

THE EFFICIENCY OF LUTZ, KATO-KATZ AND BAERMANN-MORAES (ADAPTED) TECHNIQUES ASSOCIATION TO THE DIAGNOSIS OF INTESTINAL HELMINTHS

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The association of Lutz/Kato-Katz and Lutz/Baermann-Moraes (adapted) techniques was used to improve better results that ranged from 0.4 to 11 times in the search of eggs of Ascaris lumbricoides, Schistosoma mansoni, Trichiuris trichiura, Taenia sp. and larvae of Strongyloides stercoralis.

Key words: helminthiasis – stools examination – Kato-Katz – Lutz – Baermann

The examination of stools for protozoa and helminths is one of the oldest laboratorial tests. In 1680 a Dutchman, Antony van Leeuwenhoc, the Father of Protozoology, (Hoare, 1972) described organisms observed by him in the gut of horse-flies, and *Giardia intestinalis* in his own stools (Dobell, 1932).

Since 1917 the Baermann technique, adapted by Moraes (1948) and Coutinho (1951) is available. Kato & Miura (1954) and Katz et al. (1972) introduced the Kato-Katz technique aiming to improve the finding of eggs and larvae of helminths.

The efficiency of the parasitological techniques has been studied by many authors for a long time (Ferreira, 1966; Coura & Conceição, 1974; Mello et al., 1977; Chaves et al., 1979; Castilho et al., 1984; Maia da Silva et al., 1986; Souza Dias et al., 1989; Bezerra Alves et al., 1989; Willcox & Coura, 1989).

Numerous serological techniques have been employed for intestinal parasites antibody detection (Krupp, 1972; Goodson & Dyess, 1977; Brazil et al., 1988; Barbosa Campos et al., 1988). However the possibility that the immunologic techniques should become a substitute to the usual stools examination is scanty due to: (1) serological tests are always more expensive; (2) the execution takes more

time; (3) there are difficulties in getting proper antigens; (4) the occurrence of cross-reactions, and (5) the use of an indirect method instead of a direct one. As a matter of fact the possibility of using the serological test for epidemiological studies should be taken into consideration.

Many of the techniques used nowadays show good efficiency, easy performance and low costs, besides that they allow a rapid and safe laboratorial diagnosis to find throphozoites and/or cysts of protozoa, eggs and/or larvae or even adults helminths.

MATERIALS AND METHODS

This study was based on 1463 stool samples presenting eggs and larvae of intestinal helminths. The material was obtained from field works realized in the municipalities of Santa Cruz do Escalvado, Minas Gerais state, from June 1989 to December 1990, and Coari, Amazonas state, in June 1991. In Santa Cruz do Escalvado 2123 samples were examined through Lutz, Baermann-Moraes (adapted) (Willcox & Coura, 1989) and Kato-Katz techniques. In the communities of São Francisco do Laranjal, Aranaí and São Lázaro, municipality of Coari, Amazonas state, 375 samples were tested only by Baermann-Moraes (adapted) and Lutz techniques.

A Laboratory with two microscopes, water bath, bench centrifuge, glass ware, chemicals and reagents was set up in both field areas. The

material was examined immediately after preparation. The Kato-Katz slides were transferred to the Tropical Medicine Department, at Oswaldo Cruz Institute, and were analyzed 15 days after preparation, therefore no hookworms eggs were found in those slides.

To develop the diagnosis of intestinal parasites, we decided to make some modifications in the Baermann-Moraes-Coutinho technique (Willcox & Coura, 1989) and to associate, at least, three different techniques to establish a better diagnosis for the intestinal helminths.

RESULTS

In the municipality of Santa Cruz do Escalvado 2123 samples of stools were examined by Lutz, Baermann-Moraes (adapted) and Kato-Katz techniques. 1594 (75.1%) were positive for cysts of protozoa and eggs and larvae of helminths. 1203 (75.5%) were positive for helminths: 460 (38.2%) presented eggs of *Ascaris lumbricoides*, 436 (36.2%) of *Schistosoma mansoni*, 109 (9.1%) of *Trichiuris trichiura*, 79 (6.6%) of hookworms 23 (1.9%) of *Taenia* sp. and 96 (8.0%) larvae of *Strongyloides stercoralis* (Tables I, II).

TABLE I

Results of parasitological tests in stools – Municipality of Santa Cruz do Escalvado, Minas Gerais state, from June 1989 to December 1990

Results	f	%
Helminths	1203	56.7
Protozoa	391	18.4
Negatives	529	24.9
Total	2123	100.0

f: frequency

The 391 (18.4%) samples which presented only protozoa cysts and also the 529 negative ones (24.9%) were not considered. The *Taenia* sp. and hookworms eggs will not be compared once the proper techniques were not used (Table II).

In 96 positive samples for *S. stercoralis* there was an agreement of 35 (36.5%) in both techniques. The Lutz individually showed 34 (35.4%), while the Baermann-Moraes (adapted) was positive in 27 (28.1%) (Table III).

TABLE II

Frequency (f) and prevalence (p) of eggs and larvae of helminths – Municipality of Santa Cruz do Escalvado, Minas Gerais state, from June 1989 to December 1990

Helminths	f	%	p (%)
<i>A. lumbricoides</i>	460	38.2	21.7
<i>S. mansoni</i>	436	36.2	20.5
<i>T. trichiura</i>	109	9.1	5.1
<i>S. stercoralis</i>	96	8.0	4.5
Hookworms	79	6.6	3.7
<i>Taenia</i> sp.	23	1.9	1.1
Total	1203	100.0	56.7

TABLE III

Comparison of positive results of Baermann-Moraes (adapted) and Lutz techniques in searching of *Strongyloides stercoralis* larvae in Santa Cruz do Escalvado, Minas Gerais state, from June 1989 to December 1990

Technique	Positive	%
Baermann + Lutz	35	36.5
Baermann	27	28.1
Lutz	34	35.4
Total	96	100.0

The comparison of the results of Lutz and Kato-Katz techniques (Table IV) shows a concordance ranging from 16.5% to 64.8% closely to *A. lumbricoides* and markedly distant to *T. trichiura* (Table IV).

In accordance to the results found for *A. lumbricoides*, *S. mansoni*, and *T. trichiura* it was firstly observed that the Kato-Katz technique was more efficient than the Lutz. If only the Kato-Katz was used it would certainly occur a loss of 122 (12.1%) cases for the three helminths; on the other hand, if only the Lutz technique was used, 337 (33.5%) of the samples would be negative (Table IV).

To determine how many times a technique is more efficient than the other the index $E = K/L$ was established, where E = efficiency index; K = positivity of Kato-Katz; L = positivity of Lutz.

TABLE IV

Concordance (C) and sensitivity (S) of Kato-Katz (K) and Lutz (L) techniques for helminths eggs – Municipality of Santa Cruz do Escalvado, Minas Gerais state, from June 1989 to December 1990

Parasite	Positivity							
	Total	C	%	K	%	L	%	S (K/L)
<i>A. lumbricoides</i>	460	298	64.8	95	20.6	67	14.8	0.42
<i>S. mansoni</i>	436	230	52.7	158	36.3	48	11.0	2.29
<i>T. trichiura</i>	109	18	16.5	84	77.1	7	6.4	11.00
<i>Taenia</i> sp.	23	7	30.4	11	47.8	5	21.8	1.20

The index for *A. lumbricoides*, *S. mansoni* and *T. trichiura* was respectively 0.42, 2.29 and 11 (Table IV).

In the municipality of Coari, Amazonas state, we recorded 260 positive samples for eggs and helminths larvae out of 307 (Table V). From 53 samples showing *S. stercoralis* (Table VI) Baermann-Moraes (adapted) and Lutz techniques were positive in 21 cases (39.6%); the Lutz individually was positive in 12 cases (22.7%), while the Baermann-Moraes (adapted) showed 20 cases (37.7%) (manuscript in preparation).

TABLE V

Results of 375 stool samples examined by Baermann-Moraes (adapted) and Lutz techniques in the communities of São Francisco do Laranjal (SFL), Aranaí (A) and São Lázaro (SL) – Municipality of Coari, Amazonas state, June 1991

Results	Communities			
	SFL	A	SL	Total
Protozoa	17	24	6	47
Helminths	105	133	22	260
	122	157	28	307
Negatives	18	41	9	68
Total	140	198	37	375

In the results found in Santa Cruz do Escalvado the Lutz technique was 7.3% more efficient than the Baermann-Moraes (adapted); however in Coari the Baermann-Moraes (adapted) was 15.0% more effective (Tables III, VI).

TABLE VI

Comparison of positive results of Baermann-Moraes (adapted) and Lutz techniques in searching of *Strongyloides stercoralis* larvae in the communities of São Francisco do Laranjal (SFL), Aranaí (A) and São Lázaro (SL) – Municipality of Coari, Amazonas state, June 1991

Technique	SFL	A	SL	Total	%
Baermann + Lutz	11	10	0	21	39.6
Lutz	03	09	0	12	22.7
Baermann	10	09	01	20	37.7
Total	24	28	01	53	100.0

DISCUSSION AND CONCLUSIONS

Most of the studies covering the helminths prevalence in Brazil do not use the Baermann-Moraes technique which is the best choice in the search of *S. stercoralis* and hookworms larvae (Camillo-Coura, 1970).

On the other hand the laboratorial routine in diagnosing helminths does not employ all the available techniques. The research is based on the sedimentation test (Lutz, 1919), probably due to the low cost, easier performance, and the good sensitivity of the technique for intestinal parasites.

For *A. lumbricoides* the difference between the two techniques is not very significant. However for *S. mansoni* the index of 2.28 for the Kato-Katz technique is rather than the one found in previous studies (Coura & Conceição, 1974; Castilho et al., 1984). We did not find an appropriate explanation for those results. Perhaps the revision of all the negative slides

of the Kato-Katz technique by different observers could contribute to increase the positivity.

The index 11 determined to *T. trichiura* eggs in the Kato-Katz technique is very close to the results found by Borges (1991) in the municipality of Paracambi, Rio de Janeiro state (personal communication).

As in the Lutz technique the *T. trichiura* eggs were less expressive, we decided to change the superficial tension, and to increase the centrifugation rate aiming to find more positive samples. Using the Kato-Katz technique as reference it was observed that the less positivity of the Lutz one is not related to the number of eggs laid. The possibility that the *T. trichiura* eggs should be laid on the external part of the stools such as *S. mansoni* does, must be considered.

Once the Lutz technique individually detected 46 samples (30.9%) of *S. stercoralis* and the Baermann-Moraes (adapted) 47 (31.5%), it is clear that it is necessary to use both techniques; on the contrary 30.0% of the cases will not be diagnosed.

REFERENCES

- BARBOSA CAMPOS, D. M.; OLIVEIRA, O. S.; BARBOSA, W.; CAMPOS, L. L.; ROSA, Z. S. & SOUZA, O. C., 1988. Antígeno de *Strongyloides cebus* (Darling, 1911) no diagnóstico da estrogiloidíase humana. *Rev. Pat. Trop.*, 17: 17-23.
- BEZERRA, J. G. A.; CASADO, R. J. A.; CRUZ, M. R. L. R.; MELO, M. T. & AZEVEDO, E. C., 1989. Positividade do exame parasitológico com uma, duas ou três amostras de fezes no diagnóstico das enteroparasitoses. *Revista do IMIP*, 3: 11-12.
- BRASIL, R.; BADARÓ, R.; ANDRADE, J. A. F.; ANDRADE, T. M. & CARVALHO, E. M., 1988. Diagnóstico sorológico da estrogiloidíase humana através de método imunoenzimático. *Rev. Soc. Bras. Med. Tropical*, 21: 139-143.
- CAMILLO-COURA, L., 1970. *Contribuição ao estudo das geohelminthiases*. Thesis, UFRJ, 213 p.
- CASTILHO, V. L. P.; GUIZELINI, E.; TURRI, E. S.; CAMPOS, R.; AMATO NETO, V.; MOREIRA, A. A. B. & SILVA PINTO, P. L., 1984. Exame parasitológico quantitativo das fezes. Estudo comparativo entre os métodos de McMaster, Stoll-Hansheer e Kato-Katz. *Rev. Soc. Bras. Med. Tropical*, 17: 209-212.
- CHAVES, A.; ALCANTARA, D. S. & SANTOS, J. S., 1979. Estudo comparativo dos métodos coprológicos de Lutz, Kato-Katz e Faust modificado. *Rev. Saúde Pública, São Paulo*, 13: 348-352.
- COURA, J. R. & CONCEIÇÃO, M. J., 1974. Estudo comparativo do método de Lutz, Kato-Katz e Simões Barbosa, no diagnóstico coprológico da esquistossomose mansônica. *Rev. Soc. Bras. Med. Tropical*, 8: 153-157.
- COUTINHO, J. O.; CAMPOS, R. & AMATO NETO, V., 1951. Nota sobre o diagnóstico e prevalência da strongiloidose em São Paulo. *Revista Clínica de São Paulo*, 1-2: 11-20.
- DOBELL, C., 1932. *Antony van Leeuwenhoc and his "little animals"*. London (Reprinted in 1960). *Apud Hoare*, 1972.
- FERREIRA, L. F., 1966. O estudo parasitológico das fezes – Estudo comparativo das principais técnicas. *O Hospital*, 70: 347-370.
- GOODSON, L. & DYESS, K., 1977. *Amebiasis*, ICN Medical Diagnosis Products.
- HOARE, C. A., 1972. *The Trypanosomes of Mammals*. Blackwell, Scientific Publications, Oxford.
- KATO, K. & MIURA, M., 1954. Comparative examinations. *Jap. J. Parasitol.*, 3: 35.
- KATZ, N.; CHAVES, A. & PELLEGRINO, J., 1972. A simple device for quantitative stool thick-smear technique in schistosomiasis mansoni. *Rev. Inst. Med. Trop. São Paulo*, 14: 397-400.
- KRUPP, I., 1977. *Amoebic diseases*. Diagnostically speaking, vol. 1. Portland, Oregon, USA.
- LUTZ, A., 1919. O *Schistosomum mansoni* e a schistosomatose segundo observações feitas no Brasil. *Mem. Inst. Oswaldo Cruz*, 11: 121-155.
- MAIA DA SILVA, R. S.; DANTAS JUNIOR, G. G.; DANTAS, I. G.; TRINDADE, M. P. B. & SILVA, J. C., 1986. Estudo comparativo dentre os métodos de laboratório Hoffmann e direto na prevalência de parasitos intestinais. *Ciência, Cultura e Saúde*, 8: 17.
- MELLO, D. A.; LUZ, P. E. & CIARINI, C., 1977. Comparação dos métodos coprológicos quantitativos de Barbosa (1969) e Kato-Katz et al. (1972). *Rev. Goiana de Medicina*, 23: 53-59.
- MORAES, R. G., 1948. Contribuição para o estudo do *Strongyloides stercoralis* e da estrogiloidose no Brasil. *Rev. Serv. Esp. Saúde Pública*, 1: 507-524.
- SOUZA DIAS, R. M. D.; SILVA, M. I. P. G.; NUNES, L. R.; SILVA, R. M.; MANGINI, A. C. S. & TORRES, D. M. A. G. V., 1989. Avaliação dos resultados obtidos pelo método de sedimentação exponencial em cálice e em tubo afunilado, no exame parasitológico das fezes. *Laes*, X: 46-48.
- WILLCOX, H. P. & COURA, J. R., 1989. Nova concepção para o método de Baermann-Moraes-Coutinho na pesquisa de larvas de nematódeos. *Mem. Inst. Oswaldo Cruz*, 84: 563-565.