

Title: Oral Transmission of Plasmodium berghei Malaria in Mice

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Objectives The oral transmission of malaria by ingestion of parasitized blood has been reported in the literature and has been observed in the course of other experiments in this laboratory. However, no information is available regarding the site at which the organisms cross the gastrointestinal mucosa or the effect of gastric acidity. Therefore, a series of experiments was performed in which mice were fed blood parasitized by P. berghei. Passage of the organisms through the G.I. mucosa was observed microscopically and the effect of gastric acidity was determined.

Description All blood used was obtained from mice in which 50% to 60% of the erythrocytes were parasitized by P. berghei. Mice were fed by means of a soft plastic tube on which the animals suckled twice a day. All other liquids were withheld after 0800 hours. The amount of blood presented to the animals and the number of feedings were purposely varied, however, because of spillage and occasional regurgitation exact dosage was not known. The mice were random bred albinos from the Veterinary Medicine Department at SMRL. Any animals whose mouths were injured in feeding were excluded. Peripheral blood smears were performed at 48 hour intervals and autopsies were done on those mice that died. As controls newborn mice were infected with 0.25 ml. of the same blood intraperitoneally.

A second group of newborn mice was given one feeding of blood and sacrificed at 8, 15, 30, and 60 minutes after the feeding. They were autopsied and segments of intestine at various levels were taken in an effort to observe parasites traversing the gut mucosa.

A third group of adult mice was fed an antacid (Alka Seltzer) prior to each feeding to see if a diminution in gastric acidity had any effect. It had previously been ascertained that a small dose of the antacid would neutralize the free acid in the stomach in five minutes.

Results The results are summarized in Table 1. It was found that the presence or lack of gastric acid had no detectable effect on the outcome of the infection.

Mice fed the infected organs of other mice did not develop malaria.

Examination of the gut taken in intervals after feeding showed parasites coming out of the red cells, at the luminal edge of the mucosa, passing, it appeared in most cases, between the mucosal cells and finally entering the host red cell in the underlying vascular spaces. Parasites could be found in the host RBC, in the intestinal villi of the newborn mice, eight minutes after feeding.

Summary The mucosa of the gastrointestinal tract of mice presented no barrier to P. berghei. The interval between first exposure and death, however, was considerably longer when the oral route was used. This was thought due to the fact that many of the parasites given orally were either killed or failed to pass the intestinal mucosa.

Table 1. Summary of Attempts to Infect Mice With *P. Berghei* by Oral Route

Mice	Total number	Total amount of blood fed	Smear positive	Autopsied and died of Malaria	Time of death in days
Newborn	8	0.8 ml.	2	2	14 & 20
Newborn	7	0.6 ml.	5	5	19 - 25
20 day	2	0.6 ml.	2	2	11
25 day	2	0.6 ml.	2	2	12
34 day	3	0.2 ml.	2	2	12 & 17
Adult	2	0.6 ml.	2	2	12 & 15
Adult	3	0.6 ml.	2	2	18 & 20
Total Experimental	27	0.18-0.6	17	17	11 - 25
Controls Newborn	7	0.25 ml. injected i.p.	7	7	7