### **Nanobiotechnology for health-care**

**Antitumor nanocomplex with magnetic memory**

**Valerii Orel1, Anatoliy Shevchenko2, Olexander Rykhalskyi1,**

**Olga Dasyukevich1, Irina Orel1**

*1National Cancer Institute, 33/43 Lomonosov Str., 03022, Kyiv, Ukraine.*

*2G.V. KurdyumovInstitute for Metal Physics, 36 AcademicanVernadsky Blvd., 03680, Kyiv, Ukraine,E-mail:* [*admit@imp.kiev.ua*](mailto:admit@imp.kiev.ua)

The ability of a nanomagnet to store a pattern of magnetization atwhich it wasmechanically deformed in presence of a constant magnetic field is known as the magnetic memory effect. Thiseffectisbasedoncorrespondencebetweenmechanicaldeformationandmagnetizationofantitumornanocomplex (ANC) componentsundermechanochemicalstressinducedbyan originalreactor.Nanotechnologies to produce ANC with magnetic memory canbeusedtoimprovecontrolledreleaseandtargeteddeliverytoatumor.

Viabilityassaysofhumanlungcarcinomacells(lineA549)andsurvivalanalysisofanimalsbearingWalker-256 carcinosarcomawerecarriedoutinordertoexperimentallyinvestigate the antitumor effectof ANC with magnetic memory.

Commercialferromagneticironoxidenanoparticleswithdiameter<50 nm (Sigma, Aldrich) andtheantitumoranthracyclineantibioticdoxorubicin (PfizerInc., Italy/USA) weretogetherexposedtomagnetomechanicalstressbymeansofamagnetochemicalreactor “MMR1” (NCI, Ukraine).TheprocessedANCsampleshaddifferentmagneticproperties. In other words,synthesizedANCdifferedinparametersofmagneticmemory. Electromagneticirradiation (EI)wasperformedbyanexperimentalprototypeof “Magtherm” (Radmir).

**Table. Properties of magnetic memory in antitumor nanocomplexes**

|  |  |  |
| --- | --- | --- |
| Параметр Parameter | ANC1 | ANC2 |
| Saturation magnetic moment, mS, emu/g | 8,4 | 15,8 |
| Coerciveforce, НС, G | 12,6 | 9,7 |

The preliminary analysis of cell viability in non-small-cell human lung cancer (A-549 line) after ANC in combination with EI showed that ANC with different parameters of magnetic memory had significantly different impact on the number of live cells. The results of researchonanimalswith transplantedWalker-256 carcinosarcomaindicated a dependency between ANC magnetic memory and the antitumor effect as well as proposed an approachto targeted delivery of ANC.

Therefore,itisimportanttoreportthatmagneticstorageofdataonANCrecordedbyEIimpactontumorcellsallowstoremotelycontroltargeteddeliveryandantitumoractivityofnanodrugs.Hence,thecurrentstudysetsthestageforpracticalapplicationofafundamental idea of technological singularity.

1.MayergoyzI., BertottiG.,SerpicoC.NonlinearMagnetizationDynamicsinNanosystems. Elsevier Science. 2008. p. 480

2. [Orel VE](https://www.ncbi.nlm.nih.gov/m/pubmed/?term=Orel%20VE%5BAuthor%5D&sort=ac&from=/29597047/ac) , [Tselepi M](https://www.ncbi.nlm.nih.gov/m/pubmed/?term=Tselepi%20M%5BAuthor%5D&sort=ac&from=/29597047/ac) , [Mitrelias T](https://www.ncbi.nlm.nih.gov/m/pubmed/?term=Mitrelias%20T%5BAuthor%5D&sort=ac&from=/29597047/ac). et al. Nanomagnetic Modulation of Tumor Redox State. Nanomedicine.2018, 26;14(4):1249-1256. doi: 10.1016/j.nano.2018.03.002