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DISSEMINATED INFECTION IN THE NINE-BANDED ARMADILLO (*DASYPUS NOVEMCINCTUS*) RESULTING FROM INOCULATION WITH *M. LEPRAE*

Observations made on 15 animals studied at autopsy

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The first 15 armadillos at the Gulf South Research Institute which were infected with *Mycobacterium leprae* were autopsied and selected tissues were examined histopathologically. The significant data on these infected animals is found in Tables 1 and 2. The time between inoculation and death varied from 17 to 52 months. In 4 animals the inoculum was a suspension of *M. leprae* obtained by biopsy from a patient with lepromatous leprosy, in 7 the inoculum was a suspension of *M. leprae* from mouse footpads*, and in 4 animals, suspensions of lepromatous tissue from infected armadillos were used. In 10 animals the inoculation was intradermal, in 4 intravenous, and in one animal, by dermal abrasion.

The armadillo which died with disseminated leprosy 52 months after inoculation was No. 6, one of the 4 animals inoculated 20 February 1970 with suspension of human lepromatous leprosy supplied by Dr. Bueno de Mesquita of Surinam. You will recall that No. 8 of this group died with disseminated leprosy 17 months after inoculation (1). No. 5, because of extensive disseminated leprosy, was killed 30 months after inoculation. One of the pioneer group of 4 died during cardiac puncture 24 months after inoculation. No specimens were studied at the AFIP.

* Supplied by Dr. Louis Levy, USPHS Hospital, San Francisco, CA.

In general, the histologic reaction observed in this group of 15 animals was similar to that previously reported (2, 3). There were no changes suggestive of borderline or tuberculoid leprosy. The extent of disseminated involvement was also similar. The skin, liver, spleen, eyes, and bone marrow were involved in all animals studied. In one animal the kidney was not examined, but in 13 the bacilli were present in the glomeruli or elsewhere and in only one animal were no bacilli observed. The nose was infected in 12 animals, negative in one, and not examined in two. Two of seven spinal cords examined were infected and mild lesions were in three of twelve brains examined.

The lepra cells in the armadillo and the lepra cells in man are similar. Cytologic vacuolization was not a common feature in the infected cells of the armadillo but the age of the lepromatous infiltrate of the armadillo is much less than that of a patient with advanced lepromatous leprosy.

There is no clear zone in the skin lesions of the armadillo. This probably reflects a difference in the histopathology of the skin of the armadillo rather than a feature of infection. Away from the inoculation site, infiltrates in the upper and mid-dermis are usually sparse. The characteristic location for massive infiltrates is deep in the dermis and subcutaneous tissues.

Involvement of both small and large nerves was a characteristic feature of the disease in all 15 animals. The character and distribution of infiltrates in the lymph nodes resemble that seen in human leprosy. In the testis, as in man, interstitial tissues were infected but the tubules were not involved. A longer period of infection than that in these armadillos would probably be needed for complete involvement of the testes as in advanced untreated lepromatous leprosy in man. The ovaries and uterus were examined histopathologically in only one animal. There was considerable lepromatous infiltrate in the ovary. A striking feature was the presence of M. leprae in the smooth muscle cells of the uterus.

Although striated muscle was frequently involved interstitially, no certain demonstration of bacilli within muscle fibers was made.

Of inestimable potential value in basic studies of M. leprae are the quantities of bacilli which can be collected from the extensively infected livers, spleens, lymph nodes and lepromatous nodules of armadillos with advanced leprosy (Table 1).

Table 1. Data on inoculation and infection of CNS and peripheral nerves.

Armadillo No.	Sex	Source of Inoculum	Method of Inoculation	Time, Mos. Inoculation to Death	Dermal Nerves Infected	Large Nerves Infected	Brain	Meninges	Spinal Cord	Lepromatous Tissue Collected (g)	Method of Death
5	M	H1	D	30	+	+	-	+	-	116	K
6	F	H1	D	52	+	+	-	-	NE	19	S
8	M	H1	D	17	+	+	-	+	-		S
9	F	H2	D	42	+	NE	-	-	-	13	K
14	M	M	D	34	+	+	-	+	+	172	S
16	M	M	D	33	+	+	+	+	NE	354	S
17	M	M	IV	26	+	+	-	-	-	85	S
18	F	M	IV	26	+	+	+	+	+	127	K
24		M	D	37	+	+	-	-	NE	121	S
31	M	M	D	34	+	+	NE	NE	NE	207	S
41	F	M	D	28	+	+	-	-	NE	NW	S
61	M	A(8)	D*	23	+	+	0	0	0		K
67	M	A(8)	D	17	+	-	NE	NE	NE	NW	S
124	F	A(5)	IV	19	+	-	-	-	NE	382.5	S
154	M	A(17)	IV	18	+		+	-	NE	80	S

*Abrasion
A(5), A(8), and A(17)=Inoculum from armadillos 5, 8 & 17.
H1=Lepromatous patient, Surinam.
H2=Dapsone resistant lepromatous patient, Carville.
M=Mycobacterium leprae grown in mouse foot pads by Dr. Levy.

D=Dermal
IV=Intravenous
S=Spontaneous
K=Killed
NE=Not examined
NW=Not weighed

Table 2. Organs infected (excluding CNS and peripheral nerves).

Animal	Skin	Liver	Spleen	Lung	Heart	Lymph Node	Adrenal	Urinary Bladder	Kidney	Testes	Tongue	Nose	Eye	Bone Marrow
5	+	+	+	+	-	+	+	+	+	+	+	+	+	+
6	+	+	+	+	-	NE	+	NE	+	-	+	+	+	+
8	+	+	+	+	+	+	+	+	+	-	+	+	+	+
9	+	+	+	-	-	-	-	-	-	NE	NE	-	NW	+
14	+	+	+	+	NE	+	NE	NE	+	NE	NE	+	+	+
16	+	+	+	+	NE	+	+	NE	+	+	NE	+	+	+
17	+	+	+	+	+	+	NE	NE	+	+	+	+	+	+
18	+	+	+	+	+	+	+	+	+	-	+	+	+	+
24	+	+	+	+	NE	+	+	NE	+	+	NE	+	+	+
31	+	+	+	+	+	+	+	+	+	+	NE	NE	NE	NE
41	+	+	+	NE	-	+	+	NE	+	NE	NE	+	+	+
61	+	+	+	NE	NE	+	NE	NE	NE	-	NE	+	+	NE
67	+	+	+	+	NE	NE	+	NE	+	+	NE	NE	+	+
124	+	+	+	+	-	NE	+	NE	+	-	+	+	+	+
154	+	+	NE	+	+	+	+	+	+	+	+	+	+	+

NE=Not examined

This study of the first 15 armadillos autopsied at Gulf South Research Institute confirms the previous reports (2) that leprosy in the nine-banded armadillo is a widely disseminated disease which histopathologically closely resembles human lepromatous leprosy. In these 15 animals no tuberculoid nor borderline features were observed. Until there is evidence that M. leprae can cause different histopathologic patterns in the armadillo we prefer to call the disease "leprosy" without further designation.

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