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Integrin, fibronectin, and uPAR in podocyte-glomerular basement membrane interaction under fluid shear stress

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Objectives: Interaction of podocyte with glomerular basement membrane (GBM) determines podocyte stability. On the other hand, the podocyte-GBM interaction could be also changed depending on podocyte's conditions. We hypothesized that the podocyte-GBM interaction would be changed to withstand stress conditions such as fluid shear stress (FSS). Here, we aim to explore the change of specific integrin (Itg α V β 3), fibronectin, and uPAR in the interaction of podocyte and GBM under FSS.

Methods: We used conditionally immortalized human podocyte cells which were differentiated only under specific (non-permissive) temperature (37°C) for cell experiment. We exposed the podocytes to 200 rpm of FSS. Then, we documented the protein and mRNA expressions of Itg β 3, fibronectin, and uPAR under FSS.

Results: Protein expression of Itg β 3 did not change under FSS, while activated Itg β 3 increased from early phase (30 min after exposure to FSS) (Figure 1). Fibronectin gradually increased under FSS, while uPAR had increasing trend but not consistent (Figure 2). mRNA expressions of Itg β 3, fibronectin, and uPAR did not change under FSS.

Conclusions: This study demonstrates that Itg α V β 3 is activated under FSS. Furthermore, activated Itg α V β 3, fibronectin, and possibly uPAR increase under FSS. The results suggest that the podocyte-GBM interaction is dynamic according to podocyte conditions, and plays a specific role to maintain the podocyte's stability under stress conditions.

Figure 1. Change of ITG and activated ITG under fluid shear stress