Center of Excellence for Functional SUrfaces and Interfaces for Nano diagnostics (EFSUN)

ACTIVITY REPORT
2016-2017
INTRODUCTION

The Center of Excellence for Functional Surfaces and interfaces for Nano diagnostics (EFSUN) was established in September 2016. The Center aims at the discovery of efficient tools for an early, efficient accurate, cheap and on-site diagnosis of important health problems using nanotechnology tools. Highly qualified local researchers in various fields, including medicine, molecular biology, genetics, pathology, chemistry, physics, engineering, nanotechnology and electronics were brought together in the center in order to generate original, innovative and patentable knowledge and produce high impact research. Moreover, interdisciplinary nature of the center facilitates coordinated interactions between members from different fields to reach a common goal of generation of high-tech nano-based diagnostic devices. The advisory board consists of outstanding and experienced researchers from the best institutes and universities in the US and in Europe. As such, EFSUN has made a big progress in becoming a center of reference in the fields of nanotechnology and medical diagnostics in Turkey, in the region, and it always welcomes motivated researchers who would like to join forces to reach this goal.

The Center was founded by 5 scientists who were soon joined by 26 scientists who are world-class experts in their respective fields. Contributing members are recipients of various prestigious national and international awards. Collaborations with the industry are ongoing. 43 Ph.D. students and 32 M.S. students as well as 9 Post Doctoral Research Associates are benefitting from the stimulating and collaborative environment of the Center.

Within a short time, the Center became a ‘Research Powerhouse’ at Sabanci University. The research efforts and collaborations in the Center led to more than 90 journal publications in top journals between 2016-2017 (such as International Journal of Heat and Mass Transfer, Microfluidics and Nanofluidics, Applied Physics Letters, Nature Scientific Reports, Optics Express, etc.). 4 joint patents applications were made, 4 joint patent grants were obtained, and 3 start-up companies were established. Significant large scale grants were also obtained from both national and international resources within a year (more than 5,000,000 Euro). The members are self sustaining the Center and providing high impact outputs within the framework of the Center without any substantial support from Sabanci University.

This activity report is intended to provide a collection of the outputs of the center.

Ali Koşar and Burç Msirloğlu
Co-Directors

Devrim Gözüaçık
Vice Director
EXECUTIVE BOARD MEMBERS

Co-Directors

Ali Koşar
Burç Mısırlıoğlu

Vice Director

Devrim Gözüaçık

ADVISORY BOARD MEMBERS

Sadik Esener
Director, Nano-Tumor Center
University of California at San Diego

Mehmet Toner
Professor of Bioengineering
Harvard Medical School

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Director, Microelectronic Systems Laboratory
EPFL

Yoav Peles
Mechanical Engineering
Department Head
University of Central Florida

Pamir Alpay
Materials Science Engineering
Department Head
University of Connecticut

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RESEARCH ACTIVITIES IN EFSUN

The Prototype Project Scheme: Collaborative efforts of EFSUN Researchers who are experts in their respective fields, will allow creation of a cell phone-assisted platform for quick, cheap and accurate on-site detection and diagnosis of diseases. Clinical materials (tumors, various tissues, blood, urine, saliva etc) that are collected by clinical medical doctors, are analyzed using molecular tools (omics approaches, molecular biology, genetics, cell biology, biochemistry) and novel disease markers are discovered. Experts of bioinformatics and computational biology analyze the results of high-throughput omics approaches. Currently at least 5 protein and 5 RNA new and patentable markers of cancer were already discovered by EFSUN researchers, others are in the pipeline. Innovative microfluidic biochips are used in order to enrich, purify or separate cells and biomolecules in clinical materials. Using home-made antibodies, specially designed and functionalized nanoparticles and innovative physico-chemical detection approaches, EFSUN researchers are able to detect femto to subfemtomolar concentrations of disease markers. Signal detection is achieved using a home-made and patentable detection devices that process information in a cell phone and Cloud-assisted manner, and operating with a custom-designed application. Therefore, all components and parts of EFSUN Cell Phone-Assisted Diagnosis Systems are a result of cutting-edge science and technology.

EFSUN Center of Excellence: Fascination of science and technology, excellence in surfaces, interfaces and diagnostics.

MEMBERS AND INVOLVED INSTITUTIONS IN EFSUN

Sabancı University
Ali Koşar (Co-Director)
Burç Misrlioğlu (Co-Director)
Devrim Göziçak (Vice Director)
Kürşat Sendur (Executive Board Member)
Gözde İnce (Executive Board Member)
Asif Sabanovic
Hiveyda Başağa
Özlem Kutlu Oral
Murat Kaya Yapıcı

Koç University
Havva Funda Yağcı Acar
Alper Kiraz

Yeditepe University
Asiye İşin Doğan-Ekici

Hisar International Hospital
Sinan Ekici

TUBITAK-MAM
Koray Balcioğlu
Berrin Erdağ

Kültür University
Elif Damla Arısan

Gebze Technical University
Tunahan Çakar
Pınar Pir
Saliha Durmuş

TR Forensic Medicine Institution
Arzu Akçay
Kubilay Kinoğlu

Çukurova University
Hikmet Akkiz

Marmara University
Tunç Laçin

PHI Tech Bioinformatics Company
Saliha Durmuş

Yeni Yüzyıl University
Cenk Kığ

Hacettepe University
Serap Dökmeci

Middle East Technical University
Haluk Külah

Center of Excellence for Functional Surfaces and Interfaces for Nano diagnostics
EXPERTISE AREAS OF EFSUN RESEARCHERS

**Surgery / Interventional Medicine**
Hämet Akız
Gastroenterology
Sinan Ekcı
Urology
Tuğlaçın
Thoracic Surgery
Kubilay Knoğlu
Forensic Medicine

**Chemistry / Material Science**
Hava Funda Yaşçı Acar
Nano Particle Design, Executive Board Member
Gozde Ince
Polymers, Thin Films
Buğrû Misirlioğlu
Surface Microstructural Properties

**Pathology**
Asiye İsmiş Doğan Ekcı
Clinical Pathology
Arzu Akçay
Forensic Pathology

**Molecular Biology, Genetics, Biochemistry**
İzmir Ekici
Molecular Medicine, Cell Biology
Hüseyin Başağa
Molecular Biology and Genetics of Disease
Serap Dökmeçi
Medical Genetics
Koray Balcioğlu
Antibody Design and Production
Berrin Erdoğ
Antibody Design and Production
Cenk Kıp
Cell Biology, Biochemistry
Elif Dambil Arısan
Molecular Cell Biology, Cancer Biology, Drug Resistance

**Bioinformatics and Computational Biology**
Tunahan Çakır
Systems Biology
Pınar Pir
Systems Biology, Mathematical Modeling
Salliha Durmuş
Systems Biology, Bioinformatics Tool Design

**Physics / Mechatronics**
Ali Koçar
Microfluidics, Heat Transfer, Cavitation
Kurşat Şendur
Nano-optics, Plasmon Resonance, Electromagnetics
Alper Kızar
Optofluodynamics, Photonics, Single Molecule Microscopy

**Electrics / Electronics**
Murat Kaya Yapiç
Microelectromechanical Systems, Executive Board Member
Asif Sabanovic
Robotics, Control, Micromanipulation
Haluk Külah
Microelectromechanical Systems

**Forensic Pathology**
Sinan Ekici
Gastroenterology
Hikmet Akkiz
Urology
Kubilay Knoğlu
Thoracic Surgery
Tunç Laçin
Urology

**Forensic Pathology**
Asiye İsmiş Doğan Ekcı
Clinical Pathology
Arzu Akçay
Forensic Pathology

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Molecular Medicine, Cell Biology, Biochemistry
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Molecular Biology and Genetics of Disease
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Haluk Külah
Microelectromechanical Systems

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**Patents**

**Granted Patents**


**Patent Applications**


**Projects**

- TÜBİTAK 1001 ‘Development and Fabrication of Ferroelectric Polymer Thin Films with Multilayers and Gradient Compositions for Improved Control of their Dielectric Properties’, 2017-2019, (Project No: 116F218)

- TÜBİTAK 1001 ‘Investigation of links and crosstalk between autophagy and stress responses’, 2017-2020, (Project No: 117Z244)

- TÜBİTAK (Korea Bilateral Cooperation Program Support, ‘Turkey-Korean international collaboration on the controlled bubble dynamics in magnetic nanofluids for the heat transfer enhancement’ 2017-2019, (Project number: 216M416)


- TÜBİTAK 1003 ‘Non-small cell lung cancer, investigation of its pathogenesis via omics approaches’, 2017-2020, (Project No: 216S505)

- TÜBİTAK Bilateral Cooperation Project with Pakistan, ‘Constraint-based and Structure-based Analysis of Metabolic Pathways to Identify Potential Drug Targets against the Lethal Infectious Diseases originating from K. pneumoniae and S. enterica’ 2017-2020, (Project No: 316S005)

- TÜBİTAK Entrepreneurship program (1512), ‘The development of miRNA profiling kit for milk and milk products, a new generation food tagging prototype’.
• TÜBİTAK ‘The synthesis of GHRH blocking aptamers through SELEX method and characterization biological effect of selected aptamers in prostate, breast, colon and cervical cells’, 2017-2020 (Projects no: 117Z254)

• TÜBİTAK ‘Targeting AMPKα with orlistat through 2D-DIGE method in PC3 and PNT1A prostate cancer cells’ (Project no: 116Z804).)

• TÜBİTAK European Molecular Biology Organization (EMBO) Networking Grant for COST-GENIE BM1408, (Project No: 115Z037)

• TÜBİTAK ‘The investigation of epi Brassinolide-induced cell death mechanism related to ER stress in colon cancer cells’ 2014-2016, (Project No: 113Z845)

• TÜBİTAK ‘The therapeutic efficiency of Curcumin related to autocrine growth hormone signaling cascade in different breast cancer cells’ (Project No: 113Z791)

• TÜBİTAK ‘Milk contamination sensor based on optical fiber cavity ring down spectroscopy’, (Project No: 116F442)


• Internal Research Grant, Sabancı University,’ An innovative biochip system for early diagnosis of colorectal cancer’, 2016-2017, (Project number: I.A.CF-17-01697)

• Royal Academy of Engineering, ‘Multiphase Flows and Heat Transfer in Micro scale’ 2016-2017

• ‘The investigation of molecular targets of Epi Brassinolide and/or roscovitine as potential GSK3b inhibitors in Caenorhabditis elegans model organism’ (COST Action BM1408 (GENIE), 2015-2018 (Project No: 115Z037)

**Startup Companies**

- Massive Dynamic
- PHI Tech Bioinformatics
- OptoFil A.Ş.

**EVENTS**

- Kick Off Meeting (26.11.2016)
- Project Team Building Event (04.02.2017)
- General Meeting and Iftar Dinner (20.06.2017)
- End of Year Meeting and Poster Competition will take place in November 2017
• EFSUN invites applications for Ph.D. students, post-doctoral research associate positions and technical staff.

• Candidates having experience on biology of diseases, material fundamentals, surface and interface interactions, power generation in small scale along with targeted device design are welcome.

• Please send a curriculum vitae, publication list, names and e-mail addresses of at least three referees and a motivation letter electronically to:

  Professor Ali Koşar (kosara@sabanciuniv.edu)
  Professor Burc Mısırlıoğlu (burc@sabanciuniv.edu)
  Professor Devrim Göziąaçık (dgoziacik@sabanciuniv.edu)
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