GENOMICS

OUR JOURNEY of HOPE®

THE PROMISE OF PRECISION CANCER TREATMENT

An understanding of the genetic profile of a specific tumor helps physicians better understand what caused the tumor and tailor treatment based on these findings.

Cancer patients today are **treated according to their cancer type, stage and prior therapies.**

Research suggests that **genetic changes in breast, colon and lung cancers link them to other cancers.**

Cancer patients often try out a few different lines of chemotherapy before the right combination is found.

Clinicians now are starting to **define what drives the cancer** regardless of its location in the body.

Genomic testing might suggest **a drug normally used for one type of cancer could be appropriate for treatment of another cancer.**

WHAT IS **DRIVING THE SHIFT?**

A huge drop in the cost
of sequencing an individual's genome. Sequencing an individual's genome cost **$10 million-$50 million** in 2003 but now is available for **$3,000-$5,000.**

Increasing knowledge
about the genetics of cancer. For example, many endometrial cancers have a gene mutation previously seen only in colon cancers.

Efforts by pharmaceutical companies
to target DNA defects that lead to cancer. More than 100 FDA-approved drugs are now packaged with genomic information that tells doctors to test their patients for genetic variants.

GENOMIC TIMELINE: **KEY DISCOVERIES**

Throughout history, scientists have sought a greater understanding about how the human body works at its most basic levels. Discoveries in the late 1800s laid the groundwork for the Human Genome Project, which mapped the entire human genetic code.

1973
Dr. Janet Rowley finds chromosome abnormalities in leukemia patients. Her work led to cures for previously untreatable cancers and the development of targeted therapies.

1953
British scientist Francis Crick and American scientist James Watson identify the double helix structure of DNA.

1943
British scientist William Astbury obtains the first X-ray diffraction pattern of DNA, which revealed DNA's regular, periodic structure.

2006
The Cancer Genome Atlas Pilot Project begins. The project seeks to identify genetic abnormalities in 50 major cancer types.

1869
Swiss scientist Friedrich Miescher isolates DNA for the first time.

2003
Researchers complete work on the Human Genome Project, finding that each human has about 20,500 genes.

2001
The FDA approves Gleevec, the first drug to target a specific gene mutation, to treat patients with chronic myeloid leukemia. The drug is more targeted than chemotherapy, killing only cancer cells.

1990
Work on the Human Genome Project begins. An international group of researchers collaborate to map and sequence the entire human genome.

GENOMIC TESTING: **HOW IT WORKS**

The quest for greater understanding about the genetic basis of diseases has led to the development of diagnostic tools. For cancer in particular, tools now can test a tumor sample for genetic mutations suspected of driving tumor growth. Here are the steps in genomic testing:

1 **A sample of a patient's cancer tissue** (if available) or biopsy of the patient's tumor is sent to a genomic sequencing lab.

2 **After extracting DNA from the sample,** the normal genes and the genes linked to cancer growth are sequenced.

3 **Sequencing the tumor's genetic profile** produces a large amount of data. This data is analyzed to identify mutations that are critical to certain functions of the tumor.

4 **Doctors use the lab analysis** to find a treatment that would be appropriate for the genetic variation identified.

Results can take a few days to a few weeks. Not all gene mutations can be matched with an existing treatment. But genomic medicine can offer a more precise approach by tailoring treatment to a patient's genetic information, specifically how the patient's genes function normally or trigger disease.

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