

## The Gibbon As A Host For The Canine Heartworm

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**PURPOSE:** Human infections with Dirofilaria immitis, the canine heartworm, has been the subject of a number of reports. United States and Japan confirmed infections have occurred where Dirofilaria immitis was found in the heart, lungs, subcutaneous tissue, conjunctival, or periorbital area of humans. The possibility that this parasite is the etiological agent for tropical eosinophilia has also been suggested because humans with this disease have a positive skin test to Dirofilaria antigen and respond to treatment with the vermicide diethylcarbamazine. Dirofilaria immitis occurs widely in dogs throughout Southeast Asia and in some areas of Thailand may infect 100% of the adult dog population. Because Dirofilaria is transmitted between dogs by Culex quinquefasciatus and Aedes aegypti, mosquitoes that commonly feed on man too, there may be a great opportunity for human infections to occur where heartworms are endemic. There is evidence, both in the literature and from this laboratory, that indicates that subhuman primates may be good animals to study heartworm infections as they occur in man. Dirofilaria has been found in the hearts of two orangutans and was tentatively identified as an incidental finding in the adrenal vein of an SMRL gibbon. Since Dirofilaria immitis may become increasingly recognized as a significant human parasite, this study was initiated to determine the suitability of the gibbon as a model for studying transmission as well as the clinical and pathological features of this disease in primates.

**DESCRIPTION:** Three gibbons and one dog were inoculated in November with between 35 and 50 Dirofilaria immitis larvae which were obtained through dissection of mosquitoes. The mosquitoes had fed approximately three weeks earlier on a dog with a high microfilaremia which, at necropsy, was confirmed to be infected with Dirofilaria immitis. The following laboratory examinations have been performed on the experimentally infected animals during the report period:

- a. a complete blood count and serum sample collected for examination by the fluorescent soluble antigen test each week;
- b. skin testing with the Takeda (Japanese) and Parke-Davis Dirofilaria antigens and blood examinations for microfilaria using the Knott's concentration technique each month;
- c. thoracic radiographs taken each month in those gibbons that become either reactors to the skin test or develop abnormally high eosinophil counts.

**PROGRESS:** The data collected during the report period is summarized in Tables 1 through 4. Serum samples collected for examination by the fluorescent soluble antigen technique are being stored until the study is completed so that they may be run together. Only one gibbon, V-165, and the dog, Pup 4, have experienced an eosinophilia. Each of the inoculated animals has turned positive on either or both of the skin test antigens. In the case of the gibbons uninoculated control animals have not converted, but at least one of the uninoculated control dogs has developed positive reactions to the skin test. This unexpected conversion in the dog may reflect the problem experienced in controlling mosquitoes in the dog holding area. Consultation with the radiologist at 5th Field Hospital is being obtained to interpret the thoracic radiographs of V-165, V-166, and V-169.

Difficulties experienced in obtaining adequate numbers of infective larvae from the mosquitoes have restricted experimental inoculations to only three gibbons and one dog. The yield from Aedes aegypti was exceedingly low and the high yield in Culex quinquefasciatus was offset by a high mortality in this species following feeding. In the latter case we feel the high mortality was due to the adverse physical effects of heavy microfilarial infections. Further attempts will be made to obtain microfilaria for the purpose of infecting one more gibbon and dog by using a different species of mosquito and feeding mosquitoes at the time of day when microfilarias are at lower levels.

Table 1. Gibbon # V - 165

7.6	8.1	13.8	10.7	7.9	11.3	9.2	16.7	10.2
Inoc. 50	0	0	5	9	2	6	14	23
Micro- fil.	-	N.T.	-	N.T.	N.T.	N.T.	+	N.T.
14 Nov	-	N.T.	-	N.T.	+	N.T.	+	N.T.
-	-	N.T.	-	N.T.	-	N.T.	-	N.T.

10 Oct. 15 Dec 5 Jan 19 Jan 2 Feb 16 Feb 2 Mar 12 Mar 30 Mar

White Count  $\times 10^3$   
 Eosinophils (%)  
 Skin test (J)  
 Skin test (PD)  
 Knott's Technique

Table 2. Gibbon # V - 166

8.3	10.7	9.6	9.8	15.3	14.1	8.6	9.5	12.9
Inoc. 35	2	4	4	4	3	1	1	1
micro- fil.	-	N.T.	+	N.T.	N.T.	N.T.	+	N.T.
17 Nov.	-	N.T.	+	N.T.	-	N.T.	-	N.T.
69	-	N.T.	-	N.T.	-	N.T.	-	N.T.

10 Oct. 15 Dec 5 Jan 19 Jan 2 Feb 16 Feb 2 Mar 17 Mar 30 Mar

White Count  $\times 10^3$   
 Eosinophils (%)  
 Skin test (J)  
 Skin test (PD)  
 Knott's Technique

Table 3. Gibbon # V - 169

11.4	Inoc. 50 micro: fil. 19 Nov 1969	11.6	11.4	20.9	18.5	16.7	14.4	11.0	12.0
1		2	3	2	4	1	0	1	4
-		-	N.T.	+	N.T.	N.T.	N.T.	+	N.T.
-		-	N.T.	+	N.T.	+	N.T.	+	N.T.
-		-	N.T.	-	N.T.	-	N.T.	-	N.T.

White Count  $\times 10^3$

Eosinophils (%)

Skin test (J)

Skin test (PD)

Knott's Technique

10 Oct. 15 Dec 5 Jan 19 Jan 2 Feb 16 Feb 2 Mar 17 Mar 30 Mar

Table 4. Dog 4

24.1	Inoc. 50 micro- fil. 14 Nov 1969	25.7	35.1	24.5	24.5	23.9	19.8	27.8	25
1.		15	52	14	15	8	14	27	12
-		+	N.T.	+	N.T.	-	N.T.	+	N.T.
-		N.T.	N.T.	+	N.T.	-	N.T.	+	N.T.
-		-	N.T.	-	N.T.	-	N.T.	-	N.T.

White Count  $\times 10^3$

Eosinophils (%)

Skin test (J)

Skin test (PD)

Knott's Technique

10 Oct. 15 Dec 5 Jan 19 Jan 2 Feb 16 Feb 2 Mar 17 Mar 30 Mar