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THE APPLICATION OF OSCILLATING SYSTEM TO RESEARCH OF PROCESS OF RED BLOOD CELL AGGREGATION IN MICROSCOPIC VOLUME SYSTEMS

Scientists have always been interested in rheological properties of blood. This interest stems from the fact that a large number of diseases caused due to changes in the composition and biophysical properties. Red blood cells consist 98% of the total volume of formed elements of blood and determine the rheological parameters of blood. Hemorheological disorders are of great importance in the pathogenesis of many diseases. Aggregation of red blood cells is the ability of RBCs to form "coin bars", the shape of which depends on the normal or pathological conditions [1]. The nature and process indicators aggregation of erythrocytes can be concluded about the health of the patient.

Photometric methods are used most often to study the process of aggregation. Photometric registration method based on measuring the intensity of the light flux, which receivelets blood in the process of growth units, after the termination of stirring of the test specimen in special cells [2]. A large blood volume, e.g. 1 ml or more are used in modern aggregometers. The task of developing devices with the use of small volumes of blood is relevant at the moment. Therefore, one of the objectives when designing the device for the study of the aggregation with the use of drip samples was creating a vibration mechanism integrated into this measurement system. Requirements for vibrating the platform:

- Minimum dimensions;

- To ensure the safety of the drops; (no spreading, in the process of vibration)
- Frequency and power fluctuations of the cuvette with the sample is sufficient to break the aggregates.

To create a system of shear deformations, it was decided to use a block electromagnetic focusing used in optical recording devices (CD-ROM, DVD-ROM). The dimensions of this device are allowed to put it in the camera the primary Converter for photometric studies. Instead of the focusing lens was installed in the cuvette for placement of drip samples. Photo presented in figure 1.



Fig.1. Laboratory model system shear deformation

In summing up the AC voltage to the windings of the electromagnets, the possible oscillations of the cuvette with the sample in horizontal and vertical planes. Further experiments showed that the most effective in the breakdown of cellular components and preservation are the drops in the horizontal displacement of the coal region. The changes of amplitude and frequency fluctuations of the cell are carried out by changing the amplitude and frequency of the supply voltage. After the preparation of samples for research and posting it on this cell system is placed in a photometric device, power is supplied to the mechanism that destroys the formed aggregates, the resulting homogeneous suspension is illuminated in parallel and the resulting signal is recorded on a PC.

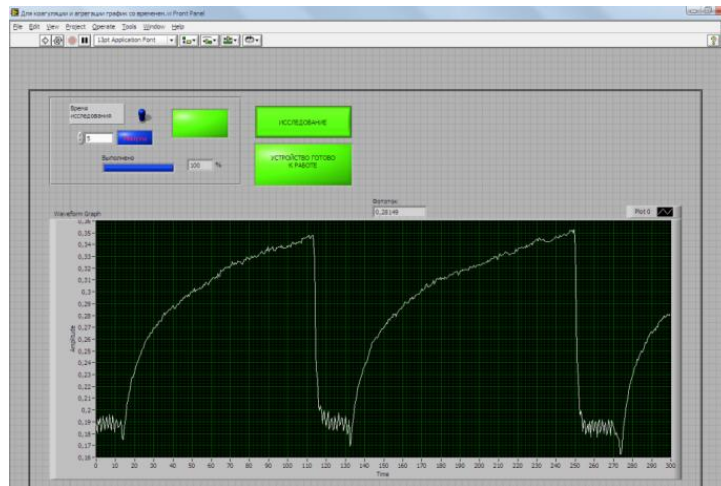


Fig.2. The example of the program

For plant control, visualization and recording of data obtained by transmission of the blood sample, using a program developed in LabView. The window of this program shown in figure 2.

Presented in figure 2 photometric curve, reflects the processes of formation and breakdown of aggregates in the drip sample.

The initial moment of time (10s) this graph reflects the breaking process of the cell units when a voltage is applied to the vibration system. A further increase in light transmission (amplitude) due to the formation of aggregates. Upon reaching the amplitude 0,35 again included In the mechanism breaking and the amplitude was also decreased to values in the 0.19 V, this proves that this system of shear deformation breaks the aggregates and the sample is homogeneous. The parameters were selected, which achieved the maximum breakdown of units (minimum light transmittance) and the shape of raindrops:

- Supply voltage (SP) – 2V,
- The supply frequency (f) is 80Hz.

Research using the proposed device, provided with a vibrational system, ensure reproducibility and high sensitivity of the measuring system to the process of aggregation of erythrocytes

Studies have shown that the proposed system shears trains, consistent with the basic stated requirements and can be used in the system of evaluation of aggregation of red blood cells. Thus, this oscillation system can be used when

creating a photometric instrument for studies of aggregation of erythrocytes in microvolumes. In the future we plan to refine the design of the device in terms of ease of its practical application and to conduct its clinical trials.

THE LIST OF REFERENCES

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