UNAT

Ultra-small Nanohybrides for Advanced Theranostics

Newsletter 8 – April 2026

Consortium

Coordinator

Université Claude Bernard Lyon 1
France

Corporation Science Park Taras Shevchenko University Of Kyiv
Ukraine

Consiglio Nazionale Delle Ricerche
Italy

Bioemission Technology Solutions IKE
Greece

Glincs
France

The project

Nanoscale materials have gained a place in the spotlight as enablers of combination diagnostic-therapeutic technologies due to their tiny penetrating sizes and their unique functional properties.

Nanohybrids that contain both organic and inorganic components, including metallic ones, offer tremendous opportunity for the functionalisation of biological or bioactive molecules.

The EU-funded UNAT project will explore the capabilities of metal-carbon nanohybrids for multimodal in vivo imaging and therapy of tumours via electromagnetic radiation.

The diagnosis and therapy of cancer will be evaluated through an ambitious campaign of preclinical in vitro and in vivo experiments.

Key figures

5 years (2021-2026)
5 partners
4 countries
832 k€

More information on **www.unat-project.eu**

UNAT Implemented secondments

Research and Innovation Staff Exchange (RISE) projects fund short-term exchanges ("secondments") for staff to develop careers combining scientific excellence with exposure to other countries and sectors. RISE enables more interaction between academia and non-academic organisations within Europe and worldwide.
A total of **16 secondments** were implemented between **July 2025** and **March 2026** :

ZADERKO Alexander	UCBL	BIOEMTECH	10/07/2025	30/08/2025
TERMENTZIDIS Konstantinos	UCBL	BIOEMTECH	16/07/2025	19/08/2025
LYSENKO Anastasia	SCIENCE PARK	UCBL	05/09/2025	26/12/2025
LYSENKO Tetiana	SCIENCE PARK	UCBL	03/10/2025	08/11/2025
PYLYPOVA Olha	SCIENCE PARK	UCBL	08/11/2025	29/11/2025
SAVIDIS Georgios	BIOEMTECH	UCBL	02/12/2025	12/03/2026
PANETA Valentina	BIOEMTECH	UCBL	09/12/2025	12/03/2026
IVANOV Ivan	SCIENCE PARK	UCBL	03/01/2026	01/02/2026
KUZNIETSOVA Halyna	SCIENCE PARK	UCBL	20/02/2026	21/03/2026
DZIUBENKO Nataliia	SCIENCE PARK	UCBL	20/02/2026	28/03/2026
LYSENKO Vladimir	UCBL	BIOEMTECH	27/02/2026	26/03/2026
DOVBYNCHUK Taisa	SCIENCE PARK	UCBL	30/01/2026	28/02/2026
LYSENKO Tetiana	SCIENCE PARK	UCBL	26/01/2026	02/03/2026
BORISOVA Tatiana	SCIENCE PARK	UCBL	21/01/2026	28/03/2026
PYLYPOVA Olha	SCIENCE PARK	UCBL	06/02/2026	01/03/2026
FATJONA Barlamaj	BIOEMTECH	UCBL	27/02/2026	30/03/2026

PROJECT DISSEMINATION

Science Park attended 2 conferences during which Valery SKRYSHEVSKY gave oral presentations :

Valeriy Skryshevsky (SP) delivered an oral presentation entitled ***"Complexation carbon dots with ion metals by dynamic light scattering"*** at ISN2A 2026 7th International Caparica Symposium on Nanoparticles/Nanomaterials & Applications 2026, held from 25th to the 29th January 2026 in Lisbon, Portugal.

Please find more informaion on the website of the conference: https://www.isn2a2026.com

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On February 27, 2026, at the Institute of Biochemistry. O.V. Palladin of the National Academy of Sciences of Ukraine held the regular, thirtieth, meeting of the interdisciplinary all-academic seminar in the field of natural sciences ***"Topical issues of physical, chemical and mathematical biology".***

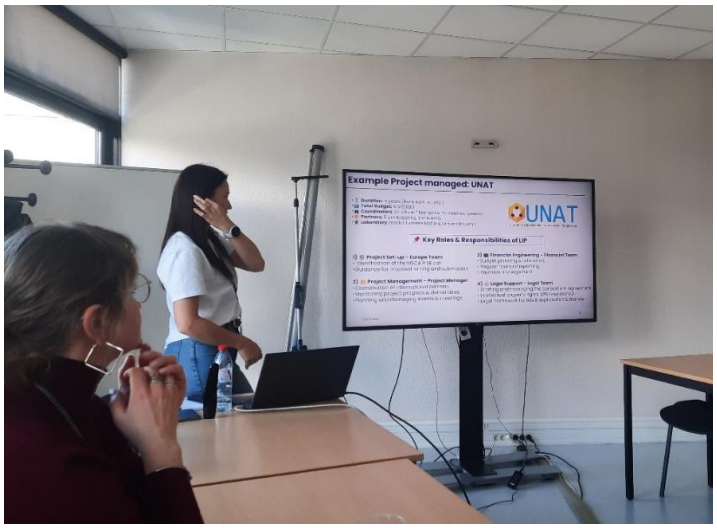
You will find more about the presentation on the webite of the National Academy of Sciences of Ukraine : «Синтез, властивості та біомедичні застосування вуглецевих квантових точок і вуглецевих наногібридів» (АНОНС СЕМІНАРУ)

Professor **Valeriy Skryshevsky** (**SP**) gave the report ***"Synthesis, properties and biomedical applications of carbon dots and carbon nanohybrids"***

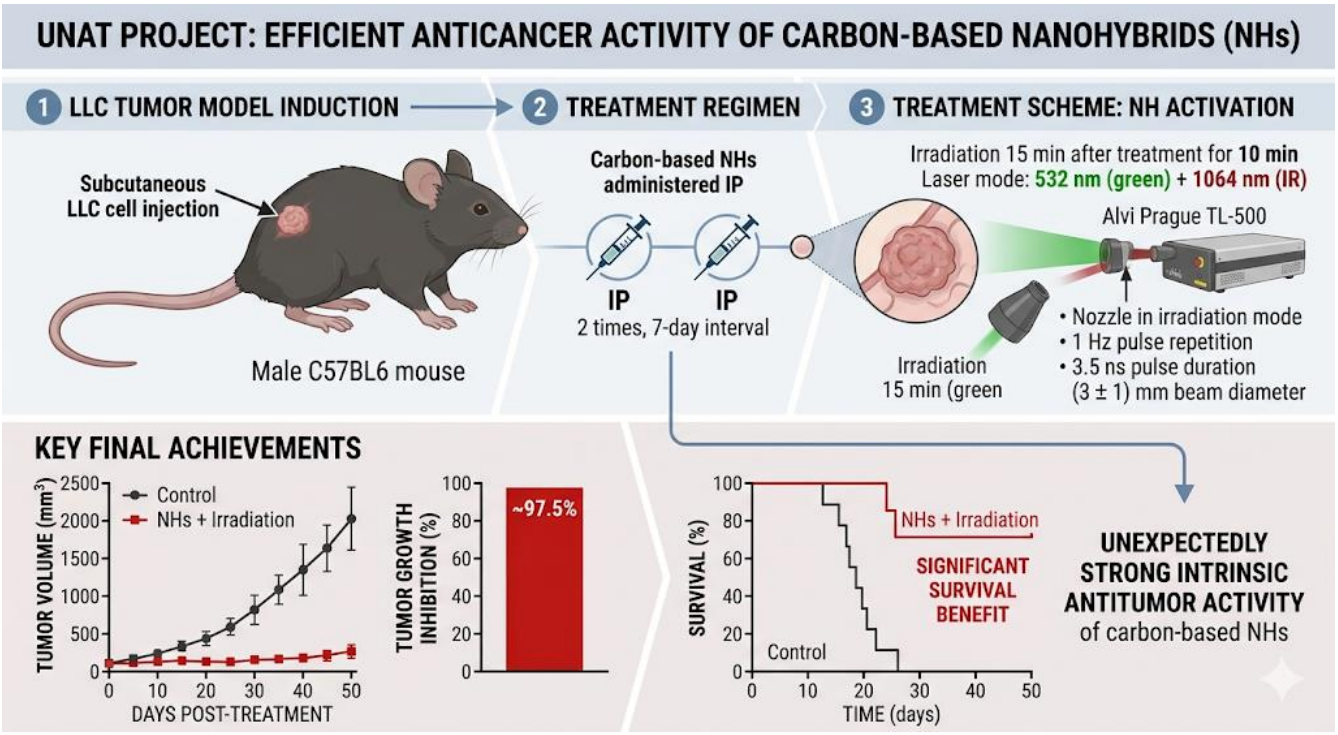
DEEPTECH TRAINING IN LYON

Ukrainian researchers from Taras Shevchenko National University and Igor Sikorsky Kyiv Polytechnic Institute came in Lyon in the frame of Erasmus+ project. Through visits to three multidisciplinary research laboratories of UCBL, three science-based startups, and by learning about the operations of three technology transfer offices, the group of Ukrainian researchers aimed to immerse themselves in the heart of Lyon's innovation ecosystem in order to understand its fundamental workings. The main objective was to introduce them to cutting-edge methodologies and shared infrastructure, while analyzing the French model of technology transfer, from intellectual property protection to proof-of-concept funding. By directly engaging with Deeptech entrepreneurs and technology transfer experts in Lyon, the delegation was able to identify synergies for future international cooperation projects, model the transition from laboratory to industry, and acquire the necessary tools to replicate these successful mechanisms within Ukrainian academic institutions.

As part of their training, ukrainian researchers were received by Charlotte Besnard from Lyon Ingénierie Projets of UCBL, who described them research, engineering and valorisation actions of UCBL. In particular, research and innovation activity of the UNAT consortium was presented in details.



KEY RESEARCH ACHIEVEMENTS



The final key achievement of the UNAT project concerns efficient anticancer activity of carbon-based nanohybrids (NHs) demonstrated on LLC tumor model. The study was conducted on C57BL6 male mice. Animals were subcutaneously (right flank) injected with LLC cells. The introduction of the NHs for cancer therapy was performed intraperitoneally 2 times with 7-day interval. Tumor irradiation was performed 15 min after the treatment, and continued for 10 min. The rationale of this scheme was to investigate the therapeutic effect of carbon-based NHs after being activated with irradiation. When irradiating mice, an Alvi Prague TL-500 laser was used with a nozzle in the irradiation mode “532 nm (green) + 1064 nm (IR)”. The laser pulse repetition rate was 1 Hz. The duration of each pulse is 3.5 ns, and the beam diameter is (3 ± 1) mm. Notably, repeated administration of carbon-based nanohybrids (NHs) resulted in unexpectedly strong intrinsic antitumor activity, with tumor growth inhibition reaching up to ~97.5% and significant survival benefit, particularly following systemic (intraperitoneal) administration. In addition to tumor control, the treatment with carbon-based NHs showed systemic protective effects, partially normalizing biochemical and hematological alterations associated with tumor burden. Histopathological evaluation further supported these findings, revealing reduced liver metastases, inflammation, and vascular alterations, alongside increased tumor apoptosis and necrosis, indicating a multimodal mechanism of action.

REMAINED CHALLENGES

UNAT project revealed several important challenges that should be addressed to support further development and translation of the investigated carbon-based nanohybrids (NHs). One of the key challenges is the incomplete understanding of the mechanisms underlying the intrinsic antitumor activity of the NHs. While significant efficacy was demonstrated for several formulations, the exact biological pathways driving tumor inhibition, apoptosis, and anti-metastatic effects remain insufficiently characterized. This limits the ability to rationally optimize these materials and predict their behavior across different tumor models. A further challenge arises from the discrepancy between expected and observed roles of external irradiation in the cancer therapy. Although some nanoparticles showed clear irradiation-dependent effects, others, demonstrated strong intrinsic activity with no additional benefit from irradiation in vivo. The project also highlights challenges related to formulation and administration. Differences in efficacy between intratumoral and systemic delivery indicate that administration route significantly impacts outcomes, yet optimal formulations for stability, homogeneity, and in vivo performance remain to be fully established. Addressing these challenges will be essential for advancing the carbon-based NHs from promising experimental systems toward robust and clinically relevant anticancer therapies.

END OF THE PROJECT

We would like to sincerely thank all partners for their strong commitment and for driving the project forward throughout its entire duration, as well as all secondees for their active involvement in achieving the project's objectives.

Despite several major challenges, including the COVID-19 pandemic and the war in Ukraine, the project has delivered strong and meaningful results that and these achievements were made possible thanks to the dedication and commitment of everyone involved.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101008159