

A Microfluidic Prostate-on-a-Chip Platform

For Dose-Dependent Cytotoxicity and Molecular Response Studies

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The Challenge in Prostate Cancer Drug Development

Prostate cancer is a leading malignancy in **men**. Although AR-targeting therapies like **enzalutamide** work initially, most patients develop resistance. Traditional models fall short:

- **2D cultures** lack tumor-stroma and vascular interactions
- **Animal models** don't mimic human AR signaling
- **Static assays** miss dynamic drug distribution and shear stress

Pharma needs predictive, human-relevant models to evaluate AR-targeting drugs in realistic conditions.

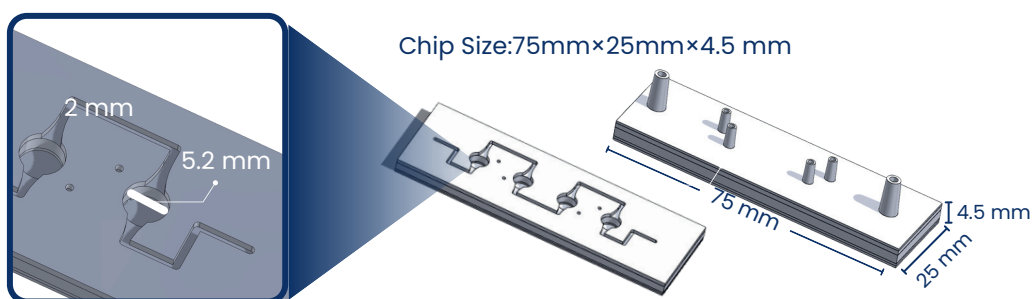
Our Solution: Prostate cancer-on-a-Chip

CanChip developed a **3D microfluidic co-culture system** integrating **LNCaP cells** with **HUVECs** under continuous perfusion. It:

- Maintains AR-regulated behavior
- Recreates tumor-endothelial crosstalk
- Enables quantitative readouts (viability, PSA, gene expression)
- Uses **ISO 9001**-aligned workflows for reproducibility

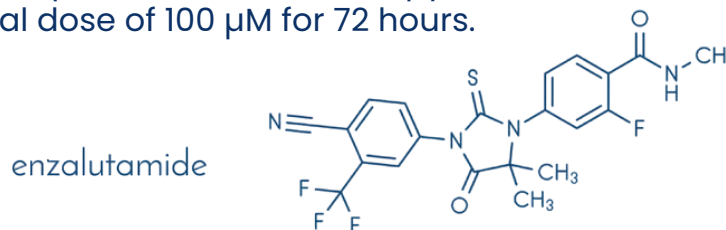
This dynamic model bridges the gap between static assays and **in vivo conditions** for anti-androgen drug testing.

Chip Design



Case Study: Enzalutamide

We evaluated enzalutamide, a clinically approved AR antagonist for prostate cancer therapy, at 30, 50, and a supra-physiological dose of 100 μM for 72 hours.



Results

Morphology:

- 30 μM : minor LNCaP density loss
- 50 μM : partial detachment and reduced cell-cell junctions
- 100 μM : extensive apoptosis and endothelial disruption

Viability (MTT):

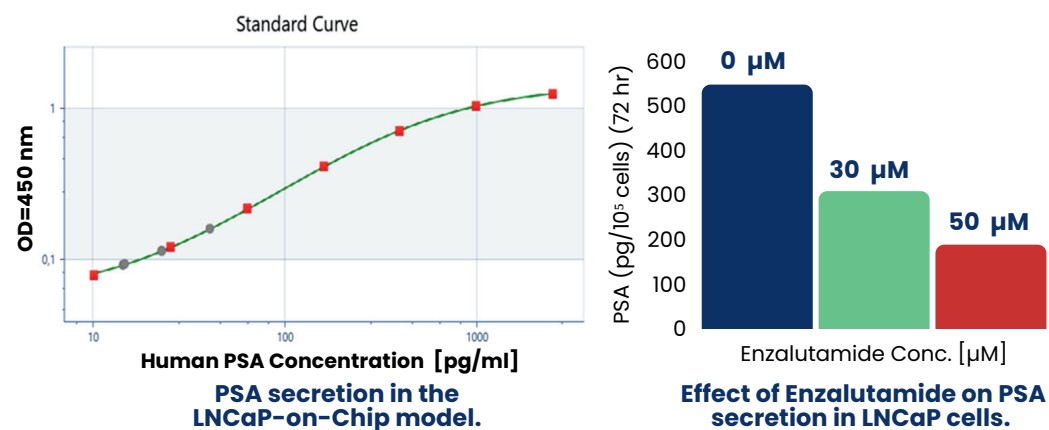
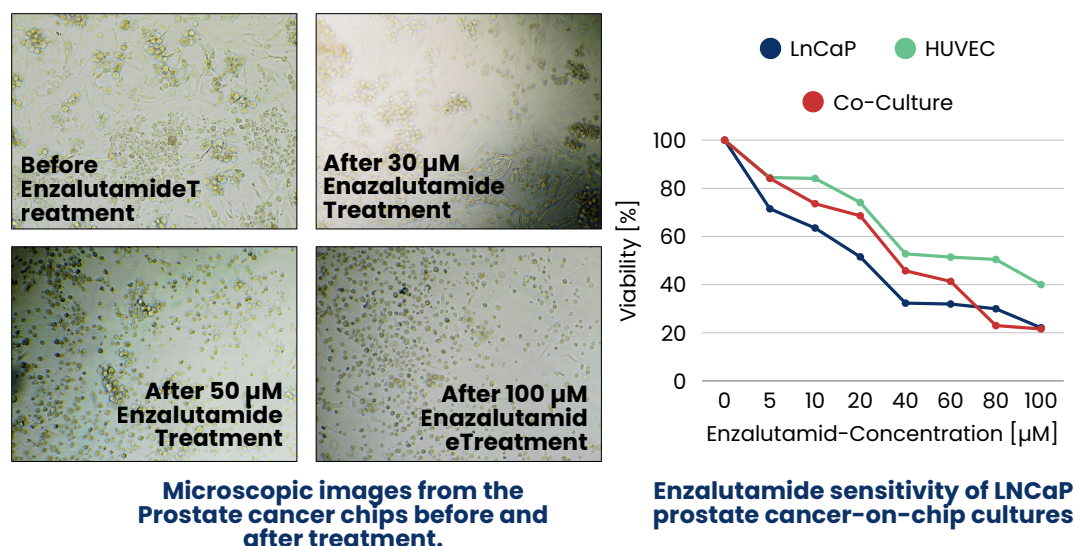
- LNCaP $\text{IC}_{50} \approx 22.95 \mu\text{M}$
- HUVEC $\text{IC}_{50} \approx 80.77 \mu\text{M}$
- Co-culture $\text{IC}_{50} \approx 36.24 \mu\text{M}$

PSA (KLK3) Secretion (ELISA):

- Control: 546 $\text{pg}/10^5$ cells
- 30 μM : 307 $\text{pg}/10^5$ cells (-44%)
- 50 μM : 187 $\text{pg}/10^5$ cells (-66%)

Gene Expression (qPCR):

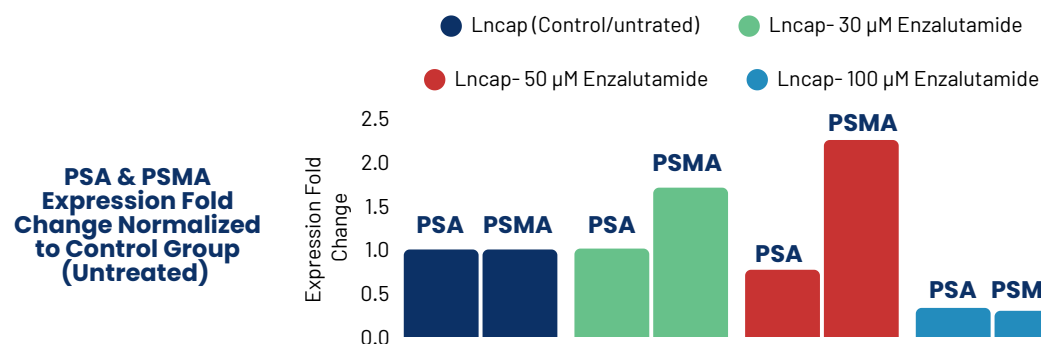
- **PSA**: Dose-dependent suppression ($1.01\times \rightarrow 0.77\times \rightarrow 0.33\times$)
- **PSMA**: upregulation ($1.71\times \rightarrow 2.25\times \rightarrow 0.30\times$), reflecting AR pathway inhibition and cytotoxic effects at high doses.



Partner with CanChip

The **Prostate-on-a-Chip model** offers a robust, human-relevant platform for evaluating AR-targeted therapies. Partnering with **CanChip helps pharma companies**:

- Reduce attrition in oncology pipelines
- Strengthen preclinical decisions
- Accelerate the development of next-generation anti-androgen drugs



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