



# ALTEX

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22nd European Congress  
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# Placenta-on-a-chip model for assessing the transport and toxicity of xenobiotics *in vitro*

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## Objectives

The study of the transport and toxicity of xenobiotics in women is limited for ethical reasons. *Ex vivo* placenta models have high variability and low success rates. Animal models *in vivo* differ from a human in anatomy, genotype, and proteome. The placenta-on-a-chip model is a compromise. The cells BeWo b30 in combination with endothelial cells are often used as models of the placenta *in vitro* [1-4]. Cultivation of cells with the circulation of the medium allows the microenvironment to be brought closer to the real organism [5]. We studied the transport of the components of the FAC chemotherapy regimen for breast cancer in this model.

## Methods

BeWo b30 cell line was grown in the DMEM with L-glutamine, 4.5 g glucose/l and Earle's salts containing 10% FBS, 1x MEM NEAA, 100 U/ml penicillin and 100 µg/ml streptomycin in inserts cut from 96-well Transwell plate and placed in a microfluidic chip. Cells were seeded with a density of 10,000 cells per insert. After 7 days, 5-fluorouracil (25 µg/ml), doxorubicin (50 µg/ml), cyclophosphamide (150 µg/ml), or all three drugs were added to the cells for 1 hour. Control cells were cultured in the presence of 0.05% DMSO. The impedance spectrum was measured before and 1 and 24 hours after the addition of the drug. The concentration of the drug was determined by HPLC-MS/MS. Cell viability was assessed using the CellTiter-Blue Assay.

## Results

After 1 h incubation with drugs, TEER decreased in experiment and control groups from an average of 90 to 25 Ω·cm<sup>2</sup>, and after 24 h TEER was 67.3 ±17.9 Ω·cm<sup>2</sup> for control, 67.8 ±16.4 Ω·cm<sup>2</sup> for cyclophosphamide, 90.0 ±20.1 Ω·cm<sup>2</sup> for 5-fluorouracil, and decreased to the background for doxorubicin and

drug mixture. Cell viability did not differ significantly between the control, 5-fluorouracil, and cyclophosphamide, but decreased to 40 ±9% of the control when exposed to doxorubicin and drug mixture. The placenta-on-a-chip model transported the drugs from the apical to the basolateral side.

## Conclusion

The developed placenta-on-a-chip model is suitable for assessing the transport and toxicity of xenobiotics *in vitro*.

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## Submission declaration:

Conflicts of interest: The corresponding author declares that there is no conflict of interest with the authors.

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