

tion of antigen-specific stimulation of previously sensitized lymphocytes<sup>3,8</sup> to mitogen-like stimulation of both sensitized and non-sensitized lymphocytes<sup>4,6,7,9</sup>. A close look at the literature and careful attention to the results obtained raises the question whether the stimulatory material in malaria parasite extracts is, in fact, a mitogen.

The points that have been put forward to support a mitogenic nature of the active factor include: (1) Ability to stimulate non-immune<sup>4,7,10,11</sup> and cord blood<sup>3,7</sup> lymphocytes; (2) the observation that a large number of immunological specificities are involved in malaria-induced autoimmunity<sup>12-18</sup> and (3) the belief that only a small proportion of the high serum immunoglobulins in infected individuals contains antibody activity specific for malaria parasite<sup>4,7,19</sup>.

Results consistent with the possibility that the response to malaria extracts by normal spleen cells represents primary *in vitro* sensitization have been obtained<sup>9</sup>. This response exhibited delayed kinetics and reduced magnitude compared to the response by immune cells. The intense activity of the reticuloendothelial system during malarial infection<sup>19</sup> may result from stimulation by highly potent antigens from the parasite. This high potency of antigenic materials from plasmodia may be responsible for the response of cord blood lymphocytes. There is evidence against a functional immaturity, and for a lack of adequate triggering of surface receptors on cord B lymphocytes<sup>20</sup>. Also, the human fetus is able to respond immunologically to intrauterine infections<sup>21-24</sup>.

While autoantibodies directed against a number of autoantigens have been described in malaria, an abnormal frequency of only anti-nuclear antibodies was found in a recent survey<sup>25</sup> carried out in a malaria endemic region in Upper Volta. Thirteen other autoantibodies studied had a normal frequency. This selective increase in the frequency of one autoantibody cannot result from a nonspecific polyclonal mitogenic activation. However, Phanuphak *et al.*<sup>26</sup> reported results associating acute malarial infection with high incidence of autoantibodies of both nuclear and smooth muscle antigens. Another factor that may operate in the pathogenesis of autoimmunity could be repeated stimulation of the reticuloendothelial system with parasite antigens cross-reactive with normal tissue antigens<sup>27</sup>.

Although there is evidence to show that only a fraction (6-11%) of the high serum immunoglobulin levels in malaria is specific malaria antibody<sup>19</sup>, there seems to be no report indicating what proportion of the total immunoglobulin produced in response to malarial infection this fraction represents.

In the light of the foregoing, is it not

more appropriate to talk in terms of highly potent (or "super") antigens rather than mitogens in malarial infection?

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## The riddle of the magnetic doors

SIR—The Wei and Ching rivers in the northwestern part of China have their sources in Kansu province and flow into the Yellow River (Huang Ho). This river basin has been in fact the cradle of ancient Chinese civilization. It was known that the Wei is rather muddy and the water of Ching is clear; when they join together, the border line can still be seen. Sian on the south bank of the river Wei was a flourishing city during the Ch'in dynasty about 2,200 years ago.

As is generally known, the first emperor of the Ch'in dynasty (221-206 BC), Shih Huang Ti, successfully unified the country. Recently near his burial place, not far from Sian, a brigade of terracotta soldiers and horses has been found and carefully excavated. The total number of life-size figures is about 6,000. Besides many metal weapons and swords, a carriage hauled by four horses made very delicately of bronze has also been discovered. A large museum has now been built at the spot.

There has long been a tradition that the door of the tomb of Ch'in Shih Huang Ti could not be cut through by iron swords because iron was attracted to it. This may seem incredible but the records of the newly found *Yung-Lo Ta Tien* are worth

mentioning. This was the world's largest known encyclopedia, and was compiled in China under the direction of the Yung-Lo emperor in 1406 (for details see *Encyclopedia Britannica* x, 847; 1980). According to Chinese literature the work contained 22,870 chapters. It was unfortunately scattered in the course of time, but a remnant of this encyclopedia, totalling 730 chapters was published in China in 1960.

Among the palaces of Ch'in Shih Huang the magnificent and splendid Ah Fang Palace was described by the famous poet Tu Mu (AD 803-853) whose rhymed description has attracted thousands of Chinese scholars. Much to our interest, another volume of the scattered *Yung-Lo Ta Tien* has been recently discovered in Yeh Hsien, a district in Shantung province. The fact that the doors of the Ah Fang Palace were built with magnetic stone is reported in this volume. We translate the description in the following passage: "There were gates of magnetic stone in Hsien-yang (a city 20 km north-west of Xian), 15 li (about 5.5 km) south-west of the city. On the east and west there were bridges leading to the north gate of the Ah Fang Palace. The gate was built of magnetic stone. Warriors wearing iron armour were detained or attracted and could not pass through".

An article entitled "The Western Capital" written by Wei Su was also quoted in this volume. It states that the gates of Ah Fang Palace were made of magnetic stone so that men with swords could not enter.

Some scientific facts recently found may perhaps be connected with the above literature. A few years ago a member of the commune near Sian with modern knowledge of magnetic ferrites — which are ferrimagnetic oxides used in making devices for high frequencies in modern electronics — wrote and told me that the natural river sand from the Wei River can be sintered and used as ferrite materials with good magnetic properties. He sent me about a kilogram of the river sand from Wei. I have had the sample analysed in our laboratory. The material possesses the following chemical composition in weight percentages: Fe-69.29; Si-0.58; Mn-0.14; MgO-0.25; W- 1.0; Ti-0.55; Cr-0.20; and Al-0.30.

The oxides are black in colour. As they are highly magnetic, it may be concluded to be a mixture of magnetic Fe<sub>3</sub>O<sub>4</sub>, ilmenite FeTiO<sub>3</sub>, and other oxides including WO<sub>3</sub> and FeCr<sub>2</sub>O<sub>4</sub>. The quality of the material is not inferior to the synthetic oxides used in the manufacture of ferrites in modern industry.

Unfortunately we have not yet found any direct evidence that this magnetic sand was used in ancient times.

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