

Title: Protection of the Newborn Rat Against Plasmodium berghei Malaria by Transfer of Immune Rat Spleen Cells

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Objective P. berghei malaria is almost uniformly fatal in newborn rats, whereas adult rats usually survive. The reason for this difference in host resistance is unknown. The immature immunological mechanisms of the newborn are thought to be an important factor. In order to test this hypothesis, spleen cells from immune adult rats were injected into newborn rats; and the newborn rats were subsequently infected with P. berghei.

Description All rats used were random-bred albinos maintained at SEATO Medical Research laboratory. The young animals were all 18 hours old or less. The adult rat spleen donors were given P. berghei malaria, allowed to recover and then challenged again. Their spleens were removed, ground in a glass tissue grinder in Hank's solution, then diluted to contain  $8 \times 10^5$  cells in 0.05 ml. Smears of this material showed most of the cells to be lymphocytes. Approximately 0.05 ml. of the splenic cell suspension was then injected by the intracardiac route into newborn rats using a fine glass needle. Another set of newborn rats were given the same number of adult spleen cells from rats which had never been exposed to malaria. Two to three days after this injection the animals were given approximately 150 million parasites I.P. (one small group got 210 million and another 75 million, both were controls.) Controls were given similar I.P. parasite injections on the first to the 5th day of life. All animals were followed by peripheral blood smears and autopsied upon death. Because of the high mortality of intracardiac injection and the difficulty of being sure that an animal with malaria has died because of the malaria, it was decided to consider that all animals dying beyond the fifth day after being exposed to the parasite had died of malaria.

Results The results are summarized in Table 1. Of 64 control rats, 61 (96%) died of malaria. All of 27 rats given non-immune spleen cells died of malaria. Of 77 rats given immune spleen cells 60 (78%) died of malaria and 17 (22%) survived. The survival curve is shown in Figure 1.

Discussion Although statistical analysis is incomplete at present the difference in survival between control rats and those given immune spleen cells strongly suggests that the spleen cells have a protective effect.

Summary The results of these experiments favor the hypothesis that acquired immunity is an important mechanism of host resistance in this experimental model.

Table 1. Survival of newborn rats infected with *P. berghei* after injection of adult rat immune spleen cells.

	No. of animals surviving 5 days after given malaria	No. surviving malaria	Percentage of survivors	Animals which died			
				No.	Days (after given malaria) on which they died		
					Range	Average	Median
Controls	64	3	4%	61	6-38	15	11
Non Immune Spleen	27	0	0%	27	7-32	17	14
Immune Spleen	77	17	22%	60	6-38	16	12

**PER CENT OF SURVIVAL IN NEWBORN RATS WITH MALARIA  
(Days 1-5)**

