



Genomics and Molecular Medicine

Molecular medicine is a branch of medicine that develops ways to diagnose and treat disease by understanding the way genes, proteins and other cellular molecules work. Molecular medicine is based on research that shows how certain genes, molecules, and cellular functions may become abnormal in diseases such as cancer.

Translational genomics research is a relatively new field employing innovative advances arising from the Human Genome Project and applying them to the development of diagnostics, prognostics and therapies for cancer, neurological disorders, diabetes and other complex diseases. For the first time in history, researchers have the knowledge to unravel the genetic components of common and complex diseases.

The increased understanding of molecular medicine is shifting clinical practice from treatment based on symptoms to treatment based on the underlying causes of disease. This will enable physicians to prescribe treatment plans that are designed more intelligently, work more effectively and have fewer toxic side effects.

Key Facts:

- The Human Genome Project was successfully completed in April 2003 at a cost of about \$2.7 billion.
- During the past decade, the cost of sequencing the 6 billion base pairs of human DNA has fallen dramatically - fueled in large part by tools, technologies and process improvements - to roughly \$100,000 in 2009 to less than \$20,000 today. The National Human Genome Research Institute recently awarded \$14 million in grants for the development of technologies that will rapidly sequence a person's genome for \$1,000 or less.
- Some commercial entities are able to conduct genome sequencing at a cost of about \$5,000 per genome today.
- DNA sequencing generates enormous amounts of data, creating information management and storage challenges for researchers.

On the Horizon:

The mapping of the human genome was just the beginning. With the vast trove of data about human DNA generated by the Human Genome Project and related projects, scientists and clinicians have powerful tools to study the role that genetic factors play in much more complex diseases, such as cancer, diabetes and cardiovascular disease. Genome-based research is already enabling medical researchers to develop more effective diagnostic tools, to better understand the health needs of people based on their individual genetic make-ups and to design new treatments for disease.

"TGen - TGen Overview." TGen Home Page. The Translational Genomics Research Institute. Web. 31 Oct. 2011. <<http://www.tgen.org/about/index.cfm?pageid=1>>.

National Human Genome Research Institute. Genome.gov | 2011 Release: *NHGRI Funds Development of Revolutionary Sequencing Technologies*. Genome.gov | National Human Genome Research Institute (NHGRI) - Homepage. 22 Aug. 2011. Web. 31 Oct. 2011. <<http://www.genome.gov/27545118>>.

"Genome.gov | All About The Human Genome Project (HGP)." Genome.gov | National Human Genome Research Institute (NHGRI) - Homepage. Web. 31 Oct. 2011. <<http://www.genome.gov/10001772>>.