# Diagnosis of Strongyloidiasis: Importance of Baermann's Method

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THE DIAGNOSIS of strongyloidiasis may be made with certainty only if the larvae and/or, rarely, the eggs of *Strongyloides stercoralis* are found. The symptoms of this parasitism are not distinctive, and would barely suggest the diagnosis in areas where it would not normally be expected.[1]

Several methods have been proposed for making a diagnosis of infestation by *S. stercoralis*. Gomes de Moraes[2] grouped them as follows:

1. Examination of the stools (direct method; after concentration; by culture; extraction of the larvae)
2. Examination of the duodenal aspirate (direct method; after concentration)
3. Blood count
4. Examination of the sputum, urine, or other organic fluids (direct method; after concentration)

## EXAMINATION OF STOOLS

Examination by direct method, after concentration, and by stool culture have been found to have no special advantages for diagnosis of strongyloidiasis. The methods of larvae extraction are based on the positive thermotropism and hydrotropism of the *S. stercoralis* larvae. Baermann's method, which takes advantage of these characteristics, was originally used to isolate larvae of *Ancylostoma duodenale* from earth and, later on, from stools. According to Shikhobalova and Semenova,[6] Hefter was the first to use this technic for the diagnosis of strongyloidiasis.

In our medical service this method is performed as follows. A simple glass funnel, 15 cm. in diameter, is connected to a simple test tube by a rubber tube. This system should contain water up to half the depth of the glass funnel and care should be exercised to eliminate all air that may remain inside the test tube. The system is mounted on a metal

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support in such a manner that the test tube is submerged in a glass containing water warmed to 40°C. The water should be constantly renewed so that its temperature remains constant during all the procedure. The feces are placed in gauze which, in turn, is placed inside the funnel

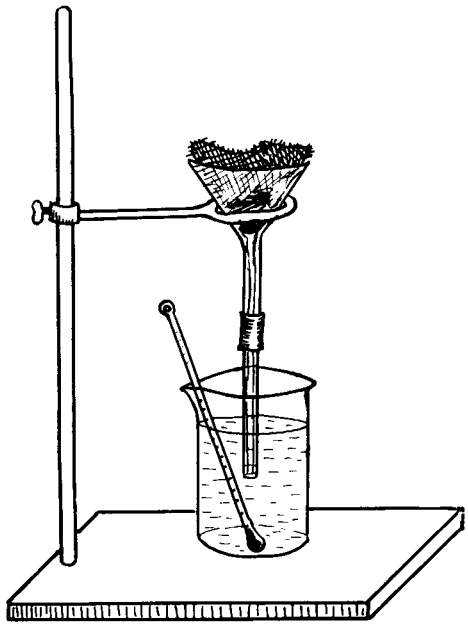

**Fig. 1.** Apparatus for performing examination by Baermann's method.

(Fig. 1). After 2 hours the contents are centrifuged at low speed for 1 or 2 min. The floating matter is discarded and the homogeneous sediment is taken off with a pipet and examined on a watch-glass. This examination is made after removal of the microscope objective. A low magnification is used (X17).

## EXAMINATION OF THE DUODENAL ASPIRATE

The larvae, and very rarely the eggs, may be recognized in the duodenal aspirate.

Paula Silva[7] studied 17 patients with strongyloidiasis in 15 of whom the diagnosis was established by examining the duodenal aspirate. However, in only 4 were the stool examinations positive.

In 1142 examinations of the duodenal aspirate, Cançado[8] observed larvae of *S. stercoralis* in 9 per cent of the cases. It is interesting to point out that this same author, in another paper,[9] using the direct method

in 2500 stool examinations, observed *S. stercoralis* in 8.6 per cent of the cases.

Microscopic examinations of an unconcentrated and a concentrated smear of feces and/or of aspirated duodenal contents were the methods used by Jones[10] in the investigation of 100 hospitalized male veterans. A total of 952 stool examinations were performed, of which 27.4 per cent were positive. Twenty patients showed consistently negative results, although their symptoms were severe and more than 5 fecal examinations had been performed in each instance. Duodenal intubation was done in 71 patients. Positive results were found in 65 (91 per cent). In 6 patients the larvae could not be found in duodenal aspirate, although the parasite had been found in the stools. The conclusion was reached that both methods should be used in conjunction and that the duodenal intubation was much more efficient than stool examination for the diagnosis of strongyloidiasis.

Later on, Jones and Abadie[11] bore out this conclusion by studying 193 patients who were known to be infected with *S. stercoralis*. A total of 1874 stool examinations and 263 duodenal intubations were performed. The latter were positive in 68 per cent of the 145 patients studied contrasting with the 27 per cent of positive findings obtained by the first method. Stools were examined by microscopic inspection of one or more direct fecal films and after concentration by the zinc sulfate–centrifugal method of Faust. Again the conclusion was reached that, concerning the diagnosis of strongyloidiasis, the examination of duodenal aspirate is superior to fecal examination.

It must be emphasized, however, that in all these papers a comparison was made between duodenal intubation and stool examination performed by direct method or after concentration following Faust's technic.

A comparative study between duodenal intubation and stool examination by the method of Baermann was performed by Coutinho *et al.* [5,12] This is, as far as we know, the only paper comparing Baermann's procedure and duodenal intubation. In 38 patients in whom the larvae of *S. stercoralis* were found using Baermann's procedure, only 24 showed the larvae in the duodenal aspirate.

Moreover, duodenal intubation is troublesome, impractical, and could not be used in a general survey of the incidence of this parasite in a certain population. Furthermore, Gomes de Moraes[2] and Pessôa[13] share the opinion that the aspirate from duodenal intubation derives only from the first and second portions of the duodenum. Therefore, as *S. stercoralis* is not always in these intestinal segments, the examination of duodenal aspirate would have negative results many times in well-recognized cases.

A complete blood count is only an auxiliary method. It is of value only with respect to the presence or absence of anemia and/or eosinophilia.

The finding of larvae of *S. stercoralis* in sputum,[14] urine,[15] or pleural effusion[16] is very rare. It is rather a curiosity than a diagnostic procedure.

## MATERIAL AND METHOD

The investigation was performed on the first 1000 patients hospitalized in one of the wards of a general hospital (Santa Casa de Misericórdia of Pôrto Alegre). The stools from 736 patients were examined. The feces were always examined by Baermann's method and after concentration by the zinc sulfate–centrifugal method (Faust) or by formol-ether (Ritchie).

The stools were always examined immediately after being eliminated, and care was taken to differentiate larvae of *S. stercoralis* from those of *Necator americanus*. Our results are summarized in Table 1.

TABLE 1. RESULTS OF EXAMINATION OF STOOLS FROM 736 PATIENTS

| | *No. of cases* | *% of all patients* | *% of infected patients* |
|---|---|---|---|
| Infected patients | 452 | 61.4 | .... |
| With *S. stercoralis* | 243* | 33.01 | 53.7 |
| With *N. americanus* | 225 | 30.5 | 49.7 |
| With *T. trichiura* | 220 | 29.8 | 48.6 |
| With *A. lumbricoides* | 111 | 15.0 | 24.5 |

*Baermann's method, 240 (32.6 per cent); Faust's or Ritchie's technic, 55 (7.4 per cent).

## RESULTS

Review of the cases of the first 190 patients hospitalized in our service[3] gave results almost identical with those shown in the Table. The incidence of *S. stercoralis* was 32.6 per cent, and *S. stercoralis* was the nematode most frequently observed.

In the present review of 736 patients the same results would not have been obtained if only Faust's or Ritchie's method, or both, had been used. The incidence of strongyloidiasis would have been 7.4 per cent instead of 33.01 per cent. In other words, using Baermann's, Faust's, and Ritchie's procedures of fecal examinations in 736 patients, we found 243 cases infected with *S. stercoralis,* 240 of whom were diagnosed by Baermann's method and 55 by Faust's or Ritchie's technic. In only 3 patients were larvae of *S. stercoralis* demonstrated by these latter methods and not by Baermann's method of extraction.

## COMMENTS

Our results show the superiority of Baermann's procedure over the most commonly used concentration methods of stool examination. This opinion is shared by all authors who have performed these studies. Gomes de Moraes[2] in the Rio Doce area, concluded that Baermann's method is three times more efficient than Faust's procedure in the diagnosis of strongyloidiasis. In a coprological survey in this area, this author examined 1007 cases, 587 of whom showed positive results for *S. stercoralis*. It is interesting to point out that another coprological survey in this same area, performed by Bassères and Pantoja[17] using Faust's technic, had revealed an average incidence of strongyloidiasis of 20.6 per cent in 5044 examinations performed. Mercer[18] also found that Baermann's method is about four times more efficient than Faust's technique. In the Rio Preto area, in 4828 stools examinations, he observed positive results in 33.1 per cent of the cases. Coutinho *et al.*,[19] studying 500 patients hospitalized in Hospital das Clínicas de São Paulo, observed an incidence of *S. stercoralis* of 35.2 per cent.

The review of the literature and our own material show the high incidence of *S. stercoralis* when Baermann's procedure is used. It emphasizes the importance of this technic and the necessity of using it as a routine procedure in the fecal examination.

## SUMMARY

The several methods for the diagnosis of strongyloidiasis are reviewed and the authors' experience is presented. The conclusion was reached that Baermann's procedure is the method of choice, and, as such, it should be used in the routine fecal examination.

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