

Taxonomy and transmission dynamics of *Angiostrongylus cantonensis* in *Rattus norvegicus* in Brazil

Arnaldo Maldonado Júnior

Laboratório de Biologia e Parasitologia de Mamíferos Silvestres Reservatórios
Instituto Oswaldo Cruz/ FIOCRUZ
maldonad@ioc.fiocruz.br

SEARCH FOR *ANGIOSTRONGYLUS CANTONENSIS* IN RODENTS



TWO REGIONS WERE INVESTIGATED:

- NORTHEAST
- SOUTHEAST

SEARCH FOR *ANGIOSTRONGYLUS CANTONENSIS* IN RODENTS

Field laboratory under biosecurity rules





THE STUDY AREA IN SOUTHEAST BRAZIL



Poor area associated with rodent proliferation

São Gonçalo municipality, Rio de Janeiro



Rattus norvegicus

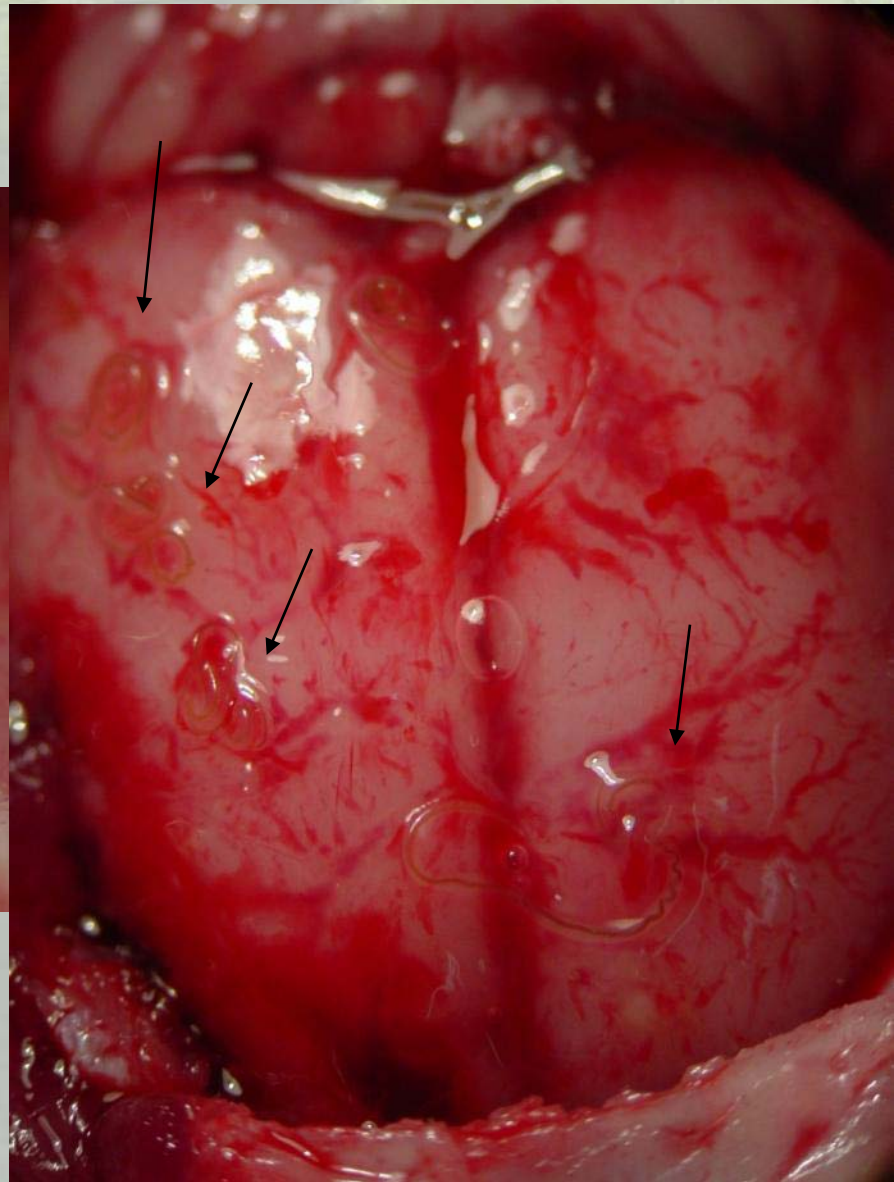
27 rodents captured: 74% infected

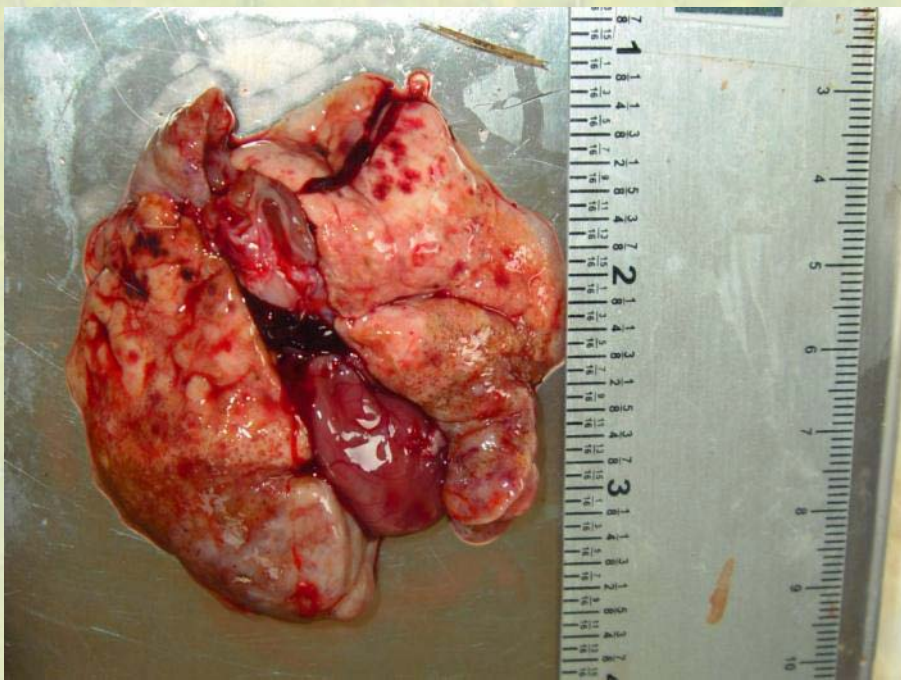
265 lung worms collected



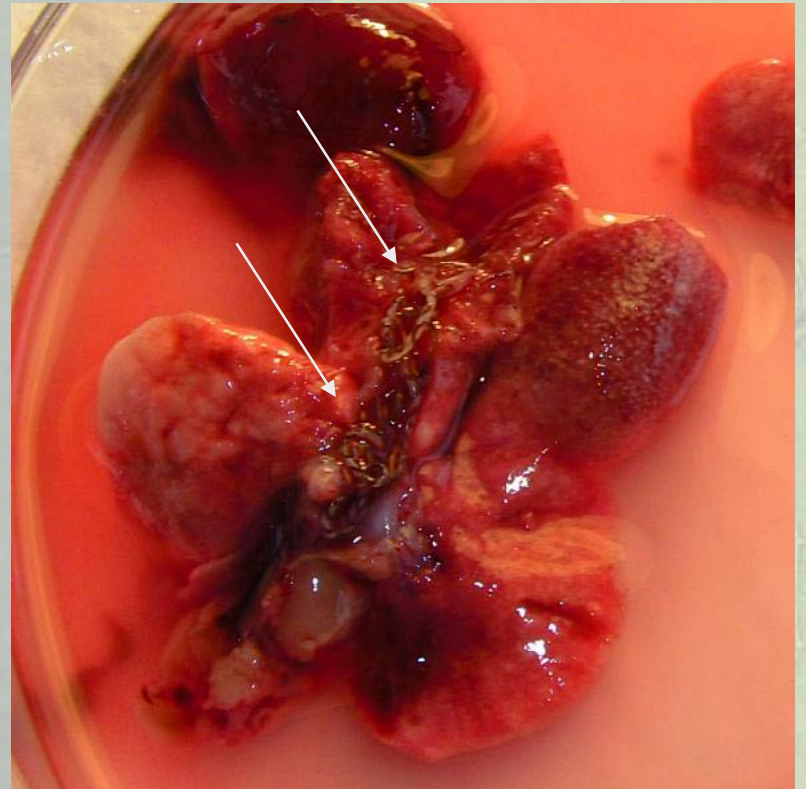
Achatina fulica

Angiostrongylus cantonensis in *Rattus norvegicus* brain





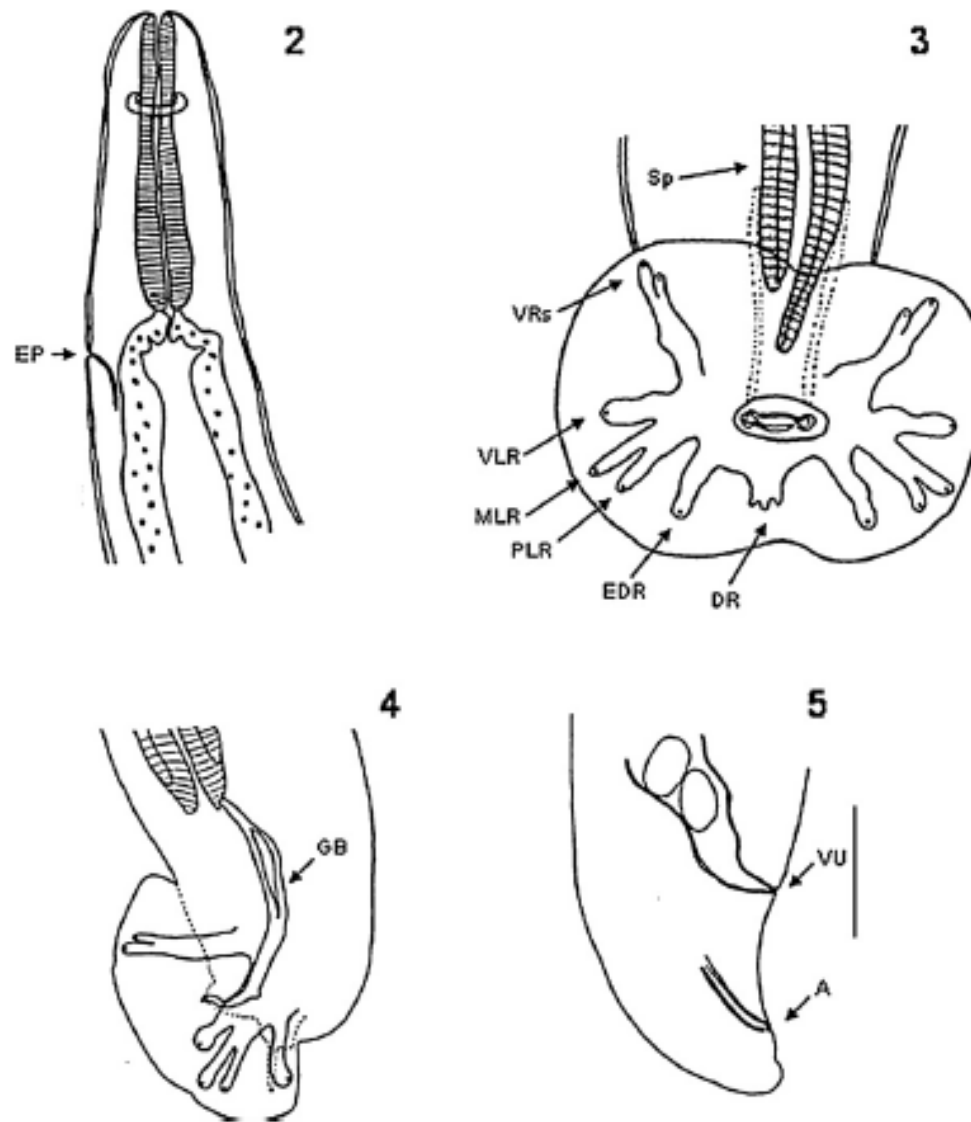
Rat lungs naturally infected with *A. cantonensis*



Rat lungs with *A. cantonensis*



Angiostrongylus cantonensis



Figs. 2-5. *Angiostrongylus cantonensis* adult worm. Scale bar: 100 μ m. (2) Anterior extremity, right lateral view, female, showing excretory pore (EP). (3) Male, caudal bursa, ventral view, showing spicules (Sp), ventral rays (VRs), ventrolateral ray (VLR), mediolateral ray (MLR), posterolateral ray (PLR), externodorsal ray (EDR) and dorsal ray (DR). (4) Lateral view, caudal bursa, showing gubernaculum (GB). (5) Female, posterior extremity, lateral view, showing vulva (VU) and anus (A).



Figs. 6 and 7. Light microscopy of *Angiostrongylus cantonensis*. Scale bar; 25 μm . (6) Male, ventral view of caudal bursa, Detail showing dorsal ray thick, with 3 short branches (\rightarrow). (7) Male, lateral view of caudal bursa, showing gubernaculum (\rightarrow).

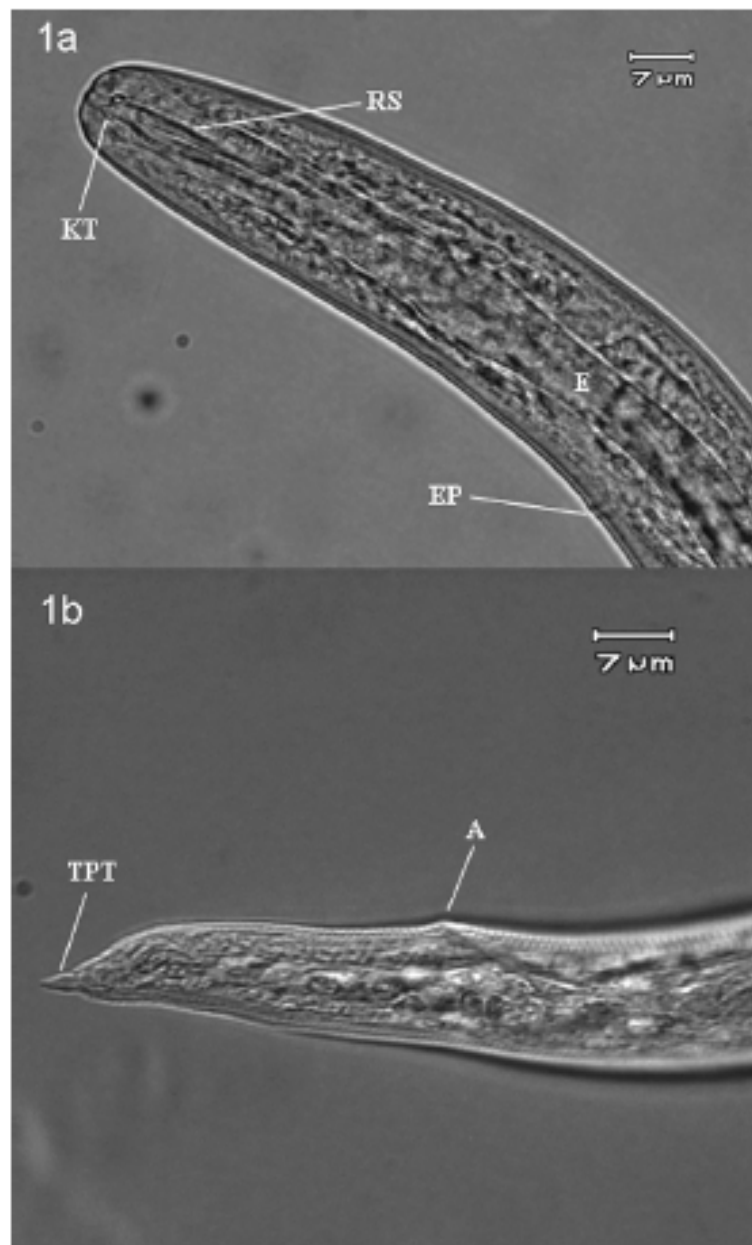


Fig. 1. Light microscopy of third-stage larvae (L_3) of *Angiostrongylus cantonensis*. (a) Anterior end showing knob-like tips (KT), rod-like structure (RS), esophagus (E), excretory pore (EP); (b) posterior end showing tail pointed tip (TPT) and anus (A).

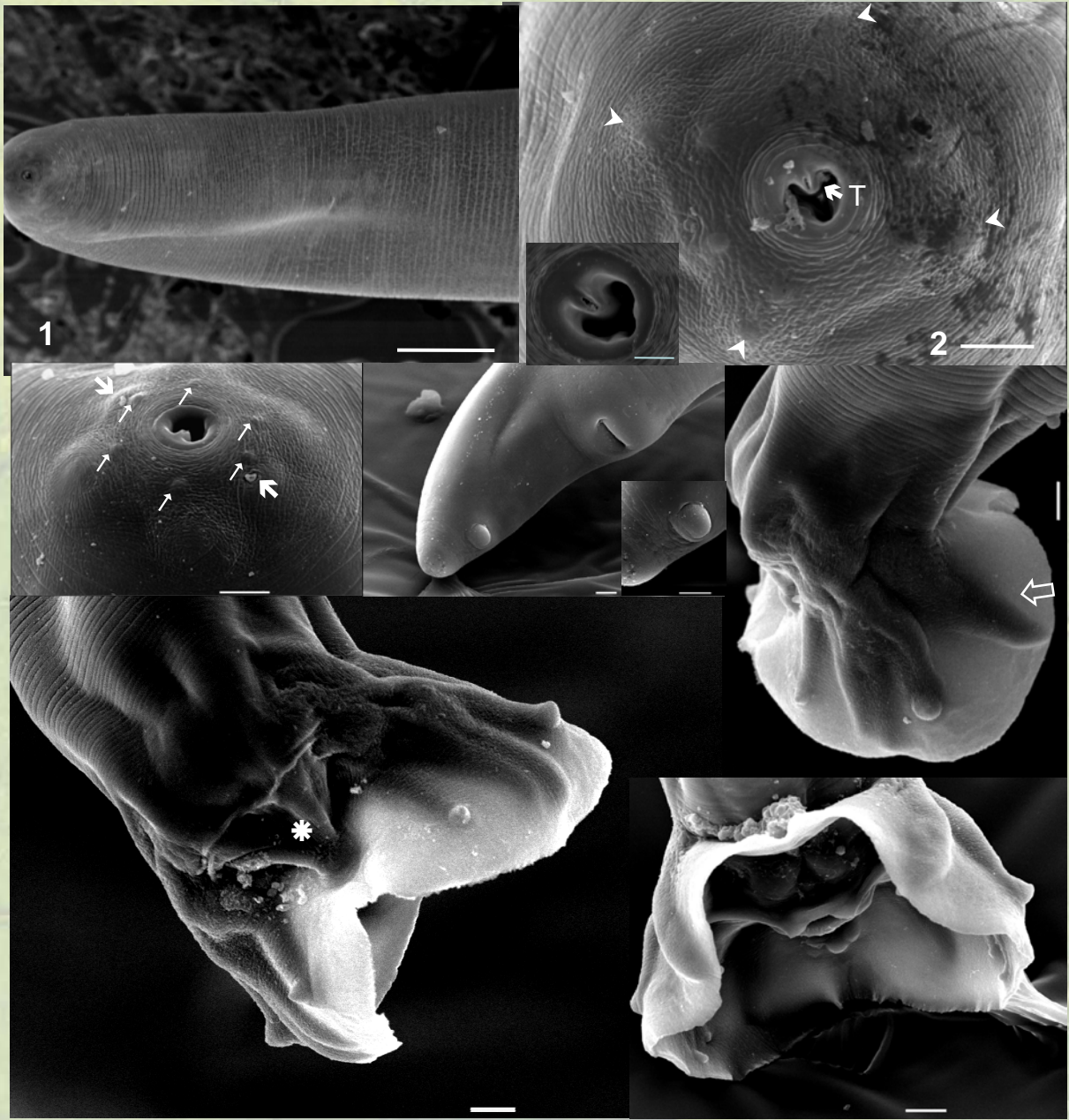


Table 2
Measurements (mm) of larvae L₅ and adults of *Angiostrongylus cantonensis* from Brazil (*) and Japan (**).

| | Larvae L ₅ | | | | Adult | | | |
|--------------------------------|-------------------------------|--------------|--------------------|--------------|-------------------------------|--------------|--------------------------------|--------------|
| | Pulmonary artery [*] | | Brain [*] | | Pulmonary artery [*] | | Pulmonary artery ^{**} | |
| | ♂ (n=10) | ♀ (n=10) | ♂ (n=10) | ♀ (n=10) | ♂ (n=9) | ♀ (n=10) | ♂ (n=10) | ♀ (n=10) |
| Body length | 12.91 ± 1.65 | 14.54 ± 1.23 | 11.88 ± 0.71 | 14.51 ± 1.23 | 22.82 ± 1.76 | 32.84 ± 2.16 | 18.35 ± 1.83 | 26.42 ± 5.69 |
| Width | 0.24 ± 0.05 | 0.28 ± 0.02 | 0.23 ± 0.02 | 0.26 ± 0.03 | 0.35 ± 0.05 | 0.48 ± 0.03 | 0.30 ± 0.03 | 0.36 ± 0.05 |
| Width at the base of esophagus | 0.04 ± 0.01 | 0.04 ± 0.01 | 0.03 ± 0.01 | 0.03 ± 0.01 | 0.04 ± 0.01 | 0.05 ± 0.01 | 0.04 ± 0.01 | 0.04 ± 0.01 |
| Esophagus | 0.28 ± 0.02 | 0.34 ± 0.08 | 0.30 ± 0.03 | 0.30 ± 0.03 | 0.31 ± 0.01 | 0.34 ± 0.03 | 0.30 ± 0.02 | 0.31 ± 0.06 |
| Nerve ring | 0.08 ± 0.01 | 0.12 ± 0.04 | 0.08 ± 0.02 | 0.10 ± 0.01 | 0.09 ± 0.01 | 0.10 ± 0.02 | 0.08 ± 0.02 | 0.09 ± 0.02 |
| Excretory pore | 0.33 ± 0.03 | 0.29 ± 0 | 0.28 ± 0.05 | 0.29 ± 0.02 | 0.43 ± 0.03 | 0.40 ± 0.04 | 0.40 ± 0.05 | 0.42 ± 0.01 |
| Spicules | 1.26 ± 0.05 | - | 1.23 ± 0.05 | - | 1.29 ± 0.06 | - | 1.29 ± 0.07 | - |
| Gubernaculum | 0.10 × 0.02 | - | 0.11 × 0.02 | - | 0.08 × 0.02 | - | 0.11 × 0.02 | - |
| Vulva-tail | - | 0.16 ± 0.02 | - | 0.16 ± 0.02 | - | 0.19 ± 0.02 | - | 0.25 ± 0.07 |
| Anus-tail | - | 0.05 ± 0.01 | - | 0.05 ± 0.01 | - | 0.06 ± 0.01 | - | 0.07 ± 0.02 |
| Eggs | - | - | - | - | - | 0.06 × 0.04 | - | 0.06 × 0.03 |

* *A. cantonensis* specimens from Pernambuco, northeast Brazil.

** *A. cantonensis* specimens from Akita, Japan.

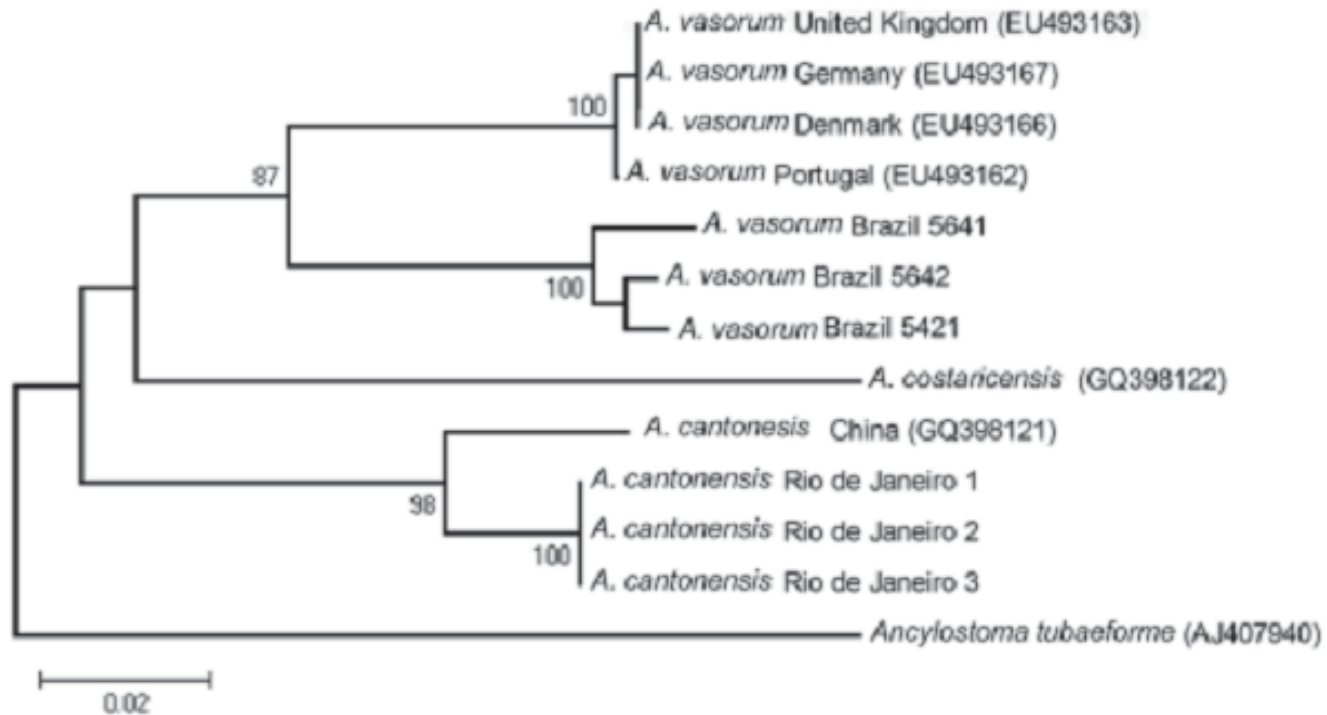
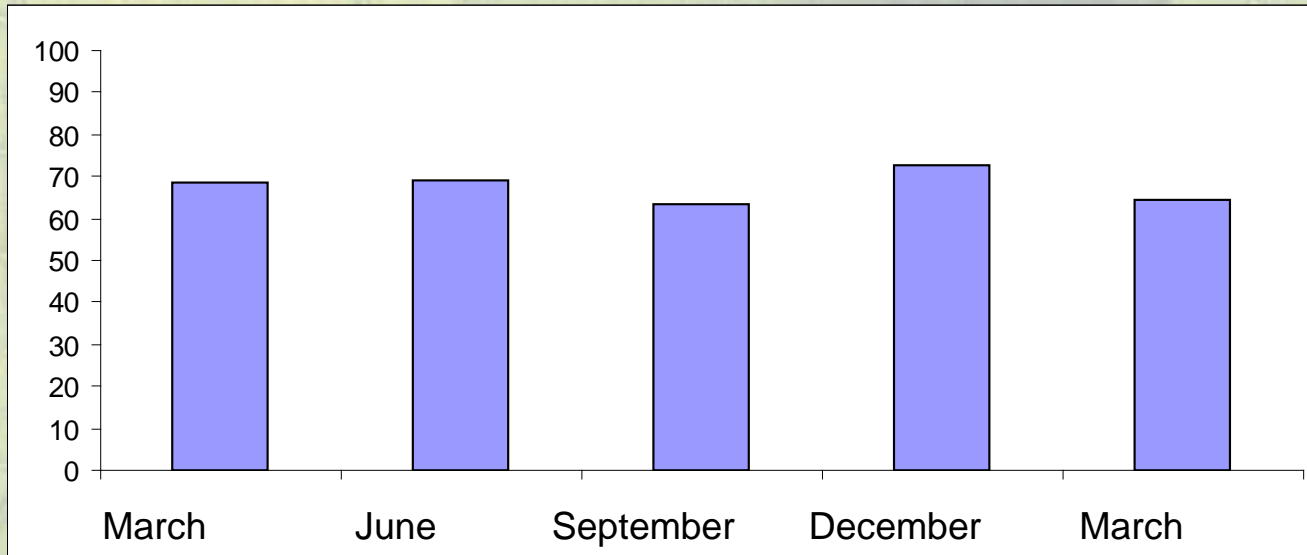
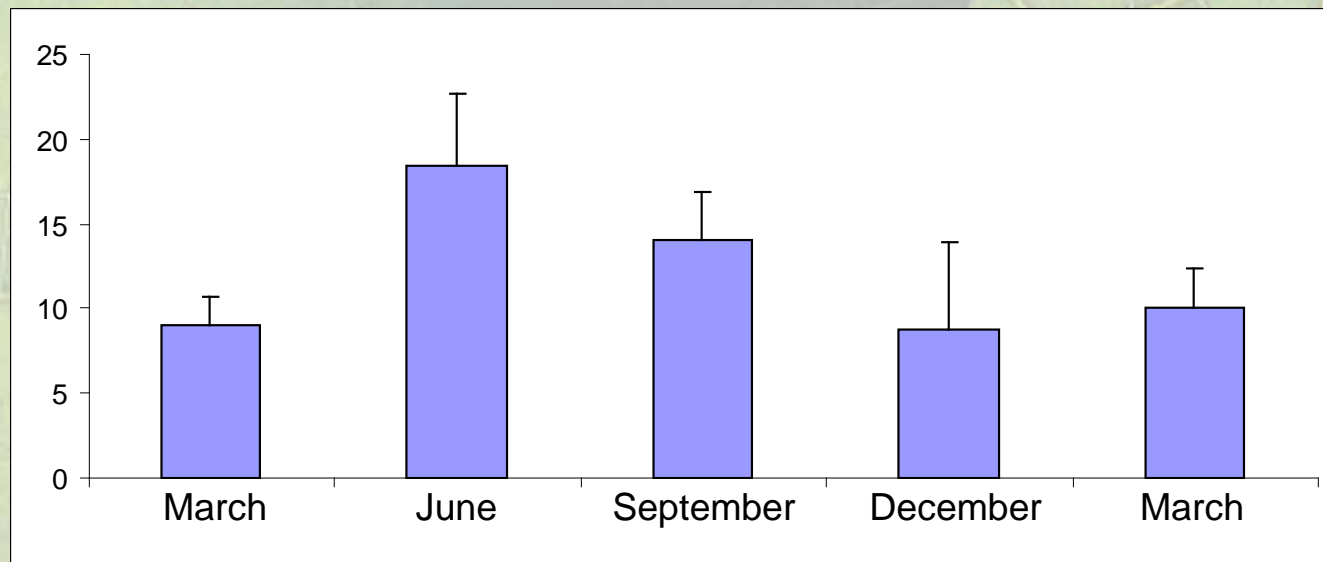


Figure. Neighbor-joining phylogenetic tree based on Kimura 2-parameter (K2-p) distances that includes all *Angiostrongylus* COI sequences in GenBank and the sequences obtained from 3 *Angiostrongylus* specimens recovered from the pulmonary arteries of a naturally infected Norway rat (*Rattus norvegicus*) from São Gonçalo, Rio de Janeiro, Brazil, 2010. The specimens yielded 1 haplotype, which clustered together with the *A. cantonensis* haplotype from the People's Republic of China with a low genetic distance (K2-p 0.038). Scale bar indicates 0.02 K2-p genetic distance.

A. cantonensis prevalence in *R. norvegicus* from São Gonçalo (2009 - 2010)



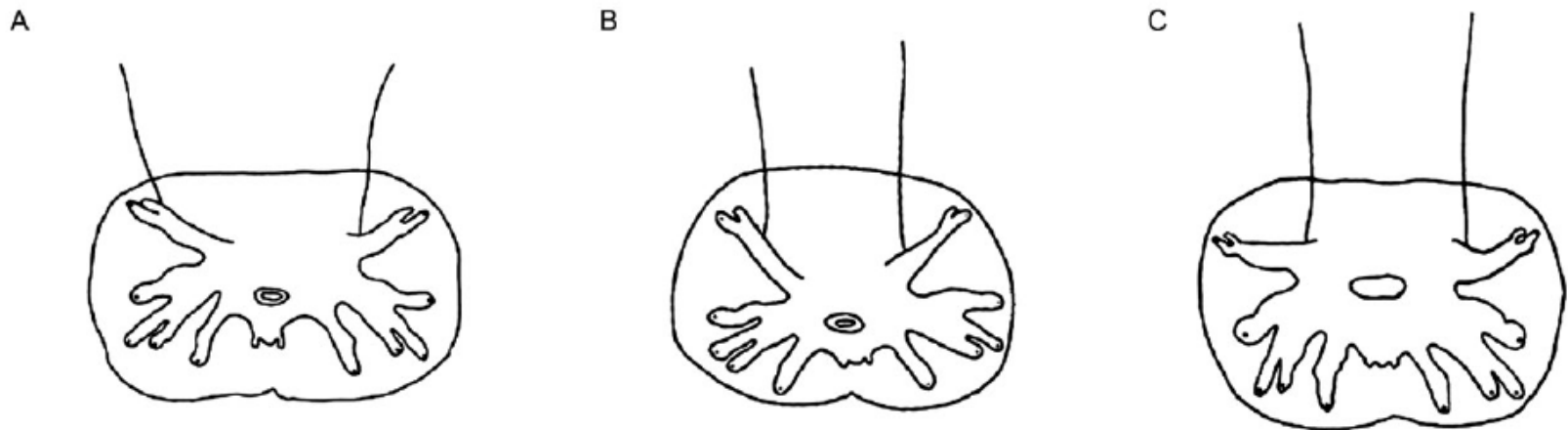
A. cantonensis mean intensity in *R. norvegicus* (2009 - 2010)



First report of *Angiostrongylus cantonensis* (Nematoda: Metastrongylidae) in *Achatina fulica* (Mollusca: Gastropoda) from Southeast and South Brazil

Arnaldo Maldonado Júnior^{1/+}, Raquel O Simões¹, Ana Paula M Oliveira²,
Esther M Motta³, Mônica A Fernandez², Zilene M Pereira², Simone S Monteiro²,
Eduardo J Lopes Torres⁴, Silvana Carvalho Thiengo²

¹Laboratório de Biologia e Parasitologia de Mamíferos Silvestres Reservatórios ²Laboratório de Malacologia
³Laboratório de Patologia, Instituto Oswaldo Cruz-Fiocruz, Av. Brasil 4365, 21040-900 Rio de Janeiro, RJ, Brasil ⁴Laboratório de Biologia
de Helmintos Otto Wucherer, Instituto de Biofísica Carlos Chagas Filho, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brasil



Light microscopy of *Angiostrongylus cantonensis*. A: *A. cantonensis* isolate from São Gonçalo, Rio de Janeiro (RJ). Ventral view of caudal bursa; B: *A. cantonensis* isolate from Barra do Pirai, RJ; C: *A. cantonensis* isolate from Joinville, Santa Catarina. Ventral view of caudal bursa. Bar = 50 μ m.

LETTERS

***Endemic
Angiostrongyliasis,
Rio de Janeiro,
Brazil***

**Raquel O. Simões,
Fernando A. Monteiro,
Elizabeth Sánchez,
Silvana C. Thiengo,
Juberlan S. Garcia,
Sócrates F. Costa-Neto,
José L. Luque,
and Arnaldo Maldonado, Jr.**

Author affiliations: Fundação Oswaldo Cruz, Rio de Janeiro, Brazil (R.O. Simões, F.A. Monteiro, E. Sánchez, S.C. Thiengo, J.S. Garcia, S.F. Costa-Neto, A. Maldonado Jr.); and Universidade Federal Rural do Rio de Janeiro, Seropédica, Brazil (R.O. Simões, J.L. Luque)

DOI: 10.3201/eid1707.101822

CONCLUSION

- *A.cantonensis* lung worm infection is enzootic among the exotic Norway rat population in the study region
- The high natural infection rate (74%) together with the dense population of *A. fulica* in the area emphasize the risk of disease transmission to humans
- Local residents should be informed about disease transmission and prevention, and physicians should consider *A.cantonensis* EM in their differential diagnosis when appropriate
- Surveillance and control strategies to reduce mollusc and rodent populations should be implemented in the study area

Thanks!

