

RESEARCH NOTE

Development of *Dirofilaria immitis* (Leidy) in *Aedes aegypti* (L.) and *Culex quinquefasciatus* (Say) from Maceió, Alagoas, Brazil

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Dirofilaria immitis (Leidy, 1856) is a nematode that can be transmitted mainly by mosquitoes of the genera *Aedes*, *Culex* and *Anopheles* (KW Ludlam et al. 1970 *JAVMA* 157: 1354-1359). The susceptibility of mosquitoes to support development of *D. immitis* not only differs according to the vector species but also with regard to strains of a particular species (BM Christensen et al. 1984 *J Invertebr Pathol* 44: 267-274, CSB Apperson et al. 1989 *J Am Mosq Control Assoc* 5: 377-382). A recent survey carried out in Maceió, State of Alagoas, Brazil, showed a prevalence rate of 3% of canine filariasis (unpublished data), but the local vector of *D. immitis* has not yet been determined. The occurrence of *Ae. scapularis*, *Cx. nigripalpus* and *Mansonia titillans* mosquitoes has been reported in Maceió (CML Calheiros 1996 *Transmissores em Potencial e Naturalmente Infectados pela Wuchereria bancrofti* (Cobbold, 1877) em Maceió-Alagoas, MSc Thesis, UFMG, 147 pp.). However, *Cx. quinquefasciatus* and *Ae. aegypti*, the local vectors of bancroftian filariasis

and dengue fever respectively, are the most abundant mosquito species in Maceió. Results of experiments carried out to demonstrate the susceptibility of these species to infection with *D. immitis* and their vector efficiency are reported here.

Both mosquito populations were originated from Maceió. Therefore, *Ae. aegypti* were reared at the insectary of Fiocruz, Recife, PE and the strain of *Cx. quinquefasciatus* was maintained at the insectary of the Universidade Federal de Alagoas in Maceió. Mosquitoes eggs were hatched in cubes containing dechlorinated water, larvae were reared with cat food (Whiskas®) and adults were kept at 27±1°C and 70±10% R.H. A 4 years-old mixed-breed male dog naturally infected with *D. immitis* was used as the microfilariae (mf) donor (80 mf/20 µl blood) and one uninfected animal was used as control. Females 3-to 7-day-old of both mosquito species were allowed to feed on blood with anticoagulant via an artificial apparatus (LC Rutledge et al. 1964 *Mosq News* 24: 407-419) or directly on microfilaraemic and amicrofilaraemic dogs. Four different experiments were carried out and both mosquito species were fed simultaneously on the dog and via artificial apparatus between 4 p.m. and 5 p.m., during 30 min. Mosquitoes were dissected daily and *D. immitis* larvae were recorded. The developmental stages of the parasite were identified according to AER Taylor (1960 *J Helminthol* 34: 27-39). Mortality was recorded daily and the vector efficiency of mosquito species was determined as described by L Kartman (1954 *Exp Parasitol* 2: 27-78).

Survival rates recorded with a total of 1,573 *Cx. quinquefasciatus* and 1,588 *Ae. aegypti* females fed on the microfilaraemic dog, were 30.6% and 20% respectively. For mosquitoes fed on the uninfected dog the values were 85% for the former and 46.4% for the latter species. The death of infected mosquitoes could be caused by the movement of large numbers of mf from the midgut to the Malpighian tubules as suggested by DR Hamilton and RE Bradley (1979 *J Med Entomol* 3: 305-306). The sausage form was observed on the 4th day and from days 8 to 9, the larvae grew longer and more narrow (L₂) reaching the infective larval stage (L₃) on the 10th day for *Ae. aegypti* and four days later for *Cx. quinquefasciatus*. Shorter developmental periods of *D. immitis* in a vector, as observed in *Ae. aegypti*, would favour disease transmission (KM Loftin et al. 1995 *J Am Mosq Control Assoc* 11: 90-93). Although both mosquito species ingested similar number of mf, the number of L₃ recorded per female was significantly higher in *Ae. aegypti*. In fact, no L₃ were recorded in *Cx. quinquefasciatus* which fed directly on the microfilaraemic dog and only one L₃

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was recorded in females which fed using the apparatus. In both species a large number of L₃ parasite larvae was produced when females were fed through the apparatus (Table). The overall vector efficiency of *Ae. aegypti* was seven times higher than that of *Cx. quinquefasciatus*. According to Loftin et al. (1995 *loc. cit.*), the vector efficiency in *Cx. quinquefasciatus* was 2.7% compared with 20.4% of *Ae. vexans*. RC Lowrie (1991 *J Am Mosq Control Assoc* 7: 30-36) observed that the efficiency of *Ae. taeniorhynchus* was 65 times higher than that of *Cx. quinquefasciatus*. In conclusion, our results demonstrate that local populations of

both mosquito species are susceptible to *D. immitis* allowing larval evolution until the L₃ stage and that *Ae. aegypti* has clearly better potential than *Cx. quinquefasciatus* as a vector of canine heartworm in Maceió. In this context, *Cx. quinquefasciatus* has been considered as a poor vector of *D. immitis* in different regions (N Labarthe et al. 1998 *Mem Inst Oswaldo Cruz* 93: 425-432, Lowrie 1991 *loc. cit.*). Investigations are being conducted to identify mosquitoes naturally infected among species from Maceió, by polymerase chain reaction using primers species-specific for *D. immitis*.

TABLE
Development of *Dirofilaria immitis* microfilariae to the third-stage larvae in *Aedes aegypti* and *Culex quinquefasciatus* under different feeding conditions

Mosquito species	Feeding condition	Number of mosquitoes			No. L ₃ /female	
		Engorged	Examined	Infective ^a (%)	infective	Efficiency ^b
<i>Aedes aegypti</i>	Dog	1,361	265	87 (33)	1.3 ± 0.3	15.8 ± 13.3
	Apparatus	227	52	12 (23)	3.8 ± 0.7	7.2 ± 4.9
<i>Culex quinquefasciatus</i>	Dog	541	242	0	0.0	0.0
	Apparatus	1,032	240	14 (6)	1.0 ± 0.0	1.0 ± 0.8

a: with infective larvae (L₃) on head or proboscis; b: no. L₃ recorded/ no. microfilariae uptake by mosquitoes.