in chromatography. It was possible to show the adsorption of quite large amounts of lipid material on to the powder after mixing with red cells for a few minutes. Extraction of the recovered powder was performed with chloroform/methyl alcohol mixtures, and the extracts analysed for cholesterol, phospholipid and nitrogen. Control experiments in which the powder was shaken with 0.15 M sodium chloride solution used for washing the cells prior to treatment yielded negligible values for the various substances. In two experiments of the type described, alumina was used for comparison.

In addition, some of the lipid material, after extraction from the powder, was freed from cholesterol and dissolved in a mixture of 10 per cent *iso*-propyl alcohol in benzene. Small quantities of this were used for making spread-films on water; the ability of suspensions of 'Hyflo Super-Cel' to lower the surface pressure of these films was measured with a Langmuir film balance. It was found that, while simply introducing a suspension of the powder into the water below the powder had no effect, directing a stream of the particles upwards towards the underside of the film lowered the surface pressure rapidly and considerably.

The results of this work suggest that, at any rate in the case of the siliceous material used, haemolysis results from an interaction between the cell surface and the powder particle, with direct adsorption of components of the membrane. Particle-size appears to be an important factor in this process.

Details of this work have been submitted for publication elsewhere, and further quantitative investigations of the factors controlling interaction between cell surfaces and solid adsorbents is proceeding.

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¹ Lovelock, J. E., *Biochem. J.*, **60**, 692 (1955).

² Johns-Manville Corp., U.S.A.

Induced Change from Culture Form to Blood-stream Form in *Trypanosoma mega*

In its vertebrate host, a trypanosome multiplies in the trypanosoma form while, in its invertebrate host, it first takes the crithidial form, which is no longer infective, to reappear as metacyclic forms at the end of its cycle. Similarly, in culture, the blood-stream trypanosomes lose their infective power and their typical shape and become transformed into the crithidial form.

We have tried to elucidate the factors responsible for those transformations and succeeded in inducing the development from culture to blood-stream form, by addition of vertebrate serum. We used *Trypanosoma mega*, a parasite of amphibians. This trypanosome has been kept through fifty subcultures in a serum-free medium¹.

Slide cultures were made with various media, examined under a phase-contrast microscope and as stained smears. In young, actively growing cultures, the flagellates multiply as round bodies, often clustering into regular-shaped rosettes. After a few days the rosettes disintegrate, and the crithidia become elongated and free-swimming (Fig. 2).

The addition of fresh toad serum agglutinates the crithidia and induces the development, after a day or two, of numerous trypanosoma forms with undulating membrane and posterior kinetoplast. In

Fig. 1. Induced transformation of *Trypanosoma mega*: 1, blood-stream form in *Bufo regularis*; 2, culture form, crithidia; 3, trypanosoma form induced by toad serum; 4, trypanosoma form induced by calf serum. (Giemsa stain. $\times c. 1015$)

1911, França² observed a similar phenomenon in *T. rotatorium*. This author transferred crithidia from the digestive tract of a leech into frog serum kept continuously agitated. He ascribed the transformation to the agitation and not to the serum.

We next noticed that the action was not specific of toad serum: the sera of various mammals, such as mouse, horse, calf, had the same action on the crithidia. This led us to choose calf serum for our next experiments.

Calf serum added to the culture medium in adequate proportion (50 per cent or more) agglutinates and kills the flagellates in a few minutes. The same serum heated to 56° C. for 39 min. agglutinates without lethal effect and, 24 hr. after its addition, numerous blood-stream forms appear in the culture (Fig. 4). Finally, this serum, exposed at 0° C. to large quantities of culture flagellates, has lost its specific agglutinins but retains its ability to change crithidia into trypanosoma form.

After dialysis, calf serum loses none of its form-changing activity. On the other hand, the serum fraction soluble in 50 per cent ethanol does not modify the form of culture crithidia.

The serum proteins were next fractionated by salting out with ammonium sulphate, followed by dialysis and lyophilization. Preliminary experiments showed that the activity is linked with the globulin fraction.

We observed that, in a culture, a certain number only of the crithidia were transformed into trypanosomes by the action of serum. This percentage seems to be closely connected with the age of the culture: a young culture, rich in dividing forms (rosettes), yields only very few trypanosoma forms. This would mean that, apart from the specific property of the serum, the transformation of the trypanosome requires a corresponding intrinsic factor. An analogy exists between this fact and the appearance of metacyclic trypanosomes at the end of the invertebrate cycle.

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¹ Boné, G. J., and Steinert, M., *Nature*, [178, 308 (1956)].

² França, *Bull. Soc. Path. Exot.*, **4**, 534 (1911).