Opportunistic Pneumocystis carinii Infection in Red-Bellied Tamarins (Saguinus labiatus)

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Abstract: P. carinii infection in red-bellied tamarins (Saguinus labiatus), born and maintained in a laboratory breeding colony, was examined by histopathologic examination postmortem. P. carinii cysts were detected in 6 of 10 red-bellied tamarins examined, by using Grocott's, toluidine blue O and immunostaining with avidin-biotin complex using antisera for rat-, simian-, and human-P. carinii. The results obtained from the present studies imply that P. carinii may be an important pathogen in this species.

Key words: P. carinii, tamarin

Pneumocystis carinii (P. carinii) is one of the causative agents of opportunistic infections and a widely distributed organism among a variety of animal species including human beings [5]. It is known that P. carinii causes fatal pneumocystosis in immunocompromized patients such as those with AIDS. We and other authorities have reported on cases of fatal and systemic pneumocystosis in rhesus monkeys (Macaca mulatta) infected with simian immunodeficiency virus and revealed that the activation of latent P. carinii infection occurred in these monkeys [1, 4]. The recorded data indicate that P. carinii infection is a common opportunistic infection in monkeys. So far, P. carinii infection has been reported in Saguinus nigriceps, Saguinus fuscicollis and Saguinus oedips [7], but there is no report of P. carinii infection in red-bellied tamarins (Saguinus labiatus). Recently we had the opportunity to examine P. carinii infection in red-bellied tamarins, and the results revealed that a high incidence of P. carinii infection was found in these monkeys under histopathologic examination. To our knowledge, this is the first report on P. carinii infection in red-bellied tamarins.

The ten red-bellied tamarins examined in this study were born in a laboratory breeding colony at the Tsukuba Primate Center (TPC) and were maintained in individually isolated cages at the animal facilities of TPC until death. They consisted of four male and six female monkeys ranging in age from 3 days to 7 years.

(Received 16 June 1998 / Accepted 20 August 1998)
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Table 1. Detection of *Pneumocystis carinii* by histopathologic examinations

<table>
<thead>
<tr>
<th>Case</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days to death</td>
<td>3</td>
<td>4</td>
<td>45</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>1730</td>
<td>2310</td>
<td>2555</td>
<td>2585</td>
</tr>
<tr>
<td>Sex</td>
<td>F</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td><em>P. carinii</em></td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
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</table>

F: female, M: male.

and one month old (Table 1). Postmortem examinations were performed on all the monkeys within 12 hr of their natural death. Their lungs were removed and fixed with 10% neutral buffered formalin, and paraffin sections were made for histopathologic examinations. Hematoxylin-Eosin (H-E), Grocott's, and toluidine blue O (TBO) stainings were performed as described previously [2, 6]. Immunostaining with avidin-biotin complex staining (ABC) with rabbit anti-mouse, -rat and -simian *P. carinii* immunized sera and a mouse monoclonal antibody for human *P. carinii* (Dako, Carpinteria, CA) was conducted to detect *P. carinii* cysts in the lungs.

At autopsy, the lungs showed almost normal findings, but, *P. carinii* cysts were detected in 6 of 10 tamarins on histopathologic examination although the number of cysts was not so high. The 4–7 μm sized cysts were attached individually to the alveolar surface or were in alveolar spaces without any infiltration into the inflammatory cells (Fig. 1). The cysts were hardly detected by HE staining, but were stained as black ovum or round shaped material with Grocott's or purple with TBO, and were colored brown with ABC staining by using different sources of anti-*P. carinii* sera. Except for these findings, no histopathologic changes were found in the lungs, and the cysts observed by histopathologic examination in this study were morphologically identical to *P. carinii* derived from other hosts.

It is considered that *P. carinii* infection is one of the common opportunistic infections in monkeys, and although red-bellied tamarins are widely used in the medical research field, there has been no report of *P. carinii* infection in red-bellied tamarins up to now. In this study, *P. carinii* cysts were detected in 60% of laboratory-bred tamarins, without the administration of any immunosuppressant. It has been reported that 11.3% of wild-born and 11.9% of laboratory-bred marmosets were infected with *P. carinii* on histopathologic examination [7]. These observations suggest that *P. carinii* is one of the common opportunistic pathogens for small sized New World monkeys such as the *Saguinus* species, in both wild-caught and laboratory-born colonies. Relatively high incidences of *P. carinii* infection were detected in this colony of tamarins, but it is not clear whether the infection was acquired from within the colony or not. Since no other experimental animals have ever been housed in the same room with

![Fig. 1. Cluster of *P. carinii* cysts on alveolar surface (arrowhead). TBO stain, × 1250.](image_url)
the tamarins, it is assumed that the infection is naturally occurring.

We used the ABC method to detect *P. carinii* cysts by using antisera to various *P. carinii* derived from different hosts. Since the cysts of the tamarin were stained by these antisera, it is suggested that the cysts have an antigen common to other *P. carinii* [3]. The findings obtained from the present studies suggest that *P. carinii* may be an important pathogen in this species.

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**References**