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## **Electromagnetic properties of erythrocytes**

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**Introduction:** The charge density of erythrocyte surface (zeta potential) strongly influences the extent and time course of aggregation/ blood viscosity. Erythrocytes and their membrane always rotate during the flow (tumbling, tank tread) and due to motion of charges, can be expressed in magnetic field. So, study electromagnetic properties of the erythrocytes, can be expresses blood viscosity alterations in arterial and venous blood.

**Materials and Methods:** We have made combined solenoid transformer (no magnetic core) with the primary winding- using the pipe for blood circulation. Pipe diameter 2mm. Lenth- 4.5m. Circulating mass: 10ml. venous blood, 0.1ml heparin, 10ml saline. Flow velocity 10ml/sec. Oscillating frequency 1Hz. Number of primary pipe turns- 18. Secondary winding with the copper wire 18 gauge. Number of secondary turns-600. Measuring tool–Fluke 101 Basic Digital Multimeter. In total 10 different experiments were done. Solenoid transformer was placed in perpendicular direction to the external solenoid magnet.

**Results:** We observed blood oscillation in the pipe inside and outside of the external magnetic field. Voltage at the secondary winding outside the magnet -  $0.2\pm0.1$ mv, voltage inside the magnet -  $0.7\pm0.1$ ml.

**Discussion:** The erythrocytes are orients with their disk plane parallel to the external magnetic field. Orientation is primarily caused by the diamagnetism of the components of cell membrane. Hemoglobin makes no contribution to the orientation of erythrocytes. During the circular motion around the transformer core, erythrocytes come closely parallel to each other. High voltage, when the transformer is inside of the external magnetic field, indicates rotational motion of the charged erythrocytes (forming tiny magnets), thus increasing the sum of the magnetic field. During the oscillation of blood, direction of magnetic field changes in 1800 and electromagnetic induction is formed. If the electromagnetic induction had been triggered just by the erythrocyte charges, it would have been expressed in voltages at the secondary winding outside the external magnetic field.

**Conclusion:** If one takes into account that oxygenated hemoglobin is diamagnetic and deoxygenated-paramagnetic, than the erythrocyte tumbling increases surface charge in the arterial blood flow. Herewith it helps to uptake oxygen in pulmonary capillary and release oxygen in peripheral capillary bed.

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