

Biomedical Technologies and Innovation Doctoral Programme (BIOTIN)



Title of the PhD Project	Targeted drug delivery for oncology applications
Acronym	TADDO
Research Fields of the Project	Organic Chemistry, Polymer Chemistry, Molecular Biology, Pharmacy, Pharmaceutical Technology, Analytical Biotechnology.
Keywords	Nanomedicine, Drug Delivery, Polymer synthesis, Organic synthesis, Pharmaceuticals, Cell biology
Host Institution, Department and Campus Location	Boğaziçi University, Department of Chemistry, North Campus, Bebek, Istanbul
PhD Awarding Institution and Graduate Programme	Boğaziçi University, Institute of Biomedical Engineering, PhD in Biomedical Engineering
Name and Affiliation of Main Supervisor	Prof. Rana Sanyal (BOUN)
Name and Affiliation of Co-supervisors	Prof. Cengizhan Ozturk (BOUN) Prof. Esra Erdal (IBG)
Research Environment and Infrastructure	Boğaziçi University one of the top public universities in Turkey. It has excellent research facilities to conduct cutting-edge projects. The researcher will have access to labs (https://sanyalgroup.boun.edu.tr/) and instrumentation at the Center for Life Sciences and Technologies (https://lifesci.boun.edu.tr/en), Institute of Biomedical Engineering (https://bme.boun.edu.tr/) and the Department of Chemistry (http://www.chem.boun.edu.tr/).
Scientific Context of the Project	<p>Quality of life for cancer patients is drastically reduced due to deleterious side effects of chemotherapy. As the chemotherapy agents, which are the forefront tools to fight against cancer, are extensively toxic to the whole body, these conventional cancer treatment drugs attack cancer cells as well as healthy cells, leaving the patient vulnerable to other diseases.</p> <p>Our solution offer to this problem is to package the chemotherapy agent in a manner to protect the agent from the body and the body from the agent till it reaches its destination: the tumor. The packaging, grandiosely termed as the nanomedicine, will be referring to the polymer therapeutic, more precisely polymer-drug conjugate. Polymer therapeutics share many properties of the biologics (proteins, antibodies,</p>

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	<p>oligonucleotides) with a bonus of synthetic chemistry utilities: tailoring of molecular weight and addition of biomimetic and bioresponsive features to the man-made construct. The successful polymer-drug conjugate has many advantages including improved water solubility (physical properties) and pharmacokinetic properties (the way the molecules behave in the body), better toxicity profile (reduced side effects), less frequent administration in the clinic and a patent application as a new entity patent, indulging the pharmaceutical industry.</p> <p>The sub projects of the thesis will gather around the theme of novel nanocarriers, starting from the preparation and continuing on the evaluation of the nanomedicines in vitro and in vivo. Our prior experience in developing nanomedicines from bench to bedside via the start-up approach will enlighten our way in moving these academic curiosities into high-impact solutions.</p>
Brief Workplan	Synthesis of novel copolymers using controlled polymerization techniques, preparation of nanoparticle formulations, attachment of antibody as a targeting agent, purification and characterization of the nanomedicines, in vitro evaluation of drug release and biological activity, in vivo evaluation in efficacy models.
Innovative Aspects of the Project	The novelty stems from the design of the polymeric carriers and drug-linker-polymer-antibody combinations. A modular synthetic approach to assemble the targeted nanomedicines will enable novel entities with very high drug to antibody ratios (DARs). The nanomedicines will be evaluated in vitro in 3D cell cultures (organoids).
Training Opportunities of the Project	The researcher will be trained in the area of polymer synthesis, nanoparticle preparation, biomolecule conjugation technologies, biotechnological purification and characterization methods, drug delivery and <i>in vitro</i> biological evaluations. There will be opportunity for participation of the researcher in <i>in vivo</i> evaluation.
Interdisciplinary Aspects	This highly multidisciplinary project involves organic chemistry, polymer chemistry, chemical biology (bioconjugation techniques), analytical biotechnology (characterization and purification techniques), pharmaceutical technology (preparation of nanomedicines and drug release), molecular biology (in vitro evaluations).
Intersectoral Mobility <input checked="" type="checkbox"/> Short Visit <input type="checkbox"/> Secondment	<i>Host:</i> RS Research <i>Context of Mobility:</i> Training in pharmaceutical formulation and analytical biotechnology
Intersectoral Mobility <input checked="" type="checkbox"/> Short Visit <input type="checkbox"/> Secondment	<i>Host:</i> Istanbul Health Industry Cluster (ISEK) <i>Context of Mobility:</i> Entrepreneurship Training, Thematic Pre-incubation Program

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International Academic Secondment	<p><i>Host Supervisor:</i> Prof. Carlo Catapano</p> <p><i>Host Institution:</i> Università della Svizzera italiana, Institute of Oncology Research, Bellinzona, Switzerland</p> <p><i>Host Department:</i> Tumor Biology and Experimental Therapeutics program</p> <p><i>Duration:</i> 6 months</p> <p><i>Estimated Time of Mobility:</i> During the second half of PhD</p>												
Main Supervisor													
Brief CV	<p>Prof. Rana Sanyal</p> <p>E-mail: rana.sanyal@boun.edu.tr</p> <p>ACADEMIC DEGREES</p> <table border="0"> <tr> <td>Ph.D.</td> <td>Chemistry</td> <td>Boston University, USA</td> <td>2001</td> </tr> <tr> <td>B.Sc.</td> <td>Chemical Engineering</td> <td>Boğaziçi University, Turkey</td> <td>1994</td> </tr> </table> <p>Google Scholar: https://scholar.google.com/citations?hl=en&user=sFTumloAAAAJ https://orcid.org/0000-0003-4803-5811</p>	Ph.D.	Chemistry	Boston University, USA	2001	B.Sc.	Chemical Engineering	Boğaziçi University, Turkey	1994				
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Brief CV	<p>Prof. Cengizhan Öztürk</p> <p>E-mail: cozturk@boun.edu.tr</p> <p>ACADEMIC DEGREES</p> <table border="0"> <tr> <td>Ph.D.</td> <td>Biomedical Engineering</td> <td>Drexel University, USA</td> <td>1997</td> </tr> <tr> <td>Spec.</td> <td>Physiology</td> <td>Istanbul University, Cerrahpaşa Medical Faculty</td> <td>1994</td> </tr> <tr> <td>M.D.</td> <td>Medicine</td> <td>Marmara University, Turkey</td> <td>1990</td> </tr> </table> <p>Google Scholar: https://scholar.google.com/citations?user=ldHoVggAAAAJ&hl=tr&oi=ao https://orcid.org/0000-0002-6966-0774</p>	Ph.D.	Biomedical Engineering	Drexel University, USA	1997	Spec.	Physiology	Istanbul University, Cerrahpaşa Medical Faculty	1994	M.D.	Medicine	Marmara University, Turkey	1990
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Brief CV	<p>Prof. Esra Erdal</p> <p>E-mail: esra.erdal@ibg.edu.tr</p> <p>ACADEMIC DEGREES</p> <table border="0"> <tr> <td>Ph.D.</td> <td>Molecular Biology and Genetics</td> <td>Bilkent University, Türkiye</td> <td>2002</td> </tr> <tr> <td>M.Sc.</td> <td>Biotechnology</td> <td>Middle East Technical University, Turkey</td> <td>1994</td> </tr> <tr> <td>B.Sc.</td> <td>Biology</td> <td>Middle East Technical University, Turkey</td> <td>1991</td> </tr> </table> <p>Google Scholar: https://scholar.google.com.tr/citations?user=d-T8dvAAAAJ&hl=en https://orcid.org/0000-0001-7264-0574</p>	Ph.D.	Molecular Biology and Genetics	Bilkent University, Türkiye	2002	M.Sc.	Biotechnology	Middle East Technical University, Turkey	1994	B.Sc.	Biology	Middle East Technical University, Turkey	1991
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