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Title of diploma thesis: Cytotoxicity testing on 2D and 3D model of human liver cells.

An inherent part of drug development are *in vitro* assays, which might be helpful in prediction of drug toxicity. Nowadays, the majority of assays use simple 2D structures for cell growth, but 3D structures with similar conditions to *in vivo* are becoming more popular. The goal of the study was to assess the cytotoxicity of selected xenobiotics *in vitro* by both 2D and 3D cell models. The research subjects were drugs from the group of antimycotics (amphotericin B, ketoconazole), NSAIDs (diclofenac, ibuprofen), antipyretics (paracetamol, fenacetine), sodium azide, tamoxifen, para-aminosalicylic acid, methanol and ethanol. For determination of cytotoxicity, the standard colorimetric method (CellTiter 96®) based on reductive assessment of metabolic active cells was used. For drug testing it was used human standard line of liver cells HepG2. The cells were cultivated in monolayer or in 3D form with the Alvetex®Scaffold technology using high porous networked polystyrene. The parameter of inhibition concentration IC_{50} was chosen for toxicity assessment of tested drugs and it enabled the comparison of drugs cytotoxicity based on 2D and 3D cultures and between each other. Measured values of IC_{50} show that cells cultivated in 3D conditions, which are more similar to *in vivo* conditions, were more resistant against higher concentrations of tested drugs compared to 2D conditions. Amphotericin B showed the highest cytotoxicity in both 2D and 3D model HepG2 cells and phenacetine showed the lowest cytotoxicity in the same conditions. The cytotoxicity effect of phenacetine was relatively low, and therefore, the certain value of IC_{50} was not possible to determine, and it was likely occurring out the interface of tested concentrations. With CellTiter 96® assay it was possible to gain IC_{50} for almost all tested drugs and it enabled us to compare cytotoxicity of substances in 2D and 3D models of HepG2 cells. As a conclusion of the findings of *in vitro* assays the 3D model represents more suitable tool for prediction of drugs induced toxicity.