



MSCA Week 2025

Department of Pharmaceutical Pathophysiology
Faculty of Pharmacy
Medical University of Gdansk, Poland

Klaudia Kubiak, PhD

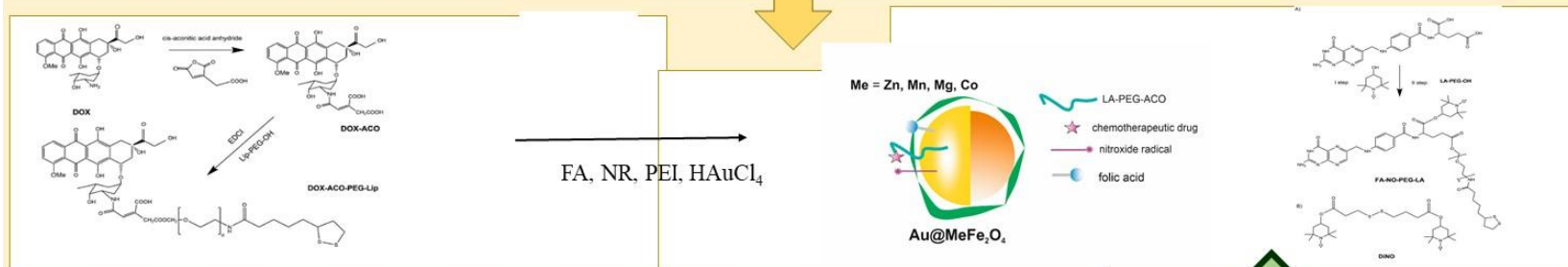
klaudia.kubiak@gumed.edu.pl

<https://structure.mug.edu.pl/282>

Smart Plasmonic-Magnetic Nanohybrids with the potential for image-guided targeted cancer therapy

Stage 1

Synthesis of nanohybrids targeting FR α



Stage 2

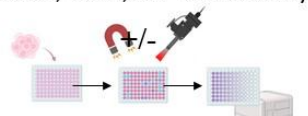
Biological study *in vitro* in 2D cell line /3D spheroids

Plan B: We assume chemical modification of nanohybrids depending on cytotoxicity results.

Specific aims 4, 8, 12

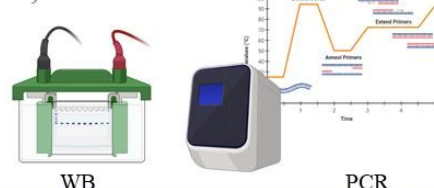
Cytotoxicity/photothermal cytotoxicity:

LDH, CCK8, BrdU, ATP-based assay


 1 step: selection the MNPs with the best selective cytotoxicity against cancer cells compared to non-cancer cells) and 2 step: evaluation on 3D spheroids and selection MNPs for the next step of the study

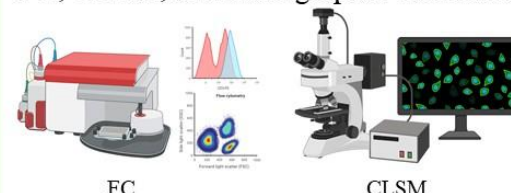
FA α expression on cells:

WB, PCR



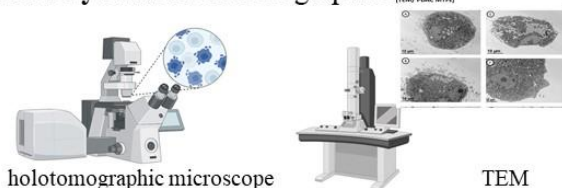
Apoptosis/necrosis:

FC, CLSM, holotomographic microscope



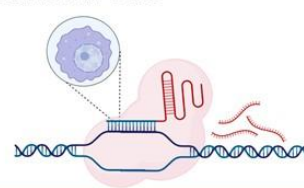
Specific aim 11

The cell internalization pathway of the nanohybrids: holotomographic microscope/TEM

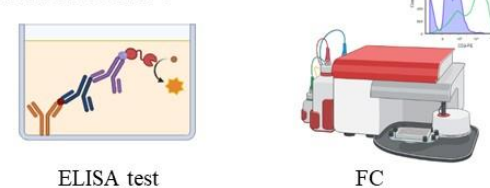


Specific aim 13

FA α gene knock-out: CRISPR/Cas9



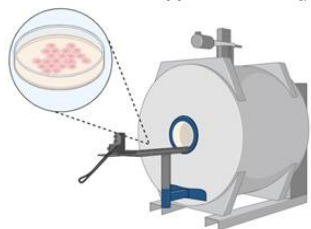
Binding capacity of nanohybrids to FR α : ELISA test/FC



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Specific aim 14

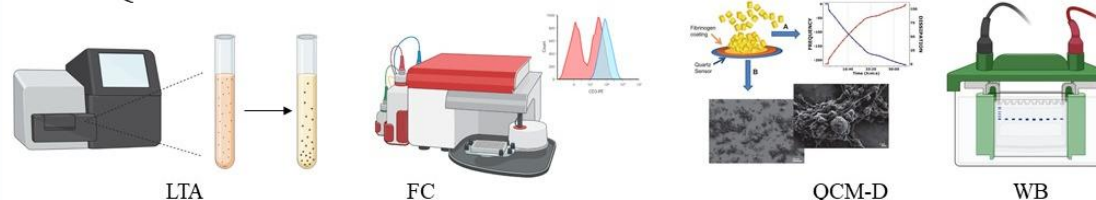
MRI scanning and analysis:



Specific aim 16

Against progression of cancer (tumor cells induced-platelets aggregation)

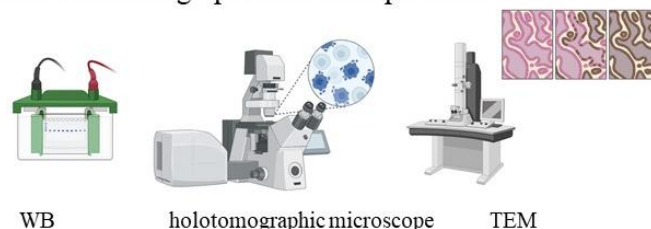
LTA/FC/QCM-D/WB



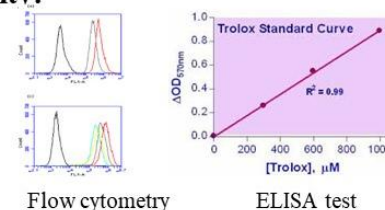
Specific aim 16

Protein level associated in programmed cell death:

WB/ holotomographic microscope/TEM



The level of ROS, RNS, antioxidant capacity:



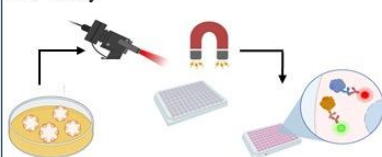
Stage 3

Ex vivo studies

Selection of nanohybrids included with the best theranostic potential in PDAC or PDAC and TNBC cancer simultaneously.

Specific aim 17

Anticancer potential on patients-derived PDAC organoids: Glo-3D ATP assay



Stage 3

In vivo studies

Selection of nanohybrids included with the best theranostic potential for TNBC or TNBA and PDAC cancer simultaneously.

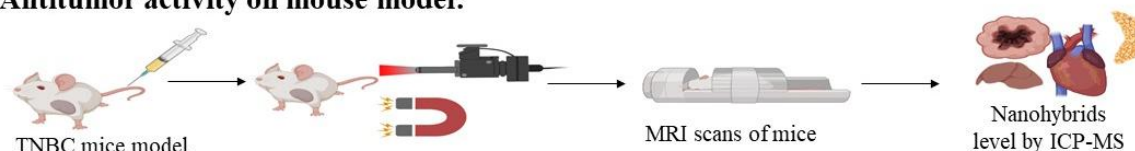
Specific aim 19

Toxicological and pharmacokinetic study:

- ✓ AUC curve
- ✓ AUMC
- ✓ Clearance (C1)
- ✓ t1/2
- ✓ volume of distribution (Vss)

Specific aim 20

Antitumor activity on mouse model:



Plan B: We assume replacement of TNBC *in vivo* model on PDAC based on cytotoxicity results (cancer cells sensitivity to nanohybrids).