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Title of diploma thesis: Transport studies *in vitro* on 2D and 3D cellular level

Three-dimensional (3D) cell models simulate *in vivo* cellular conditions better in comparison with traditional two-dimensional (2D) cell culture systems. Organic anion transporters (OATs) and organic cation transporters (OCTs) play important role in renal elimination of drugs and affect their pharmacokinetic properties. The aim of this study was to create 2D and 3D cell model from embryonic kidney cells HEK293, to transfect transiently both models by lipofection with hOAT1 and empty vector for control, to optimize transfection and to perform transport inhibition studies with selected NSAIDs (diclofenac, ibuprofen, indomethacin and naproxen). 2D cell model was created in a 24-well plate in the form of a monolayer, spheroids were used as a 3D cell model. Spheroids were made by hanging drop method on the Petri dish. The cells were incubated with the radioactive substrate of OATs *p*-aminohippuric acid ([^{3}H]PAH) with or without the appropriate inhibitor in the transport studies. The inhibitory effect of NSAIDs was compared using the parameter IC_{50}. Both 2D and 3D models from HEK293 cells were created, but the subsequent transfection was successful only in monolayer of cells. The functionality of 3D model has not been proven by the transport study. Therefore we have attempted to create spheroids from dog renal cells MDCK II stably transfected with hOCT1, but spheroids did not form. Therefore the inhibitory effect of NSAIDs on hOAT1 has only been investigated in the 2D HEK293 cell model. The highest inhibition potential for the hOAT1 transporter had ibuprofen (IC_{50} = 38.02 μM), lowest indometacin (IC_{50} = 1.78 μM). In conclusion, we have successfully created 3D cell model by hanging drop method. Because experiments on 3D cell models simulate conditions in human organism better than on 2D models, it is important to continue developing 3D cells models.