

advice in the microelectrophoretic studies recorded in this paper.

R. R. A. COOMBS.  
R. R. RACE.

Department of Pathology,  
University of Cambridge,  
and Medical Research Council,  
Emergency Blood Transfusion Service.

June 18.

<sup>1</sup> Race, *Nature*, 153, 771 (1944).

<sup>2</sup> Wiener, *Proc. Soc. Exp. Biol. and Med.*, 56, 173 (1944).

<sup>3</sup> Diamond and Abelson, *J. Clin. Invest.*, 24, 1, 122 (1945).

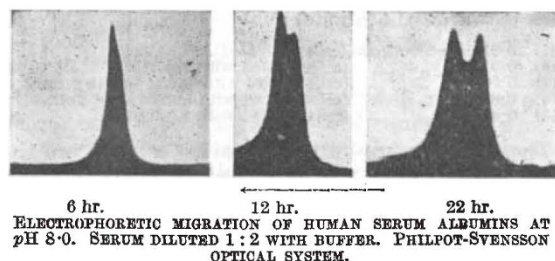
<sup>4</sup> Adair, *Proc. Roy. Soc., A*, 106, 627 (1925).

<sup>5</sup> Furchgott and Ponder, *J. Gen. Physiol.*, 24, 447 (1941).

## Heterogeneity of Human Serum Albumin

THE existence of more than one serum albumin in the horse has been demonstrated by chemical fractionation by several workers. We have now examined human serum in the Tiselius electrophoresis apparatus under conditions designed to detect heterogeneity of the albumin fraction, and find that it consists of at least two components. The experiments were carried out at the high potential gradient of 10.0 volts/cm. in phosphate buffer of pH 8.0 and ionic strength 0.1, and extended up to 26 hours.

Some evidence of heterogeneity can be detected in the ascending albumin boundary after six hours, while after twelve hours definite separation into two components was observed.



We have also observed a small third peak migrating faster than the albumins. This is associated with pigment and lipoids. It is not yet possible to say whether it represents a true protein component.

The two albumin peaks have now been observed in all the five normal sera examined up to the present. The ratio of the mobilities of the two albumins is 1.01, and this value remains constant throughout the experiment.

Previous workers have reported only one albumin boundary at pH 8.0, although Luetscher<sup>1</sup> observed a complex pattern between pH 4 and 6. Moyer and Moyer<sup>2</sup> separated two albumins from horse serum by fractional crystallization and showed that the difference in electrophoretic mobilities was greatest at pH 8.0. The present observations show that human serum also contains at least two albumins, which have not previously been differentiated on account of the small difference in their mobilities.

We suggest that the faster component be termed  $A_1$  and the slower  $A_2$ , pending their further characterization, on which we are now engaged.

H. HOCH.  
C. J. O. R. MORRIS.

Hale Clinical Laboratory, and Endocrine Unit,  
The London Hospital, June 2.

<sup>1</sup> Luetscher, J. A., *J. Amer. Chem. Soc.*, 61, 2888 (1940).

<sup>2</sup> Moyer, L. S., and Moyer, E. Z., *J. Biol. Chem.*, 132, 373 (1940).

## An Antibiotic Substance in the Chinese Water-chestnut, *Eleocharis tuberosa*

IN our search for the presence of antibiotic substances in the higher plants used in China for food or for drugs, we have examined the tubers of the waterchestnut, *Eleocharis tuberosa*.

The waterchestnuts, bought in the local market, were washed and crushed in a Carver laboratory hydraulic press. In a typical experiment, 1,650 gm. of waterchestnuts yielded 300 ml. of a milky liquid with a slightly acid reaction (pH 6.3). This was neutralized with a few ml. of *N/10* sodium hydroxide solution and the antibiotic action of the solution was tested with the 'ring test' method of Heatley<sup>1</sup> for penicillin. Positive results were obtained with *Staphylococcus aureus*, *B. coli* and *Aerobacter aerogenes*. *Bacillus graveolus* was found to be unaffected under the conditions of our experiments.

The active principle has not yet been extracted, and concentration of the liquid extract has thus far been effected by a crude technique<sup>2</sup> because of lack of a proper vacuum pump. The active substance is thermolabile, being destroyed when subjected to a water-bath temperature of 95° C. for more than 10 minutes. It is not destroyed when kept at pH 3 or pH 8 for at least 30 minutes. In slightly alkaline, acid or neutral media, it is not extracted by ether, petroleum ether, chloroform, benzene, carbon disulphide, ethyl acetate, acetone, etc. It is not adsorbed by the sample of animal charcoal which we used or by kaolin. The activity of the solution appears to be destroyed by ethyl alcohol. When the milky solution is cleared of its protein and other substances with lead acetate, and the latter is removed with hydrogen sulphide, the clear neutralized solution gives no activity.

The partially concentrated extract when added to *B. coli* in microrespirometer vessels of the Warburg type inhibited the respiration of the culture more than 80 per cent after about ten hours.

For convenience, we shall designate the active antibiotic principle in *Eleocharis tuberosa* as 'puchiin', from the Chinese characters for *Eleocharis tuberosa*.

We are indebted to Dr. G. S. Fan of the China Blood Bank for his assistance in carrying out some of the tests on the antibiotic effects of puchiin.

S. L. CHEN.  
B. L. CHENG.  
W. K. CHENG.  
P. S. TANG.

Physiological Laboratory,  
Tsing Hua University,  
Kunming.

<sup>1</sup> Heatley, N. G., *Biochem. J.*, 38, 61 (1944).

<sup>2</sup> Lou, C. H., and Chen, S. L., *Biochem. Bull.*, No. 28 (1943).

## Utilization of Carotene from Oils

VARIATIONS in the growth-response of vitamin A-deficient rats to carotene dissolved in different oils has been partly attributed to their linoleic acid content<sup>1</sup>. While trying to discover the causes of the variations, it was felt that it would be of interest to test this hypothesis by equalizing the intake of linoleic acid. Rats depleted of vitamin A reserves on a low-fat diet similar to that of Sherman<sup>1</sup> were divided into five groups and fed the supplements indicated in the accompanying table by *a* and *b* by means of calibrated droppers.