Bernard Friedenson, J Comput Sci Syst Biol 2014, 7:5
http://dx.doi.org/10.4172/0974-7230.S1.005

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Summit on
Integrative Biology
August 04-05, 2014 Hilton-Chicago/Northbrook, Chicago, USA

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Closely related sets of genes are mutated in both breast and viral cancers

Infections may play a larger role in breast cancer than previously thought if normal breast cell defenses have been weakened by gene mutations. Functions likely affectedby ~8000 mutations in 124 breast cancer genomes and exomes were compared to genomes from 14 HPV cervical cancers as model viral cancers. DNA sequences were from publicly available data.Breast and viral cancers all had damage to genes essential for immune responses and barriers to infection.Most breast cancers had mutations in genes for multiple cell attachments, potentially opening easier routes for infectious particles. A basement membrane encircles a discontinuous layer of breast duct myoepithelial cells surrounding epithelial cells. Genes encoding for basement membrane cell adhesion and organization were almost always damaged. Protective mucins had mutations in both breast and cervical cancers. Many mutations found in breast and in cervical cancers could affect the function of primary cilia. Unlike motile cilia on some cervical cells which circulate mucin-containing fluid, some breast cells have these primary cilia. Primary ciliausually do not beat but function as sensors for environmental conditions. Other breast cancer mutations altered genes for the dense, tightly packed cytoplasm and could degrade its architecture, leading to abnormal cell shapes. The nucleus contains additional formidable barriers with gene damage in both breast and cervical cancers. Breast cancers parallel viral cancers with damage to about 1000 identical or closely related genes. Functional effects of immune and barrier abnormalities in many genes have now been documented in detail for 138 different cancers. The results change the most widely held view of cancer. Cancer is no longer a disease in which >99.9% of the genes mutated are irrelevant. In the 138 cancers, damage to related functions mediated by mutations in many known genes creates coherent mechanisms of carcinogenesis.

Biography

Bernard Friedenson is a PhD research scientist authoring nearly 60 publications. Friedenson received an NIH research career development award and recently won an Innocentive Award in competition with nearly 400 other scientists. After a BA in honors chemistry-mathematics at the University of Minnesota Duluth and a PhD in biochemistry-organic chemistry at the University of Minnesota, he did post-doctoral work at Roswell Park Memorial Institute, where he rose to senior cancer research scientist, specializing in immunology. As a faculty member at the University of Illinois Chicago, he acquired 13 years further training in medical sciences, molecular medicine and genomics. His recent work found evidence that hereditary breast cancer gene mutations BRCA1 and BRCA2 increase risks in other organs beyond breast and ovary. Nonetheless he showed these mutations do not make breast or any other cancer inevitable. BRCA1 and BRCA2 gene mutations increase susceptibility to carcinogens, especially those capable of causing complex DNA damage. For example, mutation carriers may be unduly sensitive to alcohol and acetaldehyde carcinogens. However hidden alcohol and acetaldehyde are widespread in foods and confound epidemiologic studies trying to demonstrate this increased risk. He showed that differential exposure of organs to carcinogens and some infections play a major role in which organ develops cancer. His background in immunology enabled his recent finding that acquired mutations may cause defects in the ability of breast cancers to respond to microbial infection. This deficit may underlie breast cancer and even help target breast and ovary for BRCA1 and BRCA2 related cancers. He recently chaired sessions at an international cancer meeting and an online meeting. He is a member of the editorial board of BMC Research Notes, a member of the American Society of Preventive Oncology, the American Society of Clinical Oncology, and a reviewer for multiple journals. One of his publications is still advancing among the top 100 most accessed among about 360 BioMed Central journals. He has authored several highly accessed videos.

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