ONCHOCERCIASIS IN BRAZIL: NEW FINDINGS AMONG THE
YANOMAMA INDIANS1,2

Mario A. P. Moraes3 and Geovane M. Chaves4

As previously reported,2 an endemic focus of onchocerciasis, the so-called "river blindness" widespread in parts of Africa but limited to a few isolated parts of the Americas, has been discovered in Brazil. The survey of Yanomama Indians described on these pages represents part of a continuing effort to determine the extent of the affected region.

Introduction

Onchocerciasis was first reported in Brazil in 1967 by Bearzoti, et al. (1), who described the case of a three-year-old child with two nodules in the scalp. The child had clearly acquired the disease in the Federal Territory of Roraima. Possibly because of difficulty determining just where the case had arisen, however, the discovery did not lead to research directed at finding a possible focus of the disease in this region.

In 1972, Moraes and Dias (3) reported finding two more cases in American women missionaries living near the Toototobi River, a tributary of the Demini River in the State of Amazonas. Both women had nodules in the sacral region that were several years old, and both had been living close to villages ("malocas") of Waica Indians belonging to the Yanomama group.

Some time later, Moraes and Chaves (4) found another case in an American woman missionary; this missionary was living in the Surucucus Mountains of the Roraima Territory, an area likewise inhabited by the Waicas. The fact that the three missionaries had lived for many years in close proximity to tribes of the Yanomama group, whose villages occupy widespread territory in the area of the Brazil-Venezuela border, led Moraes and Chaves (4) to advance the hypothesis that onchocerciasis was endemic in the region, that the entire Yanomama group was involved, and that the disease had probably come into the area from Venezuela. Reinforcing this hypothesis was the fact that the Yanomama region encompasses the Parima, Surucucus, Uruzucoire, Tapirapeco, and Curupira mountain ranges, which extend along the Brazil-Venezuela border for some 500 kilometers; the locale thus has sufficient altitude to favor proliferation of the vectors of O. volvulus (flies of the genus Simulium, known as "borrachudos" or "piums," which are abundant in the region).

This theory received confirmation in 1973, when Moraes, Fraiha, and Chaves (5) found that 57 Waica Indians of the Toototobi River area (out of 91 examined) had microfilariae in their skin. These Indians were residents of three separate villages, but the percentage of positive findings was fairly similar in each village. Among the positive cases were Indians who had previously lived near the upper Orinoco River in Venezuela and along the Mapulau River, a tributary of the Demini slightly to the south of the Toototobi.

Shortly afterwards Moraes (6) had an opportunity to examine biopsy material taken from 13 more Indians living along the Mapulau River and from three Venezuelan Indians living at a
FIGURE 1—A map showing the geographic distribution of the Yanomama and Makiritare Indian groups. The Yanomamas are scattered over more than 90,000 square kilometers in Brazil and Venezuela.

locality named Nenez. All three of the latter were positive for *O. volvulus*, as were 10 of the 13 Mapulaú residents. (A malaria epidemic in the Mapulaú region had caused many Indians to go to the Toototobi area to seek help from the local mission, and it was there that the biopsies were performed.)

In all, out of 107 individuals examined in the Toototobi region, 56 per cent were found to be positive for *O. volvulus*.

This discovery of an onchocerciasis focus with a fairly high infestation index in the northernmost part of Brazil at once created a need (among other things) to determine the extent of the problem.

The Yanomamas are a large Indian group—some 10,000 strong, according to Chagnon, et al. (2)—and are scattered over a very wide area. On the Brazilian side their region includes part of northern Amazonas and almost the entire western part of the Roraima Territory. Within this expanse the locale most clearly in need of investigation was the area of the Surucucus Mountains, where one of the three missionaries known to have the disease had been living.

**Materials and Methods**

A total of 57 Yanomama Indians (32 males and 25 females) were examined at the Surucucus mission post. They were residents of villages with the following names: Aikamteri, Koamaiteri, Parafuri, Xamokrenoteri, Ximixiuteri, and Xinamoteri.

The examination involved removing a small skin sample with fine-pointed scissors. This was usually done in the area of the shoulder blades, but if any cutaneous lesion characteristic of onchocerciasis was observed the sample was taken from the area of the lesion. The material obtained was placed in a drop of saline solution on a glass slide, warmed slightly, and covered with a coverslip. It was then examined for microfilariae under low magnification for several minutes. If the first examination proved negative, a second was carried out (using the same slide) 10 to 15 minutes later.

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591 from the Toototobi region, 13 from the Mapulaú River area, and three from Venezuela.
The subjects tested were also examined for subcutaneous nodules and ocular lesions. Unfortunately, lack of adequate resources prevented us from examining subjects for microfilariae in the anterior chamber of the eye. All nodules that were found were surgically removed.

Results

Skin samples from 27 of the 57 Indians examined were found to contain microfilariae, revealing an infestation index of 47.3 per cent. A greater proportion of women (56 per cent) than men (40.6 per cent) were found to be harboring the parasite.

It was not possible to classify the Indians examined by precise age groups, because the local mission had no register. Nevertheless, on the basis of their appearance we did attempt to separate the individuals tested into three general groups—children (under 15 years), young adults (15-40 years), and older people (over 40 years). Using this classification, the positive cases were distributed as follows:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Total</th>
<th>No. positive</th>
<th>% positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>11</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Young people</td>
<td>36</td>
<td>17</td>
<td>47.2</td>
</tr>
<tr>
<td>Older people</td>
<td>10</td>
<td>10</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>27</td>
<td>47.3</td>
</tr>
</tbody>
</table>

As had previously been observed in the Toototobi River area, all test subjects in the “over 40” category were found to be infested with *O. volvulus*.

Despite maternal objections, we were able to obtain skin samples from a number of children under 10 years of age (this had not been possible in the Toototobi region). All of these samples yielded negative results.

Nodules were found on five Indians, all of whom tested positively for microfilariae. In four cases the nodules were located on the scalp, and in the other on the iliac crest. Histopathologic examination of these nodules revealed adult filariae in all cases, though some were already dead and in a state of degeneration.

Two Indian males, both of them young,
were found to be blind in one eye, but they attributed this to traumatic causes. In addition, two women who were both fairly old were discovered to have keratitis and loss of vision. All four subjects were found to be infested with microfilariae, and one had a nodule on the scalp.

Cutaneous manifestations attributable to *O. volvulus* microfilariae were also observed. These most frequently consisted of erythematous and intensely pruritic papules located on the buttocks and back, or of thick, shiny wrinkled patches of skin (some quite large) on the buttocks, back, and extremities. When lesions like these were observed they were chosen as the site for the biopsy, since the authors' experience in the Toototobi area indicated that such lesions were invariably positive for microfilariae.

In addition, skin samples were taken from four missionaries (two of whom had lived in the Surucucus area for several years) and from two Indians of the Macuxi tribe, the latter being situated in an area named Maracaña to the east of the Roraima Territory. All of these samples yielded negative results.

Discussion

This new finding of onchocerciasis among Indians of the Yanomama group tends to confirm what we suggested in our earlier paper concerning the extent of this focus in the Brazil-Venezuela border region. It can now be said with assurance that besides taking in some of northern Amazonas State, the focus encompasses a large part of the Roraima Territory as well. This whole region is hard to reach and is inhabited almost exclusively by the Yanomamas, who live in over 100 widely scattered villages on both sides of the border. Each village generally contains between 40 and 250 inhabitants.

While the confirmed infestation index in the Surucucus area was high (47.3 per cent), it was nevertheless lower than that found in the Toototobi River area (62.6 per cent). The inclusion of children under 10 does not appear to have affected the findings significantly, since the number of children involved was small. What does seem likely is that in some villages the problem is more serious than in others, because of differing local conditions. Data from the two largest villages included in the present study, Koamaiteri and Aikamteri, illustrate this point. In the former the infestation index found was 63.1 per cent; however, in the second, where approximately the same number of persons were examined, this index was only 46.6 per cent.

The proportion of infested persons found with subcutaneous nodules was 18.5 per cent, approximately the same percentage as was found among the Toototobi test subjects (17.5 per cent). The number of blind persons discovered was small, but the proportion was relatively larger than among those living in the Toototobi area. However, in the absence of a complete examination it is not certain that the lesions observed were due to onchocerciasis.

ACKNOWLEDGMENTS

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SUMMARY

To further evaluate the extent of a focus of onchocerciasis recently discovered in Northern Brazil, the authors have carried out a survey among the Yanomama Indians in the Surucucus
Mountains of the Federal Territory of Roraima. It was in this region that the authors had previously found a woman missionary with onchocercial nodules. Fifty-seven Indians from several villages ("malocas") were examined, of which 27 (approximately 48 per cent) were found to have Onchocerca volvulus microfilariae in their skin. However, only five of these 27 (18.5 per cent) were found to have subcutaneous nodules.

These findings support the previously presented hypothesis that onchocerciasis is endemic among the Yanomama Indians, who occupy a large expanse of territory on both sides of the Brazil-Venezuela border.

REFERENCES

(6) Moraes, M.A.P. Unpublished data.