

## CARDIAC LESIONS RESEMBLING ASCHOFF BODIES IN MICE \*

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In a previous paper we <sup>1</sup> have described lesions similar to the Aschoff nodules of human rheumatic fever, occurring spontaneously in the hearts of rabbits. This paper deals with spontaneous carditis observed in mice.

Mice used in this investigation received intracerebral inoculations with material from the hearts of patients who had succumbed to acute rheumatic fever. The mice were 40 to 50 days old. A number of the Swiss strain <sup>2</sup> were included and a further group was exposed to X-ray irradiation <sup>3</sup> in an effort to decrease the resistance to virus infection. Neither factor proved important in the results which are to be discussed. Of 203 injected mice, cardiac lesions of varying severity were found in 60 (29.5 per cent). The intensity of the process was arbitrarily graded from 0 to 4 plus. Table I shows the frequency of mild and severe lesions.

TABLE I  
*Incidence and Degree of Severity of Lesions*

	Injected mice		Control series	
	No.	Per cent	No.	Per cent
No lesions	143	70.5	43	67.2
Lesions++++	7	3.5	4	6.3
Lesions+++	11	5.4	2	3.1
Lesions++	21	10.3	6	9.4
Lesions+	21	10.3	9	14.0
Total	203		64	

As in the experiments dealing with rabbits,<sup>1</sup> an attempt was made to relate these lesions to the inoculation. This was futile. In 64 control mice the incidence of cardiac lesions (32.8 per cent) approximated that in the injected group. Data for this group also appear in Table I. Since there were no significant differences in either the total incidence or the severity of the process between the inoculated and control groups, it was necessary to conclude that the cardiac lesions had occurred spontaneously in both. We

\* Received for publication February 10, 1941.

could not demonstrate, however, an acute epizootic such as was described among the rabbits suffering cardiac lesions.

Figures 1 to 8 illustrate the varied pathological findings, comprising in some animals a true pancarditis; with verrucous involvement of the valves; a mononuclear pericarditis; myocardial foci, often perivascular and containing "owl-eyed" cells resembling those seen in human rheumatic fever; and in other animals showing varying degrees of arteritis and periarteritis.

#### DISCUSSION

Pathological examination disclosed the following similarities in the spontaneous lesions of the rabbit and the mouse, and the rheumatic human lesions: In all three a focal necrosis of the myocardium was noted. The foci tended to be perivascular. The replacement reaction was mononuclear in type with a tendency to "owl-eyed" cells (which some consider pathognomonic of human Aschoff bodies). In the hearts of all three species, endocarditis, valvulitis, pericarditis and arteritis were also observed. In the more advanced lesions reduplication of the supporting tissue of the endothelium was demonstrated by connective tissue stains. In all three, bacteriological cultures with refined aerobic and anaerobic technics failed to disclose bacteria. Specially stained preparations of the heart lesions also proved devoid of organisms. In none of the species has the etiology of the carditis been determined.

For the study of certain human diseases of unknown etiology, observations of similar spontaneous syndromes of lower animals offer an approach to an understanding of the pathology of the human disease. Smith<sup>4</sup> demonstrated the importance of this method. Recently, studies of this sort have given interesting results in the work of Shope<sup>5</sup> and others on the relationship of human and animal influenza. From this point of view interest may be justified in the description of a disease in mice which resembles in form, if not in etiology, the rheumatic pancarditis of man.

#### CONCLUSIONS

1. A spontaneous pancarditis, resembling human rheumatic pancarditis, is described as it has been observed in mice.
2. The implications of this observation from the viewpoint of comparative pathology are discussed.

3. The discovery of these lesions in control animals will prove to be of value to pathologists who attempt to evaluate experimental cardiac lesions in mice.

NOTE: We wish to thank Paul Klemperer and Gregory Shwartzman for their interest and helpful suggestions. We are also deeply indebted to the late Louis Gross for the time which he devoted to the pathological aspect of this work. Impressed with the resemblance of certain lesions to the Aschoff bodies in rheumatic myocarditis, he applied to them the term "Aschoffoid."

#### REFERENCES

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3. Brodie, M., and Park, W. H. Active immunization against poliomyelitis. *Tr. Sect. Pediat., A. M. A.*, 1935, 175-189.
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## DESCRIPTION OF PLATES

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Hematoxylin and eosin staining was used throughout.

### PLATE 134

- FIG. 1.** Mouse No. 198. A lesion in a sinus of Valsalva adjacent to the valve simulates an Aschoff nodule. Interstitial valvulitis is present, most marked at the base. The myocardium shows proliferation of "myocytes," histiocytes with an occasional giant cell and lymphocytes. There is destruction of muscle fibers.  $\times 275$ .
- FIG. 2.** Mouse No. 198. Higher magnification of lesion shown in Figure 1. The nodular infiltration consists predominantly of polygonal, often stellate, mononuclear cells. These have large pale nuclei with conspicuous nucleoli, and basophilic cytoplasm.  $\times 625$ .

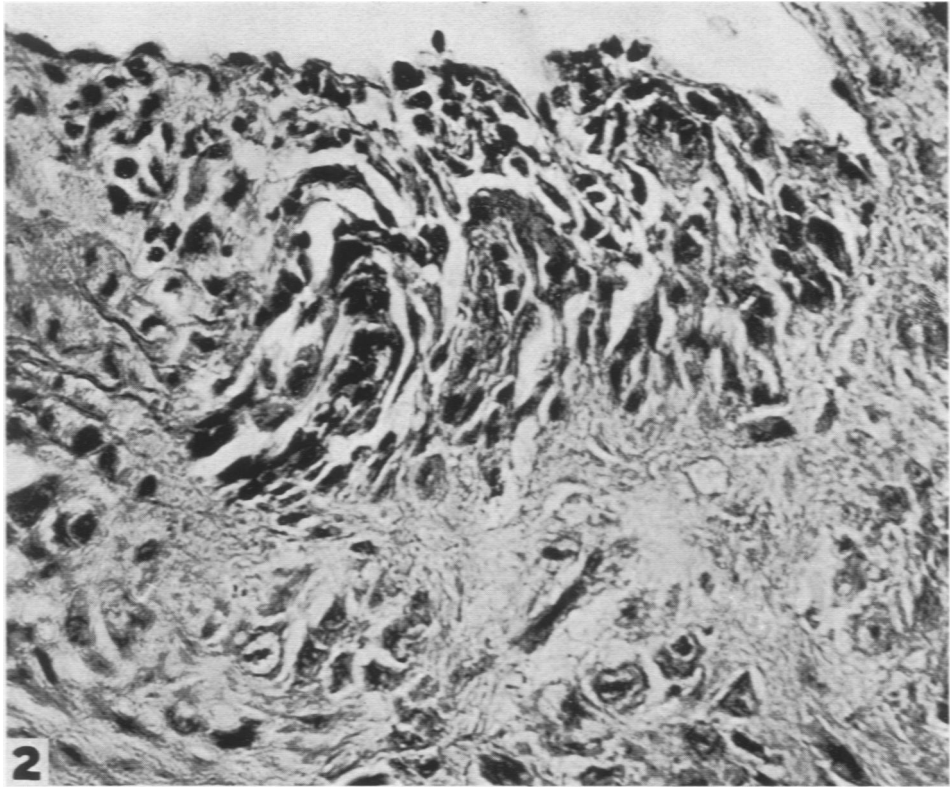
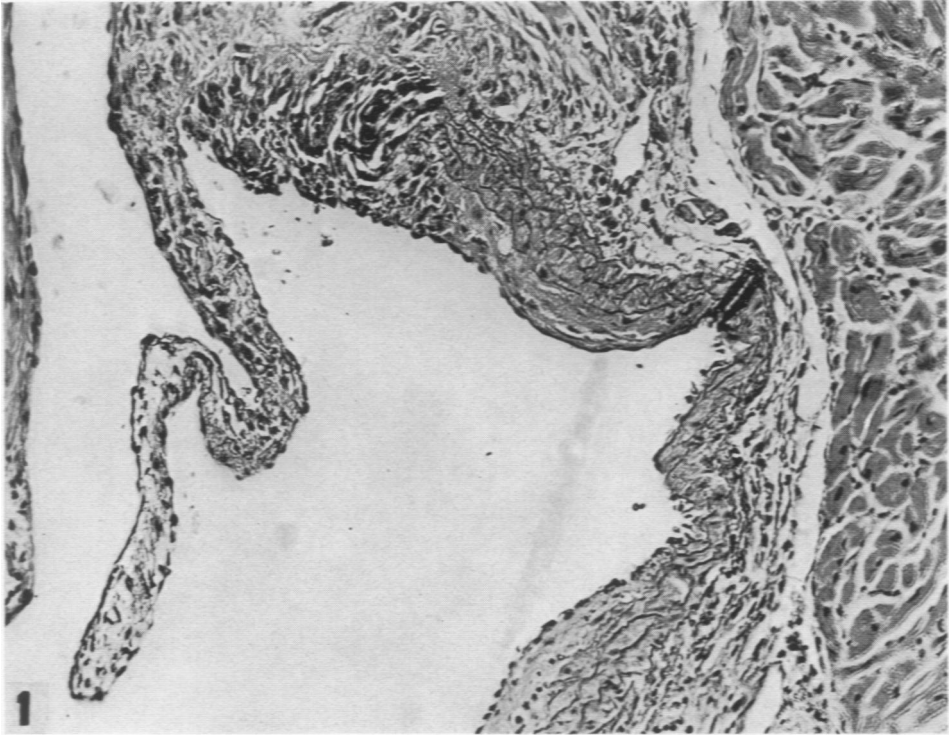


PLATE 135

FIG. 3. Mouse No. 40. Bland verrucous lesion, covered with endothelium, at the root of the aorta in the sinus pocket.  $\times 525$ .

FIG. 4. Mouse No. 151. Acute arteritis and periarteritis. Periarteritis nodosa-like, vascular lesion.  $\times 450$ .

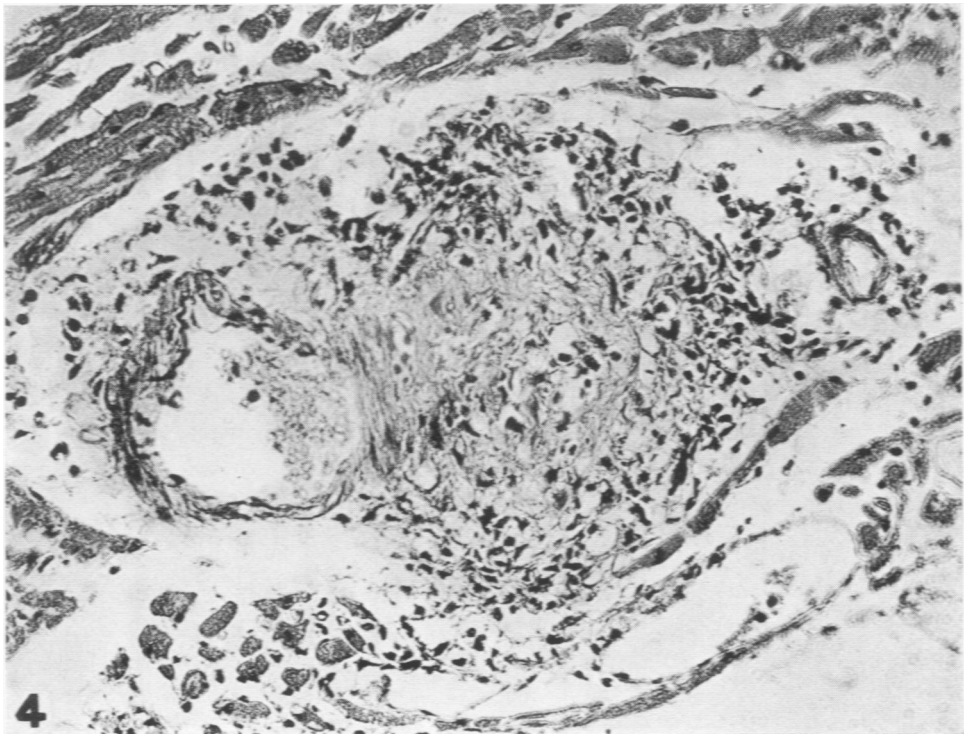
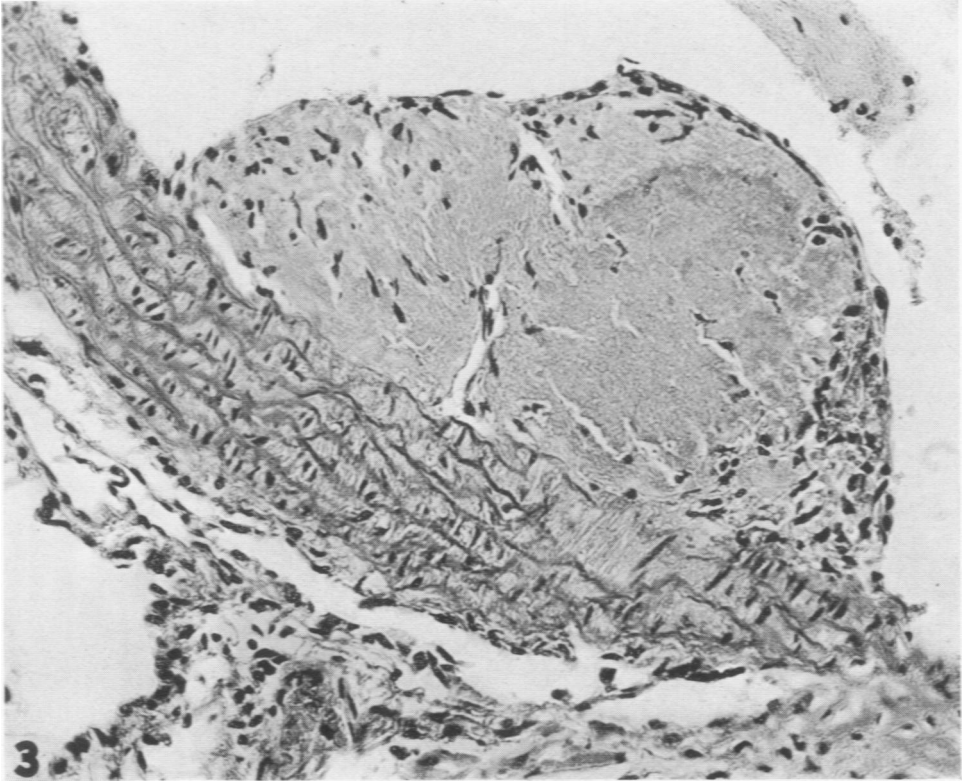


PLATE 136

FIG. 5. Mouse No. 171. Marked necrotizing arteritis.  $\times$  290.

FIG. 6 Mouse No. 6. Multiple foci of myonecrosis with early scarring.  
 $\times$  190.



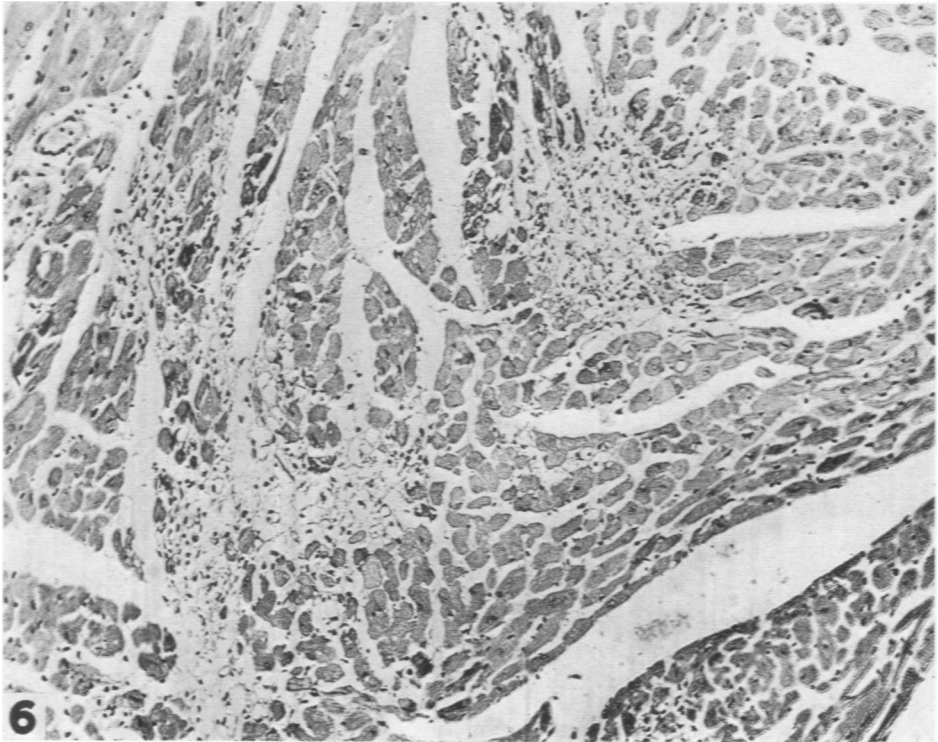
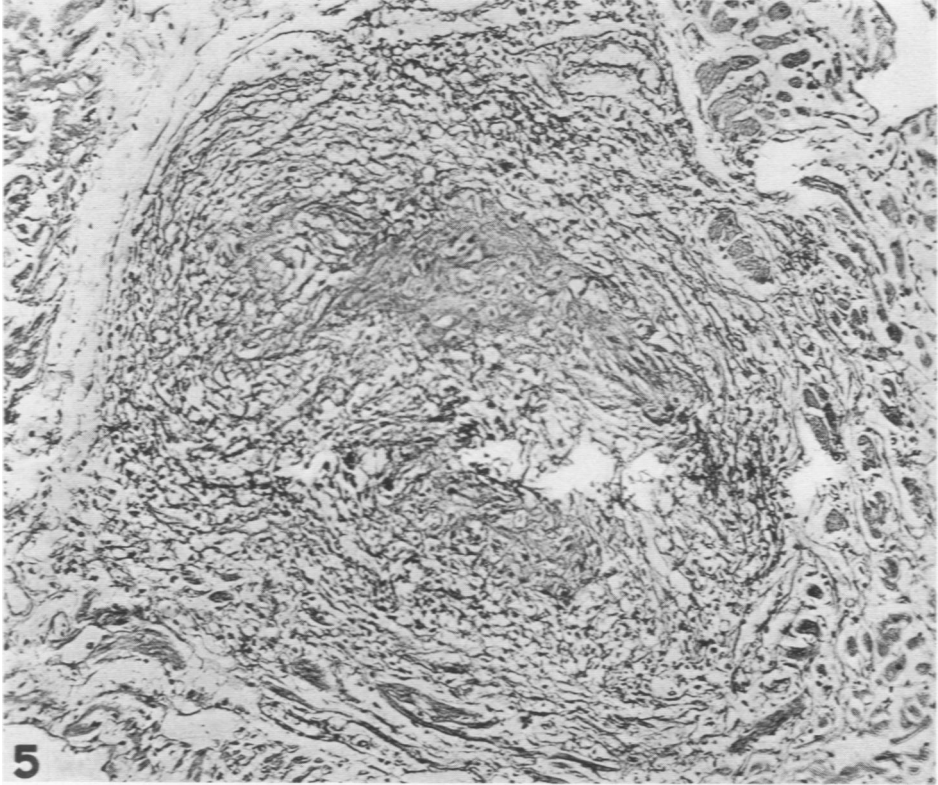


PLATE 137

FIG. 7. Mouse No. 2. Retro-aortic lesion resembling a diffuse Aschoff body.  
× 230.

FIG. 8. Mouse No. 233. High magnification of segment of perivascular nodule resembling Aschoff body. Interstitial myocarditis. × 1750.

