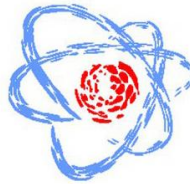




Joint Institute for Nuclear
Research

SCIENCE BRINGING NATIONS TOGETHER



The XXIV International Scientific Conference
of Young Scientists and
Specialists (AYSS-2020)

9-13 November 2020



Study of magnetic core-shell type nanoparticles for drug delivery system in cancer treatment

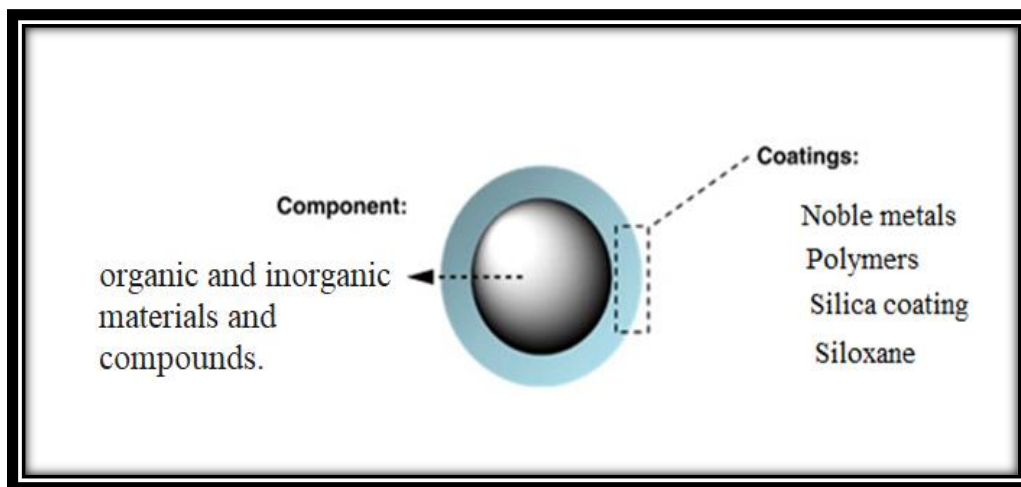
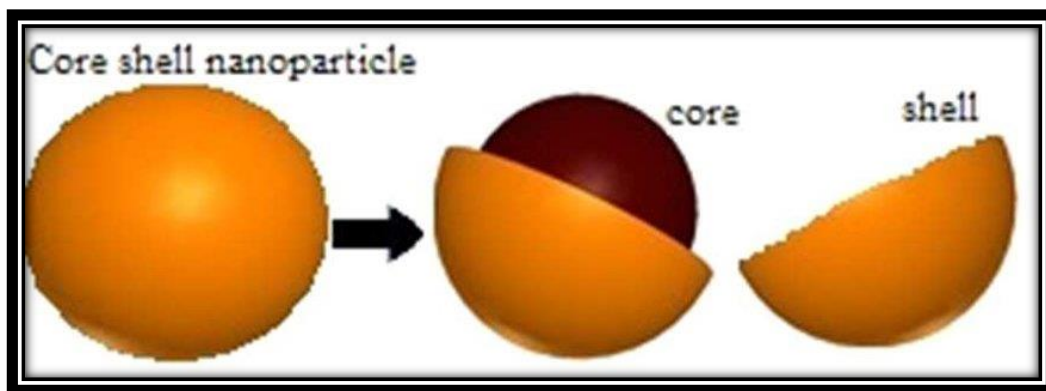
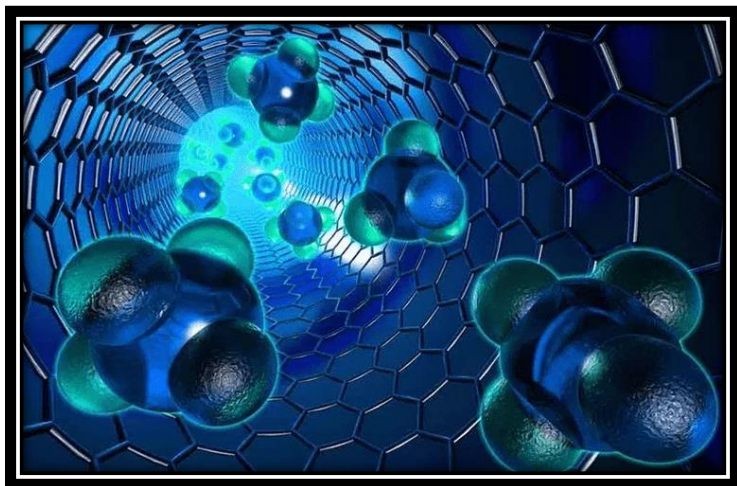
Supervisor from JINR - **Chudoba D.M.**

Supervisor from ENU - **Kozlovskiy A.L.**

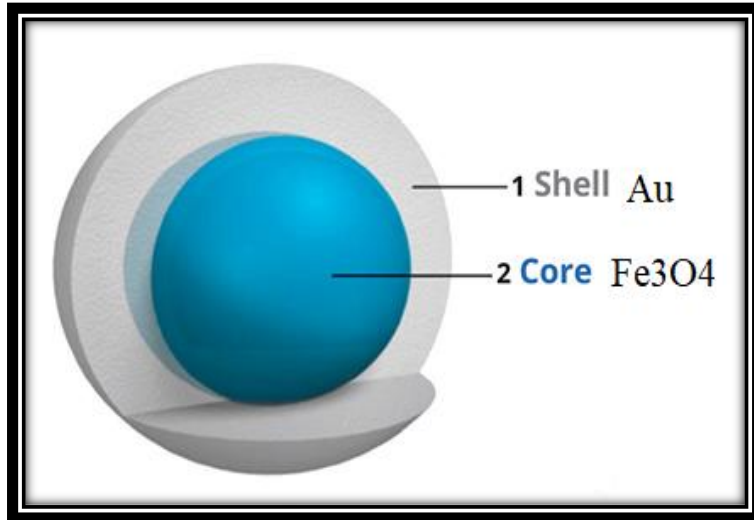
Junior researcher in FLNP, JINR (Russia),
2nd year PhD-student at Eurasian National
University (Kazakhstan)

Assel Nazarova

NANOparticles rushing to the rescue



Fe₃O₄@Au core–shell nanoparticles



Iron oxide:

- Superparamagnetism
- high magnetic susceptibility
- low Curie temperature
- no coercivity value

Gold:

- Biocompatibility
- chemical stability
- low cytotoxicity

Combining several different properties into a single material is a key feature of multicomponent materials. Unlike single component material, multicomponent materials including two or more different materials inherit respective properties from their individual component, and they have unique multifunctional characteristics.

The purpose of the work:

The main aim of the current study is to carry out synthesis and modification of magnetic nanostructures of the “core-shell” type based on $\text{Fe}_3\text{O}_4@\text{Au}$ in drug delivery system for bio-application.

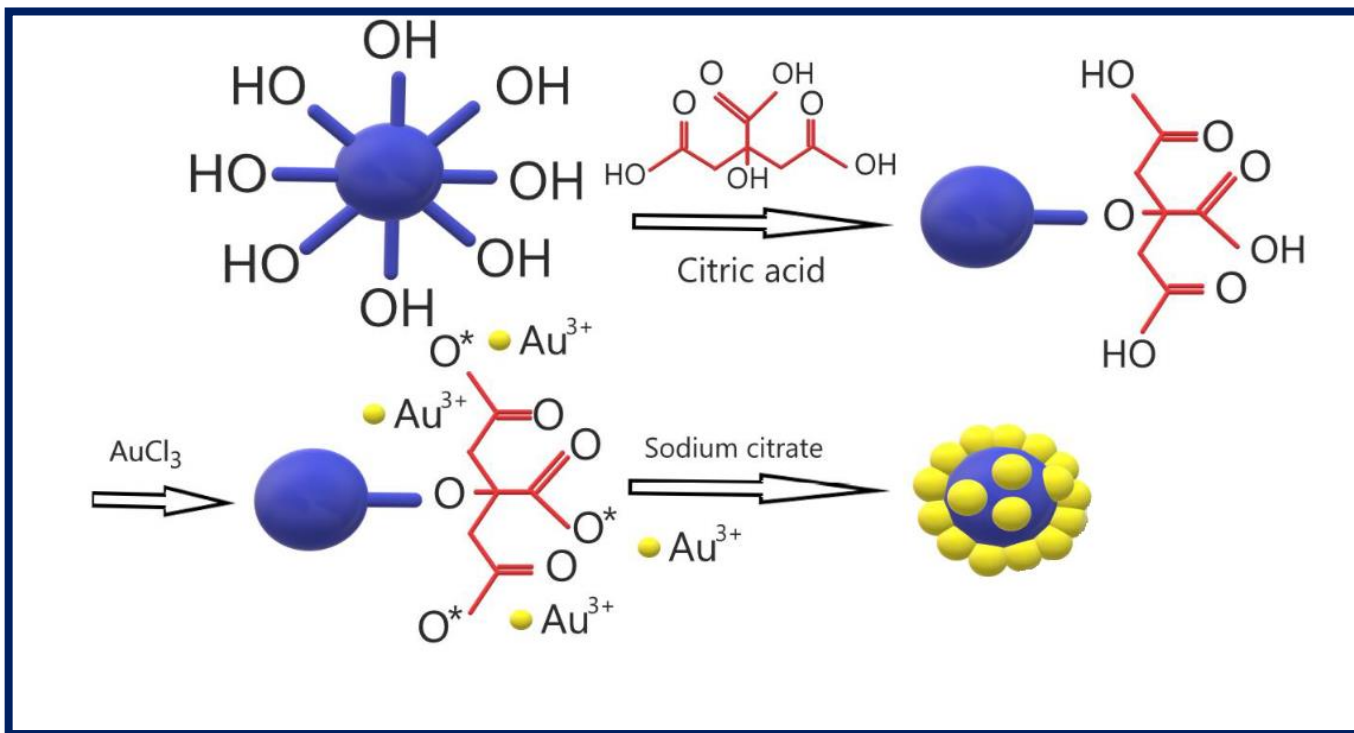
The main tasks of the work:

- Study of the synthesis and characterization of "core-shell" type nanoparticles;
- Study of the physical/chemical properties and cytotoxicity of the synthesized nanoparticles;
- Study of structural transformations as a result of external influences.

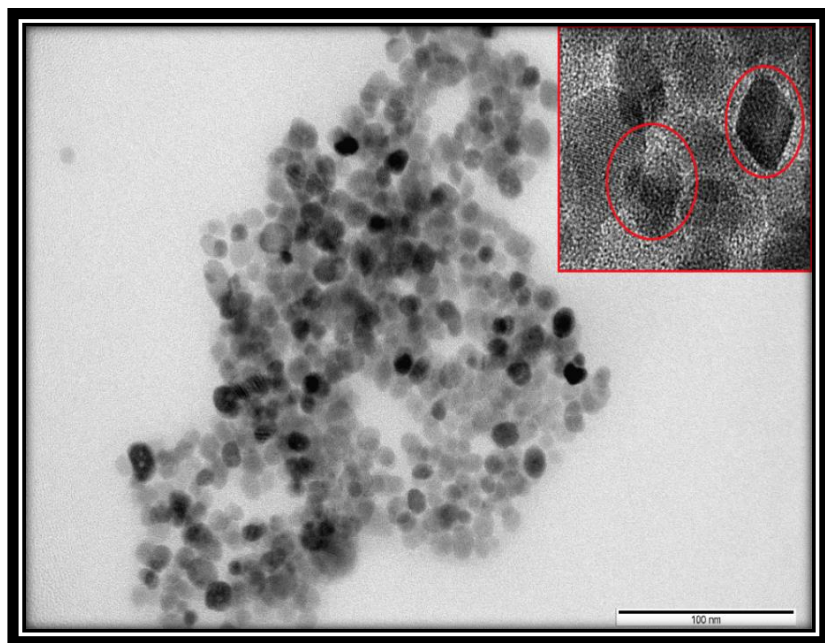
Synthesis of Fe₃O₄ nanoparticles



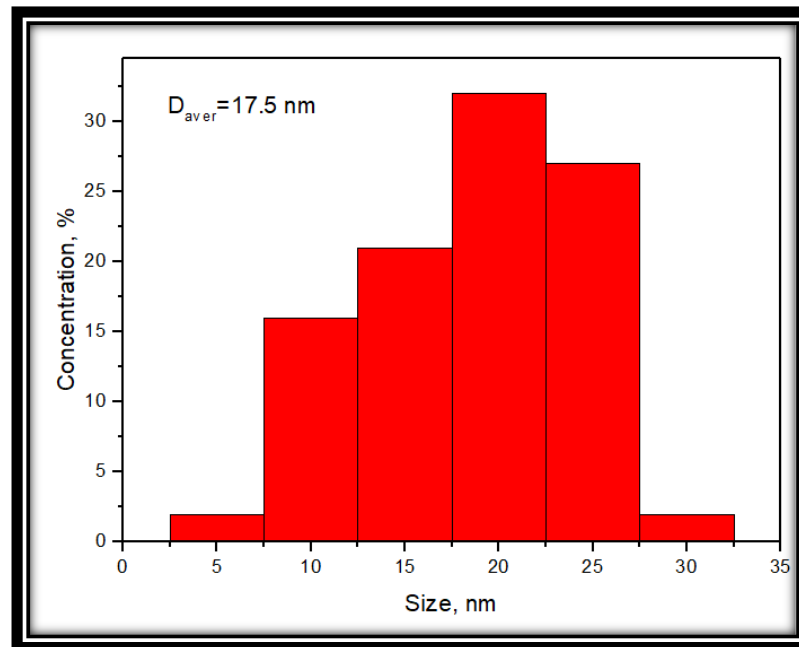
2) Synthesis of “core-shell” nanoparticles:



Structural and compositional analysis

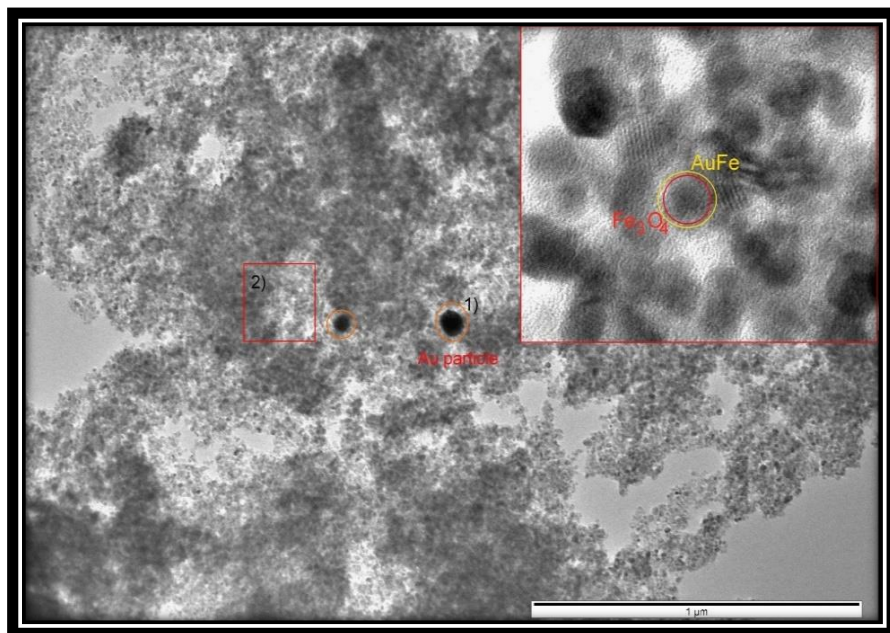


SEM and TEM images of initial
nanoparticles of iron oxide

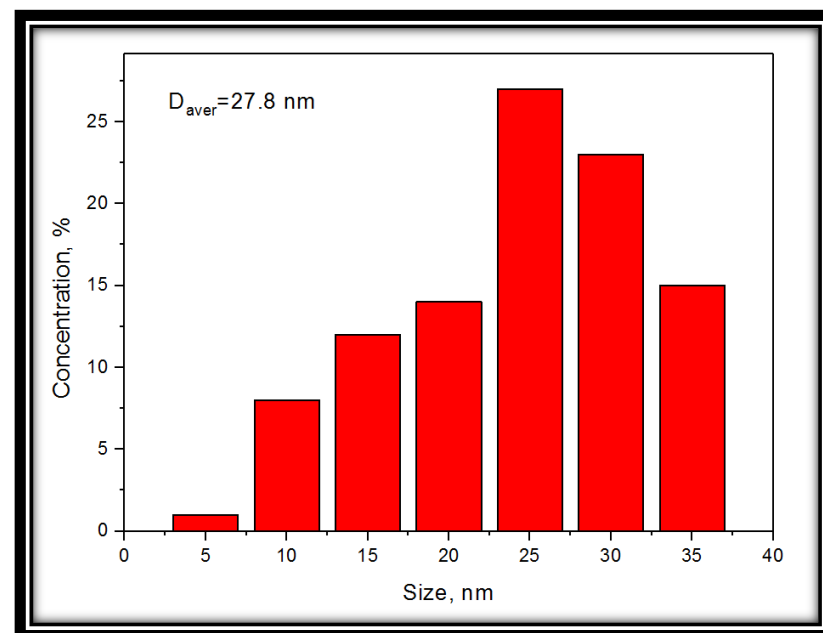


Size distribution chart according to SEM
of initial nanoparticles of iron oxide

Structural and compositional analysis

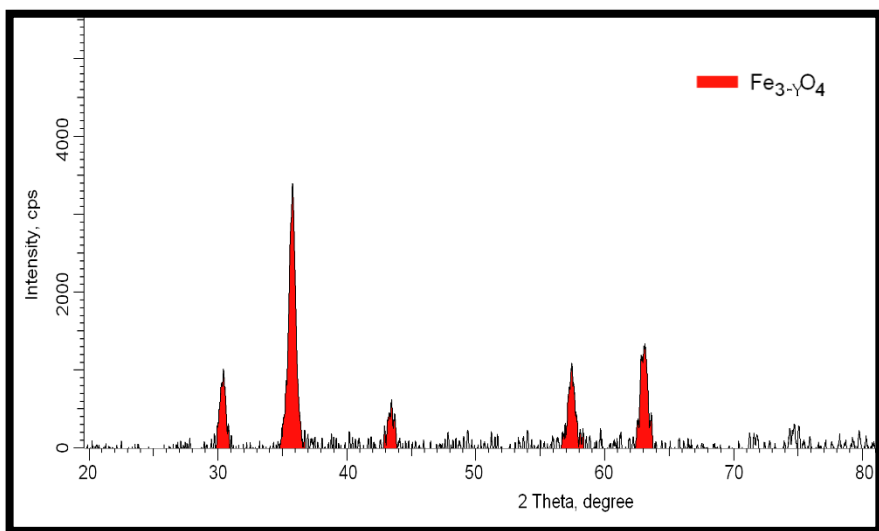


TEM images of the studied nanoparticles of the
“core-shell” type

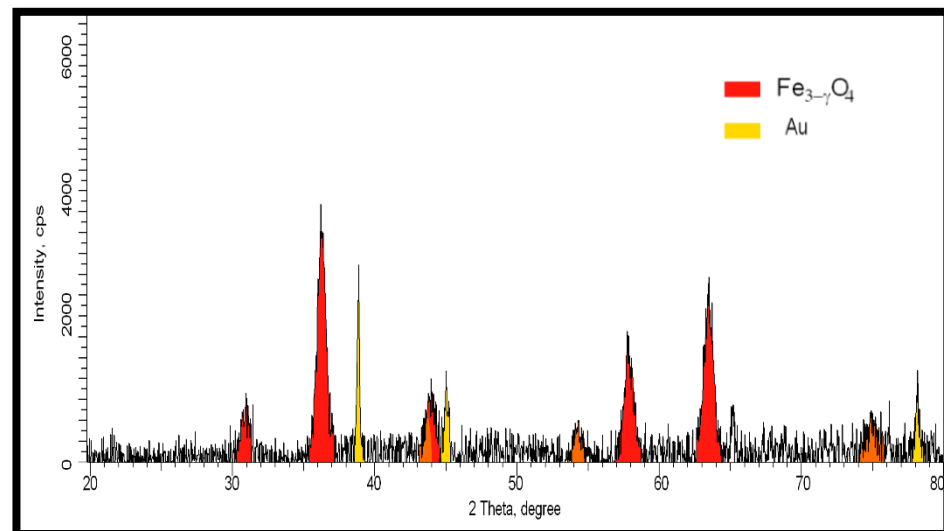


Size chart of nanoparticles obtained from
the data of SEM images

X-ray diffraction analysis

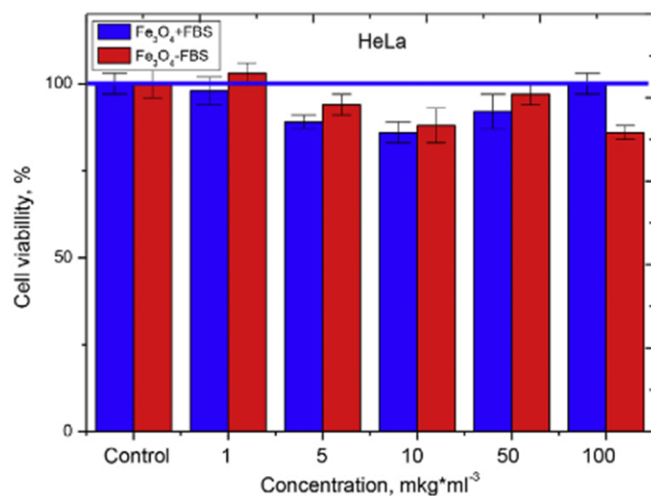


X-Ray diffractogram of initial
nanoparticles Fe_3O_4

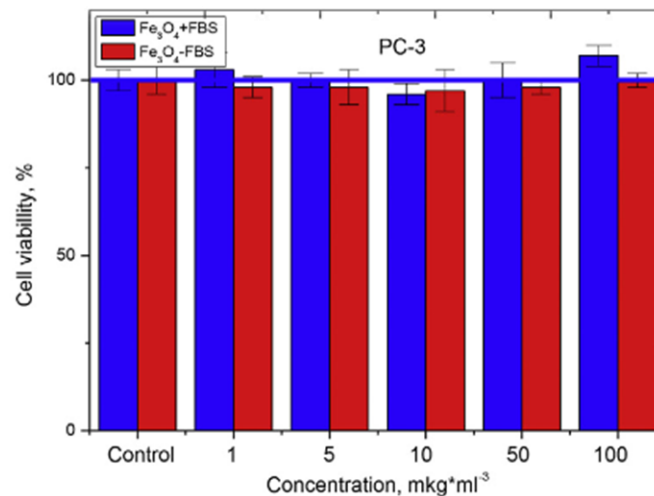


X-ray diffractogram of nanoparticles of the
"core-shell" type

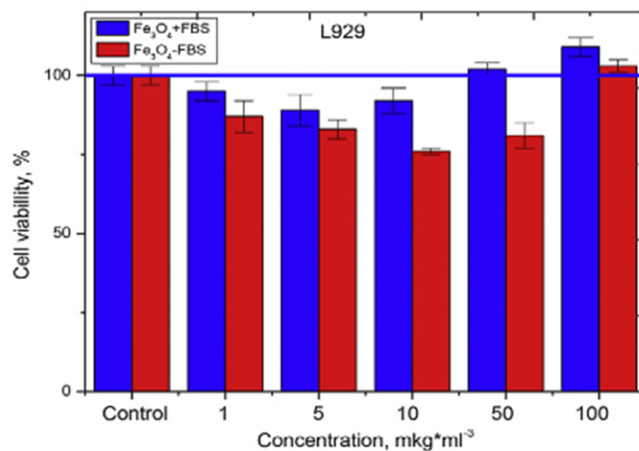
Cytotoxicity



a)



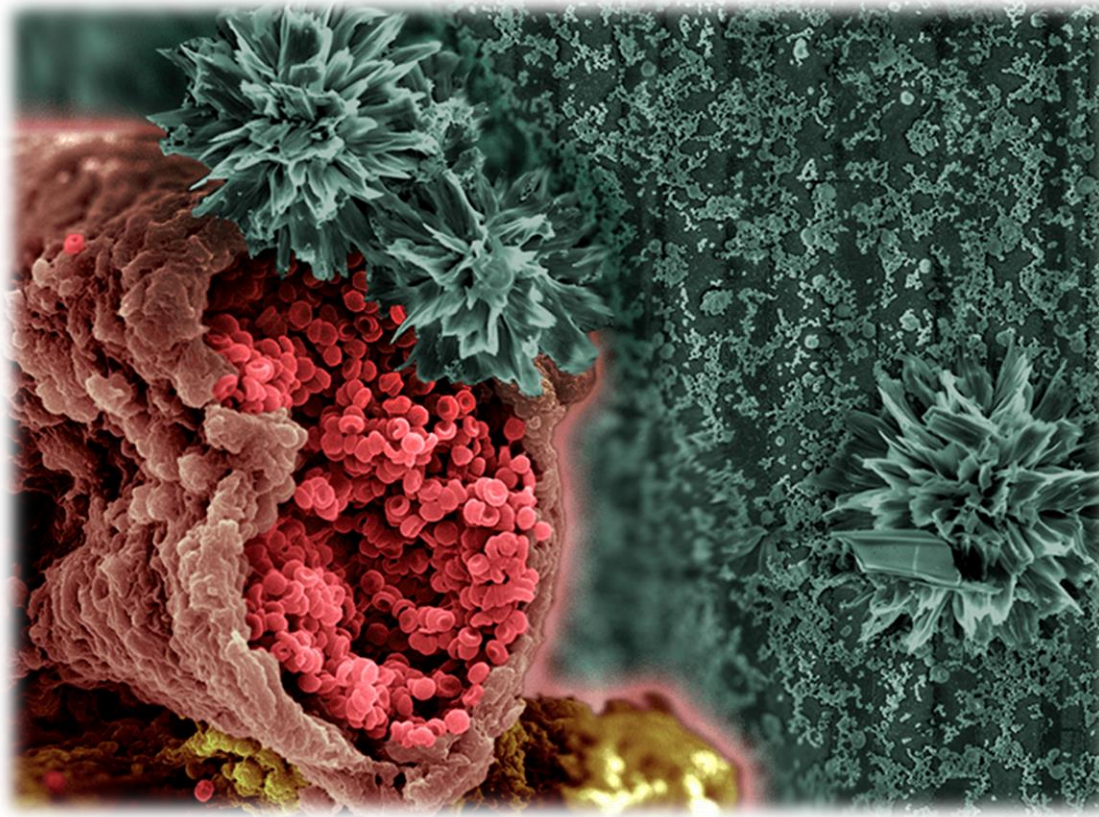
b)



c)

The Cytotoxic effect of Fe₃O₄ nanoparticles using different cells: a) HeLa test; b) PC-3 test; c) L929 test.

Invisible border: where "nano" and "bio" collide



What will be the consequences of the interaction of “our” nanobiosystems with artificial nanoparticles, since the latter will become widespread in the near future?



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THANKS FOR YOUR ATTENTION