of animals from slaughterhouses and livestock farms in the cities of Cajamarca (Cajamarca) (7° 9’ 52” S, 78° 30’ 38” W) (highlands), Tingo Maria (Huánuco) (9° 17’ 43” S, 75° 59’ 51” W) (rainforest), Oxpampa (Pasco) (12° 34’ 3” S, 75° 24’ 14” W) (rainforest) and Iquitos (Loreto) (3° 43’ 46” S, 73° 14’ 18” W) (rainforest), Peru; *F. hepatica* eggs were collected from the gallbladder and stools obtained at a local slaughterhouse, in Lima city (coast). Eggs in feces were obtained by applying the sedimentation method.

One hundred eggs of the three species were morphologically examined. The measurements were microns, scoring first the average and then the range sizes in parentheses. Digital photographs were obtained in all 3 species. Furthermore, in order to elucidate the details of the shell the eggs of *F. hepatica* and *C. panamensis*, electron microscopy was performed in the Laboratory of Specialized Equipment at the Post-Graduate School Unit of the Faculty of Biological Sciences, National University of San Marcos, Lima, Peru.

Results from the microscopic examination are shown in table 1 and figs. 1, 2, 3, 4 and 5.

**Table 1. Comparison of the eggs from 3 species of Paramphistomidae in ruminants in Peru** (measurements in microns, average in parentheses).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th><em>P. ichikawai</em></th>
<th><em>P. panamensis</em></th>
<th><em>F. hepatica</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>112 – 136 (128)</td>
<td>104 – 125 (121)</td>
<td>114 – 145 (126)</td>
</tr>
<tr>
<td>Width</td>
<td>65 – 75 (70)</td>
<td>50 – 70 (65)</td>
<td>60 – 78 (65)</td>
</tr>
<tr>
<td>Shape</td>
<td>Oval, symmetrical</td>
<td>Oval. Slightly asymmetrical</td>
<td>Oval, symmetrical</td>
</tr>
<tr>
<td>Color</td>
<td>Pale yellow</td>
<td>Golden yellow</td>
<td>Golden yellow</td>
</tr>
<tr>
<td>Shell</td>
<td>Thin, smooth</td>
<td>Thin, finely ornamented</td>
<td>Thin, smooth</td>
</tr>
</tbody>
</table>

*F. hepatica*, a liver fluke, is endemic in Peru mainly the Andean Region (Lima, Ancash, Cajamarca, Pasco, Huánuco, Junín, Cusco, Apurímac, Ayacucho, Arequipa, Ica, Moquegua, Tacna, Amazonas, Puno, Huancavelica). Human cases of *F. hepatica* have been also described in some of these regions. In the case of fascioliasis or the infection caused by *F. hepatica*, the adult parasite is found in the bile ducts generating in some cases fibrosis, dilatation, cirrhosis and obstruction, and the migratory phase results in a very serious hemorrhagic hepatitis.
The 3 Paramphistomidae species infecting wild and domestic ruminants in Peru are *C. cotylophorum*, *C. panamensis* and *P. ichikawai* and are distributed mainly in the departments of Cajamarca, Amazonas, Pasco, Loreto, Huanuco (Tingo Maria) and San Martin (mainly rainforest). Moreover, these 3 species may be present in animals in the same geographic area which makes the differentiation of the eggs and species by coprological tests difficult to elucidate. By histopathology, the juvenile stage of these species causes mainly hemorrhagic catarrhal enteritis in the duodenum and jejunum by migration of the parasite that can lead to death of the animals, mostly in those under 1 year old.

In Peru, there have been no reported cases of infection by *Paramphistomum* or *Cotylophorus* in humans; however, it is important to note that in Venezuela there has been described a case of infection by *Paramphistomidae* in a malnourished girl, whose diagnosis was based on the adult worms and eggs eliminated in stools. Thus, human infections are possible by this parasite. Appropriate sedimentation techniques by using stool samples have been developed for coprological diagnosis purposes, although there
is sometimes difficult to visualize because they are mistaken with artifacts such as plant fibers found in the sediment. It has been shown that the application of some stains such as methyl green, methylene blue and toluidine blue may allow to differentiate *F. hepatica* from *Paramphistomum* sp. eggs.

*F. hepatica* and *P. ichikawai* eggs are similar in morphology and size. The shell of *F. hepatica* is smooth according to a previous study by scanning microscope. According to our observations, the shell in *P. ichikawai* is smooth but colorless. We believe that it would there may be more difficult to differentiate the eggs of *F. hepatica* from *Cotylophoron panamensis* due to similarity. Nonetheless, *C. panamensis* eggs are slightly asymmetric and have a finely ornamented shell as seen under light microscopy and confirmed with scanning electron microscopy. In relation to the dimensions, we can conclude that they may vary as reported somewhere else.

The eggs of these 3 species including, *P. ichikawai, F. hepatica* and *C. panamensis*, can be distinguished by their morphological and structural features by using the features as described in this study.

**Authors contribution:** MTV, designed the study, analyzed the results and wrote the paper. JAT, did the parasites collection and review the manuscript with comments and suggestions. MQH, prepared the samples and contributed in technical assistance. SDM, drafted the manuscript.

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**References**

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