

# The Center for Cancer Epigenetics

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## THE CHALLENGE

While the Human Genome Project mapped our genes, the resulting “blueprint” fails to account for malignant cells whose genetic codings actually appear normal. Scientists at The University of Texas MD Anderson Cancer Center believe the answer to this quandary lies in the study of epigenetics—changes in gene expression that occur without altering basic DNA structure.

These epigenetic changes include DNA methylation, a chemical alteration that prevents the reading of protein-making instructions contained in genes, and histone



*Identical twins have identical genes. However, differences in their epigenomes, which control how genes behave, can explain disparities in their health.*

deacetylation, which results in the same outcome by keeping DNA strands wound tightly around spool-like histone proteins.

This shutdown of the protein-making process (essential to normal functioning as protein molecules activate other genes and carry out virtually every other cell task) leads to malfunctioning genes and

mechanisms that can impact disease development and progression. Thus epigenetic changes, which can be inherited or acquired, are now thought to be just as important in cancer formation as genetic mutations.

## THE OPPORTUNITY

But unlike genetic mutations, epigenetic changes can be reversed. At the Center for Cancer Epigenetics (CCE)—one of seven centers of excellence in MD Anderson’s Institute of Basic Science—more than 30 scientists in a dozen-plus disciplines are working to unveil links between cancer and specific epigenetic actions which switch gene functions on and off. Led by Co-directors **Sharon R. Dent, Ph.D.**, and **Jean-Pierre Issa, M.D.**, CCE efforts to define the full spectrum of epigenetic markers in normal and tumor cells and to determine the mechanisms that drive epigenetic changes will ultimately lead to new therapies that can

## WHY NOW?

Epigenetics is the key to reading the genetic code in different ways and ultimately altering the code to coax disease cells, which begin as normal cells, to return to their proper behavior. This area of research holds such great promise that the National Institutes of Health has designated it as a major “Roadmap” initiative to speed its development. The study of epigenetics has the potential to explain the mechanisms that lead not only to cancer, but to aging, heart disease, mental health and other conditions.

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turn critical genes back on—including those known to suppress tumors. These new therapies will be designed to manipulate wayward genes to return to their original activities rather than to kill tumor cells, a treatment approach with reduced toxicity and fewer side effects.

## EPIGENETICS IN ACTION

Research in Dr. Issa’s lab has shown that environmental factors—lifestyle, diet and geographic location, for example—can affect the DNA methylation status of genes in normal tissues and potentially result in pre-cancerous or cancerous conditions. His work helped lead to Food and Drug Administration approval of decitabine (which affects DNA methylation) as the standard of care in myelodysplastics syndrome, a precursor of acute myelogenous leukemia.

Dr. Dent and her team are leading research on the role of chromatin-remodeling enzymes in gene expression and how they contribute to cell growth and development. Chromatin is a mix of mostly DNA and specialized proteins called histones that help control gene behavior.

## THE IMPACT OF GIVING

Philanthropic support is essential to advancing research at the CCE. The center seeks \$5 million to provide seed funding for novel research projects (to collect the preliminary data needed to effectively compete for federal funding); aid new faculty recruitment; support educational programs to train the next generation of epigenetics researchers; fund data and information exchange; and sustain the Solexa Deep-Sequencing Facility, a state-of-the-art technology center used to map the locations of individual epigenetic markers across entire genomes.