surface of the medium. Usually the most rapid growth was found in the case of cultures placed at the boundary between the liquid and gaseous phase of the medium. Dependence of growth of the cells from the central tissue fragments on to the surface of the glass and the liberation of products of tissue metabolism stimulating cell division from it [4, 11].

These investigations thus showed that various factors connected with the conditions of culture affect quantitative assessment of the viability of the tissue in culture to different degrees. This fact must be taken into account both when cultures are set up for quantitative investigations and also when methods of assessing the viability of living tissue explants are developed.

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ORIENTATION OF NONSPHERICAL CELLS IN BLOOD FLOWING THROUGH A VESSEL

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Photometric experiments on model blood vessels showed that nonspherical blood cells are oriented in the flow with their short axes along the radius of the vessel.

KEY WORDS: *blood cells; physiological function.*

During investigation of the hemodynamic properties of blood the determination of the orientation of blood cells without spherical symmetry frequently arises; it is important for the study of their kinematics and, possibly, their physiological functions.

Since the available data are insufficient to solve this problem, the investigation described below was carried out to determine the orientation of nonspherical cells in the blood flow by recording changes in optical density of a cell suspension in plasma moving through cylindrical cuvettes with cross sections of different shapes, and also in a resting state.

EXPERIMENTAL METHOD

The optical density of the suspension was measured as it passed through a glass cuvette with rectangular cross section of 0.7 × 14 mm and through a tube with a bore of 2.5 mm. An LG-56 helium-neon laser with wavelength of 632.8 nm, the beam of which passed perpendicularly to the flow, was used as the source of light. The cuvette with the rectangular cross section was illuminated along the larger side, the tube through its central part. Changes in optical density were observed by means of a square detector, the signals from which were recorded on an automatic writer.

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The flow was created by application of hydrostatic pressure. The difference in optical density of resting and moving plasma containing platelets or red cells was measured.

According to the theory of scatter of light, for a suspension of particles shaped like ellipsoids of rotation [1], if such particles are oriented with their minor axes in the direction of spread of light the optical density of the suspension will be smaller than if they are arranged randomly. Consequently, the orientation of the blood cells in the flow can be judged from changes in the optical density when the flow of plasma is started and stopped.

Blood was obtained from a rabbit by cardiac puncture and stabilized with 3.8% sodium citrate solution in the ratio of 9:1. Platelet-enriched plasma was prepared by centrifugation of blood at 2000 rpm for 5 min, platelet-deprived plasma by centrifugation of blood at 5000 rpm for 15 min. A suspension of red cells was obtained by adding washed red cells to platelet-deprived plasma in a concentration of 10^5 cells/μl.

EXPERIMENTAL RESULTS

On starting the flow of plasma containing both platelet and red cells in the cuvette with rectangular cross section the optical density increased, whereas in the tube it decreased, and when the flow was stopped, the original optical density was restored.

Nonspherical cells moving in a flow with nonzero velocity gradient were oriented in a definite manner by hydrodynamic forces. In the cuvette with rectangular cross section the velocity gradient and direction of incidence of light were mutually perpendicular and lay in the plane of section, whereas in the transilluminated part of the tube the velocity gradient was parallel to the incident beam. Since the effect of a change in transmission of light after stopping the flow differed in sign in the case of transillumination along and perpendicularly to the velocity gradient, it can be concluded from the observed decrease in optical density when the flow through the tube was started and its increase to its previous level when the flow was stopped, that nonspherical cells move in the blood flow with their minor axes oriented along the radius of the vessel.

The second important result of these experiments is that the optical density of a suspension of disk-shaped cells, arranged with their minor axes perpendicularly to the direaction of incidence of light, is greater than if they are arranged randomly.

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