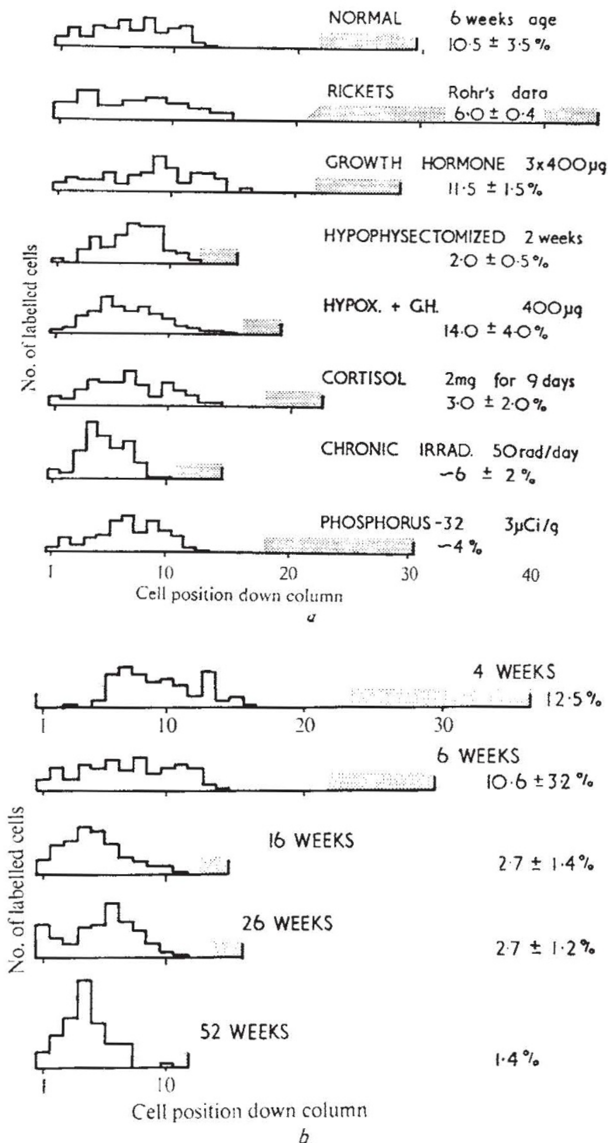

Fig. 1 (*a*) Labelling profiles of the proximal growth plate of the rat tibia. The shaded areas show the approximate lengths of the hypertrophic zones. Figures to the right of the profiles give the labelling index with standard deviation. Normal, 6 week old male Wistar rats; Rickets, weanling Wistar rats after 2 weeks rachitic diet (data from ref. 13); growth hormone: three daily injections of 400 µg (1 mg = 1 IU) of bovine growth hormone in 6 week old male Wistar rats; hypophysectomized, male Wistar rats hypophysectomized when 6 weeks old, data for 2 weeks after operation; hypox. + G.H., rats 2 weeks after hypophysectomy killed 24 h after receiving 400 µg of growth hormone; cortisol, 6 week old male Wistar rats given 2 mg daily injection of cortisol for 9 days; Chronic irrad, 7 week old female August–Marshall F1 hybrid rats subjected to chronic gamma irradiation at 50 rads/day for 35 days; phosphorus-32, 7 week female August–Marshall F1 hybrid rats injected with 3 µCi/g ^{32}P, killed 4 weeks later. (*b*) Labelling profiles for male Wistar rats 4 weeks to 1 yr old.

actions linking cause with effect; for example it is known that the effect of growth hormone is mediated by sulphation factor[8], but there is evidence from transplant studies[7,9] that the basic growth controls are internal to the growth plate. There is less evidence on the control that limits the length of the proliferation zone. If differentiation from proliferation to maturation is triggered at a certain level in a diffusion gradient, then a constant length of zone would be expected but the available data on the direction of diffusion within growth cartilage are conflicting[10,11]. A further possibility of controlling the number of cells per column in the proliferation zone is by setting a limit to the number of divisions that each daughter cell of a resting cell may make. We tested this type of control on a computer model[12] and found it to be very insensitive.

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Impairment of Antibody Response and Recovery in Malarial Rodents by Antilymphocyte Serum

HETEROLOGOUS antilymphocyte serum (ALS) is a very potent inhibitor of cell-mediated immune responses such as homograft rejection and delayed hypersensitivity[1]. It has also been shown to suppress the antibody response to inert antigens such as sheep red blood cells and bacterial products in rodents and other laboratory animals[1–3]. By contrast, in the several infections of rodents in which the antibody response has been followed, including trichinosis in rats[4] and several viral infections of mice[5,6], ALS impaired recovery, but the antibody response was not altered. It is therefore of interest that we have found a marked delay in the antibody response associated with delayed recovery from a malaria infection in ALS-treated mice.

NIH general purpose female mice were infected with the 17-X strain of *Plasmodium berghei*[7]. This strain causes a self-limited infection in mice and is therefore suitable for the study of the immune response. ALS was prepared in rabbits by the method of Levey and Medawar, using thymocytes from newborn mice[8]. Mice to be infected were divided into three groups containing ten mice each: an ALS-treated group, a control group treated with normal rabbit serum (NRS), and a control group receiving no treatment. Treated mice received 0.3 ml. of ALS or NRS intraperitoneally every three days, beginning three days before infection and continuing throughout the course of the infection. Parasitaemia levels were determined daily and fluorescent antibody levels were determined weekly on all mice by the method of Kuvin and Tobie[9].

Fig. 1 shows the course of the parasitaemia and the specific antibody response for each group of mice. Mice in the control groups attained peak parasitaemia values of 20–30% and showed a rapid decrease of parasitaemias during the third week. By contrast, ALS-treated mice attained peak parasitaemia values of 70% and clearance of parasites was delayed

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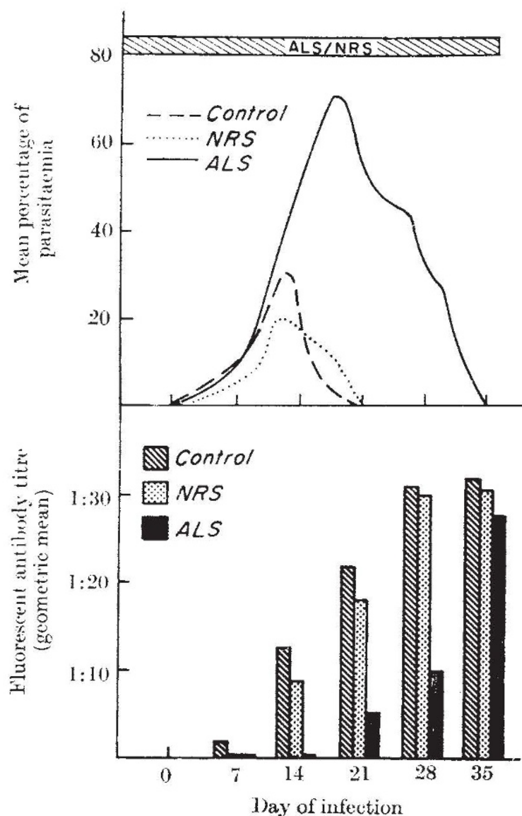

Fig. 1 Daily group parasitaemia levels (top); weekly fluorescent antibody titres (bottom).

until the fifth week of infection. By day 14, the untreated control and the NRS-treated mice showed significant increases in antibody titre, and peak titres were attained by day 28. At day 14, the ALS-treated mice showed no increase in titre. By day 21 they showed modest increases, and not until day 35 had they attained titres comparable to the other two groups.

This study shows that, in mice, ALS can suppress the antibody response to a replicating agent just as it suppresses the response to non-replicating antigens such as sheep red cells. As already noted, ALS treatment did not alter the humoral response of rodents to several other infectious agents. On the other hand, Wenner *et al.* have recently reported a delay in the antibody response to a monkey pox infection in ALS-treated cynomolgous monkeys[10], a result similar to our own in mice with a malaria infection. It is reasonable to suppose that ALS may act similarly in man and that the suppression of the humoral immune response by ALS might interfere with the diagnosis of or recovery from some infections.

It is apparent from the appearance of antibody and recovery from the *P. berghei* infection that the effects of ALS were transient. This was probably because of the formation of antibody to the ALS, known to occur in rodents receiving frequent ALS injections[2,11].

The close temporal relationship of antibody synthesis and decrease in parasitaemia in all three groups of mice suggests that antibody participates in the recovery process. This possibility is supported by previous studies which showed that malarial antibody can passively protect infected humans and rodents[12-14], and impair the *in vitro* proliferation of plasmodia[15].

There is evidence from studies using neonatal thymectomy and passive transfer of lymphocytes that cell-mediated immunity may also participate in recovery from *P. berghei*[16-18]. Phagocytic activity by the reticuloendothelial system is essential to recovery[19], and recently it has been suggested that interferon may be involved[20]. In addition to antibody synthesis, each of these defence mechanisms may be impaired by ALS[21,22], making it difficult to delineate the critical factors in recovery from infection by the use of ALS.

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Xg Blood Groups of Thais

SAMPLES of blood from 181 normal unrelated Thais from Bangkok have been tested for the *X*-linked blood group antigen Xg^a. The results are shown in Table 1.

Table 1 Frequency of Xg^a in Thais

	Xg (a +)	Xg (a −)	Total
Male	73	48	121
Female	46	14	60

The number is small but the results are sufficient to show that antigen is less common in Thais than in Europeans[1] and Indians[2], but more common than in Chinese[3]. Thai gene frequencies calculated from the male and female results are: Xg^a 0·57 and Xg 0·43.

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