Genomics Fact Sheet

Understanding genomics[1]

Genomics is the study of complex sets of genes, how they are expressed (what their level of activity is), and the role they play in biology. Another way to think about it is as a small society of genes and how they work together to influence tumor biology. The Human Genome Project helped identify and sequence the full set of genes in the human body, but it did not provide sufficient information to affect treatment planning. Actionable insight comes from understanding how genes inter-relate and what those resulting functions are, in addition to knowledge of their sequences or forms.

As the study of genomics advances, the application of genomic information is expected to enhance the diagnosis, prognosis, and treatment of diseases, including cancer.

What is the difference between genomics and genetics?[2]

While genomics and genetics may sound similar and are related, each focuses on different information.

Broadly speaking, genetics is the study of how inherited traits are passed from one generation to the next, through the genes, and how new traits appear by way of genetic mutations or changes. These traits may be characteristics like eye or hair color.

A predisposition to certain types of diseases can also be passed through the genes. For example, there are tests for BRCA1 and BRCA2 genes. Inherited changes to these genes are involved in many cases of hereditary breast and ovarian cancer.

These genetic tests are different from Onco*type* DX™, which is a genomic test. A genomic test looks at groups of genes and how active they are. This activity can influence how a cancer is likely to grow and respond to treatment. Unlike a genetic test, the Onco*type* DX test does not provide information about a person's inherited genetic make-up. Instead, the Onco*type* DX test looks at 21 genes in a patient's breast tumor to understand how these genes interact and function.

Genomics in cancer[3]

There is a tremendous need for new ways to manage and treat cancer, an extremely complex disease family that accounts for one out of every four deaths in the United States.[4] An individual cancer contains many different alterations based on the unique biology of the patient's disease. As a result, certain patients may be more likely than others to develop advanced disease or to respond to certain therapies. Because we have only limited insight into these differences at initial diagnosis, choosing a treatment tailored to the individual is extremely difficult.

This is where genomics – the study of complex sets of genes and how they work as a small society to influence tumor biology – comes in. New genomic services are being developed to provide clinically validated, individualized tumor profiles that may greatly improve the quality of

treatment decisions for patients with cancer, ultimately impacting patient outcomes.

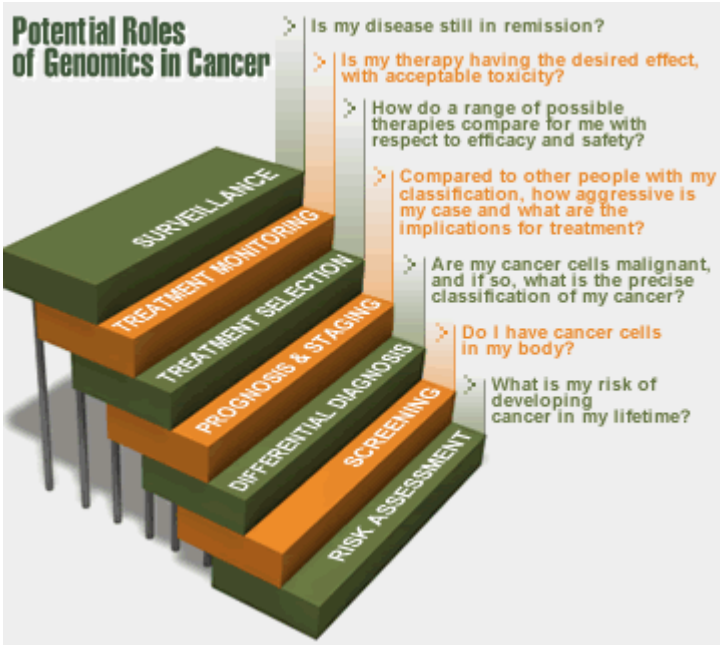
Applying genomics to cancer[5]

The application of genomics to cancer may seem straightforward, but the behavior of cancer is dependent on many different genes, how they interact, and the conditions they create for disease to occur.

Although it is possible to identify a single gene that may signal a more aggressive type of disease, by analyzing a key set of genes that the tumor expresses we can gather far more specific and reliable information. With genomics, it is possible to assess the unique biology of each patient's cancer and to predict the course of the disease for that individual. In turn, this knowledge makes it possible for physicians and patients to help individualize a treatment plan, which can potentially improve patient outcomes.

The key to effectively using genomics to improve cancer treatment and outcomes lies in determining which sets of genes and gene interactions affect different subsets of cancers. Studies can be performed to help us understand which patterns of gene expression within a tumor are linked to a response to therapy or to the likelihood that the cancer will return or metastasize. These results can then be used to develop clinically validated tests—such as Onco*type* DX—that provide the genomic profile of an individual's tumor, allowing physicians to better understand whether patients are likely to benefit from treatments such as tamoxifen or chemotherapy, or whether those patients are likely to experience a recurrence of their cancer.

The field of genomics is a dynamic area of research. It is growing and evolving very quickly as more and more researchers grasp the potential of this exciting branch of science. Ultimately, experts in the field expect that genomics will play a role in each step of the cancer management process, as illustrated below.



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[1] Source: www.genomichealth.com/genomics/understanding.aspx
[2] Source: www.mytreatmentdecision.com/320-genomics-vs-genetics.aspx
[3] Source: www.genomichealth.com/genomics/default.aspx
[4] Source: American Cancer Society, Inc.'s *Cancer Statistics 2007*
[5] Source: www.genomichealth.com/genomics/applying.aspx