

International conference

“Physics of Cancer: Interdisciplinary Problems and Clinical Applications”

23-26 May 2017, Tomsk, Russia



Physics and cancer

International Conference on Physics of Cancer: Interdisciplinary Problems and Clinical Applications, Tomsk, Russia, May 23-26, 2017

The International Conference “Physics of Cancer: Interdisciplinary Problems and Clinical Applications” held in Tomsk on May 2017, was sponsored by the Institute of Strength Physics and Materials Science of SB RAS, Tomsk Research Institute of Oncology, Institute of Continuous Media Mechanics of UrB RAS, National Research Tomsk Polytechnic University, National Research Tomsk State University with supported by the Russian Federal Agency of Scientific Organizations and Technical Platform “Medicine for the Future”.

There were over 200 research scientists from 5 countries, including France, Germany, Italy, Israel and Russia attended this conference. The purpose of the Conference was the sharing of results and ideas by physicists, biologists, chemists and medical doctors in most challenging

issues of fundamentals of cancer diseases, risk detection and cancer cure.

Cancer has been recognized as complex processes of cell and tissue morphogenesis driven by a set of both intracellular and environmental cues. The fundamental question is how we can understand such a complex and fine-tuned regulated system? The classical reductionistic approach that is focused on single gene expression did not allow for a full understanding the link of general gene expression patterns as well as morphological changes at both tissue and gene levels. Cell behavior integrates simultaneous physical and biochemical inputs to produce a few possible phenotypes. These data outline that biological pathways are subjected to a nonlinear dynamics and suggest that signal specificity should be ascribed to the overall system configuration rather than to single specific components. The physical forces (electromagnetic and gravitation fields) and structural cues both affect the cell behavior and phenotypic traits (shape and differentiation). Normal cells need to adhere to extracellular matrix (ECM) in order to survive,

differentiate and proliferate. ECM molecules bind the specific cell surface receptors (integrins) and therefore activate intracellular signaling pathways that drive a cell toward proliferation, differentiation, apoptosis, or even neoplastic transformation. Compelling evidence suggests cancer can arise as a consequence of the disruption of the reciprocal interactions between cells and the microenvironment, leading to modification in cell morphology, signaling pathways, and genomic functions.

Multiscale spatial-temporal analysis of biological and medical signals, including molecular-genetic studies, mammography and infrared data combining with high resolution microscopy (confocal microscopy, scanning electron microscopy, scanning surface potential microscopy) were specially targeted to establish the links between cell and tissue behavior and clinic stages of tumor progression. Particular attention was devoted to the research and development of new materials and implants to prevent the progression of malignancy in patients with cancer.

Conference consisted of several sessions devoted to the following areas of research and applications:

- Current transdisciplinary issues in cancer diagnosis and treatment
- Cell biology and cell mechanics and their impact on cancer progression
- New technologies and theoretical models for cancer research
- Mechano-genetics of the cell: application to embryonic and tumor development
- Multi-scale analysis and modeling of genomic, epigenetic and microscopy data, methodology and application to cancer
- Application of molecular genetics technology and biophysics methods in target therapy and cancer risk estimation
- Modern materials and diagnosis methods for cancer treatment
- Cancer nanotechnology
- Materials / implants for reconstructive oncology
- Nuclear medicine
- Soft matter science

Next International Conference “Physics of Cancer: Interdisciplinary Problems and Clinical Applications” is planned to organize in Russia, Perm in 2019.

Conference co-chairmen Elazar Y.Gutmanas, Oleg B.Naimark, Sergey Psakhie.