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Evaluation of Different Anticoagulant Effects on Flow Properties of Human Blood Using Falling Needle Rheometer

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Abstract : Flow property of human blood is one of the important factors on the prevention of the circulatory condition such as a high blood pressure, a diabetes mellitus, and a cardiac infarction. However, the measurement of flow property of human blood, especially blood viscosity, is not so easy, because of their coagulation or aggregation behaviors after taking a sample from blood vessel. In the experiment, some kinds of anticoagulant were added into the human blood to avoid its solidification. Anticoagulant used in the blood test has been chosen for each purpose of blood test, for anticoagulant effect on blood is different mechanism for each. So that, there is a problem that the evaluation of measured blood property with different anticoagulant is so difficult. Therefore, it is so important to make clear the difference of anticoagulant effect on the blood property. In the previous work, a compact-size falling needle rheometer (FNR) has been developed in order to measure the flow property of human blood such as a flow curve, an apparent viscosity. It was found that FNR system can apply to a rheometer or a viscometry for various experimental conditions for not only human blood but also mammalians blood. In this study, the measurements of human blood viscosity with different anticoagulant (EDTA and Heparin) were carried out using newly developed FNR system. The effect of anticoagulant on blood viscosity was also tested by using the standard liquid for each. The accuracy on the viscometry was also tested by using the standard liquid for calibrating materials (JS-10, JS-20) and observed data have satisfactory agreement with reference data around 1.0% at 310K. The flow curve of six males and females with different anticoagulant were measured using FNR. In this experiment, EDTA and Heparin were chosen as anticoagulant for blood. Heparin can inhibit the coagulation of human blood by activating the body of anti-thrombin. To examine the effect of human blood viscosity on anticoagulant, flow curve was measured at high shear rate (□350s-1), and apparent viscosity of each person were determined with different anticoagulant. The apparent viscosity of human blood with heparin was 2%-9% higher than that with EDTA. However, the difference of blood viscosity for two anticoagulants for same blood was different for each. Further discussion, we need the consideration of effect on other physical property, such as cellular component and plasma component.

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