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Effects of red blood cell deformability on the non-uniform distribution of platelet-sized particles in blood flow through microchannels MASAKO SUGIHARA-SEKI, KEISUKE SAKAMOTO, TOMOAKI ITANO, JUNJI SEKI, Kansai University — In blood flow through microvessels, platelets are known to have enhanced concentrations near the vessel wall, which is the so-called near-wall excess (NWE). This phenomenon is considered to be caused by the interaction with red blood cells (RBCs); since RBCs have a tendency to approach the vessel centerline due to their highly deformability, they may push away less deformable platelets toward the near-wall region. In order to examine this proposition by in vitro experiments, we measured the distribution of platelet-sized particles mixed in intact RBC or hardened RBC suspensions flowing through microchannels of 50μm x 50μm cross-section. Hardened RBCs were prepared by immersing human RBCs in glutaraldehayde solution of 40 – 4000 ppm. Fluorescent observations were conducted with the use of a confocal laser scanning microscope system with a high-speed video camera. It was found that platelet-sized particles exhibited high concentrations near the channel wall, i.e., NWE, when they were mixed in intact RBC suspensions. By contrast, the particles mixed in hardened RBC suspensions showed weak NWE or uniform distribution over the channel cross-section, indicating that deformability of RBCs plays an essential role in the NWE phenomenon.

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