

Policy Briefings

**Curing Cancer: How Close Are We?**

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*A Joint Partnership of:*

**The Health, Medicine and Society Program at the Aspen Institute  
Friends of Cancer Research**

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**Cancer Research in the 21<sup>st</sup> Century: A Policy Briefing Series:** These policy briefings explore the history and evolution of cancer care, highlighting progress, challenges, and the path forward. As they showcase the success of medical research and preview exciting scientific advances, the briefings look at where therapeutics are headed and what else needs to happen to combat the second leading cause of death in the United States today. The series is a joint presentation of the Health, Medicine and Society (HMS) Program at the Aspen Institute and Friends of Cancer Research (*Friends*).

*About the Panel*

**Francis Collins, MD, PhD**, is director of the National Institutes of Health (NIH). Prior to joining the NIH in 2009, he was a Howard Hughes Medical Institute investigator at the University of Michigan. Dr. Collins served as director of the National Human Genome Research Institute from 1993-2008 and is an elected member of the Institute of Medicine and the National Academy of Sciences. He received the National Medal of Science in 2009.

**Ronald DePinho, MD**, is president of the University of Texas MD Anderson Cancer Center in Dallas. Before joining that institution in 2011, he was founding director of the Belfer Institute for Applied Cancer Science at Dana-Farber Cancer Institute and an American Cancer Society Research Professor at the Harvard Medical School. He is an elected member of the Institute of Medicine and the National Academy of Sciences, and the founder of several biotechnology companies focused on cancer.

**Susan Page** is the Washington bureau chief for *USA Today* and also appears regularly on television and radio news programs, including “Late Edition,” CNN’s Sunday morning journalist roundtable. A graduate of Columbia University’s renowned School of Journalism, she has covered six presidential elections, and interviewed the past seven presidents and seven of the men they defeated for that job.

## Policy Briefings

### Curing Cancer: How Close Are We?

#### *Policy Briefing Whitepaper*

The quest to understand, treat, and cure cancer is a long story of hope, disappointment, opportunity, and progress.

Two decades ago, cancer was generally viewed as a single disease, and a handful of highly toxic chemotherapy drugs were used to treat most tumors. Unable to distinguish between healthy and cancerous cells, these pharmaceuticals often did more harm than good. Likewise, a narrow understanding of breast cancer continued to bias many surgeons towards radical mastectomy, although breast-conserving techniques were beginning to emerge.

In the years after the nation declared a War on Cancer in 1971, cancer research clearly did not move fast enough, despite the substantial resources that were being dedicated to it. In 1990, the National Cancer Institute budget was \$1.6 billion a year,<sup>1</sup> and the pharmaceutical industry was spending some \$8.4 billion annually on all research and development.<sup>2</sup>

A sea change in the scientific approach to cancer can be traced to the 1998 approval of Herceptin for the subset of breast cancer patients with a specific genetic mutation – that is, about 15-20% of women with invasive cancers.<sup>3</sup> It was a groundbreaking development, not only because Herceptin extended many lives, but because it was the first time a drug's use was tailored to individual genetic information.

In 2001, Gleevec, a dramatic new treatment for chronic myelogenous leukemia (CML), reinforced the sense that cancer breakthroughs targeting the genetic underpinnings of cancer were about to come fast and furiously.<sup>4</sup> It not only shifted CML from a likely-fatal diagnosis to one that could be managed, but as significantly, it demonstrated the power of basic science – in this case, by explaining how a malfunctioning signaling protein could allow abnormal cell proliferation, and how to correct it.

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<sup>1</sup> [National Institutes of Health Almanac: Appropriations](#). URL accessed October 10, 2014.

<sup>2</sup> Congressional Budget Office. [Research and Development in the Pharmaceutical Industry](#), Figure 2-1. October 2006. The National Science Foundation provided these figures, in 2005 dollars, for domestic R&D investments.

<sup>3</sup> Pray L. "[Personalized Medicine: Hope or Hype](#)." *Nature Education* 2008; 1(1):72.

<sup>4</sup> Pray L. "[Gleevec: The Breakthrough in Cancer Treatment](#)." *Nature Education* 2008; 1(1):37.

Personalized medicine is widely believed to be the future of effective cancer treatment. In the years that followed Herceptin's approval, cancer research began to gather momentum. Funding increased, with the National Cancer Institute's budget reaching \$3.3 billion annually by the early 2000s,<sup>1</sup> and pharmaceutical industry R&D spending at about \$15 billion a year.<sup>2</sup>

The Human Genome Project, long expected to transform our foundational understanding of human biology, was completed in 2003, with the sequencing of all 20,500 genes in the body.<sup>5</sup> Dr. Francis Collins, then director of the National Human Genome Research Institute, described the map of the genome like this:

*"It's a history book - a narrative of the journey of our species through time. It's a shop manual, with an incredibly detailed blueprint for building every human cell. And it's a transformative textbook of medicine, with insights that will give health care providers immense new powers to treat, prevent, and cure disease."*

But if the map of the human genome provides a manual for the human body, and Herceptin and Gleevec suggest that life-saving treatments can emerge from knowledge about how specific cells function, we still do not have a prescription for vanquishing cancer. The problem is that cancer is extraordinarily complex. Indeed, the more we learn about it, the more complex it is revealed to be. As Siddhartha Mukherjee has written in his extraordinary "biography" of cancer, *The Emperor of All Maladies*":

*"Malignant growth and normal growth are so genetically intertwined that unbraiding the two might be one of the most significant scientific challenges faced by our species."*

A single study hints at the difficulty of finding therapies that target specific disease. After sequencing the genomes of breast cancer tumors in 50 patients, researchers identified 1,700 mutations – we don't know how many of those mutations contribute to cancerous growth, but we do know that only three occurred in 10% or more of the tumors.<sup>6</sup> If every tumor has a genetic fingerprint so unique, will we need equally unique therapeutic options to face each one down?

How close to curing cancer are we, then? Closer than ever, because we know so much more about it. Yet disappointingly far away – because we know so much more about it. We are making great strides in extending life and mitigating symptoms, and many cancers are more manageable as chronic illnesses. But we remain far from a cure.

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<sup>5</sup> National Human Genome Research Institute. "[An Overview of the Human Genome Project](#)." URL accessed October 10, 2014.

<sup>6</sup> Wadman M. "[Fifty genomic sequences reveal breast cancer's complexity](#)." *Nature*, Published online April 2, 2011.

Still, the future gives us reason to hope, as Dr. Ronald DePinho, president of the University of Texas MD Anderson Cancer Center, told the *New York Times*:

*"The elements are in place to make a decisive assault. We're in a moonshot moment."*

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[Health, Medicine and Society Program \(HMS\) at the Aspen Institute](#), established in 2005, gathers together academic, government, and industry leaders in multidisciplinary forums to examine health policy and public health and consider their impact on individuals, families, and communities across the United States. Rigorously nonpartisan, HMS is the principal domestic health initiative at the Aspen Institute, one of the world's premier gathering places for leaders to come together to explore the ideals and ideas that define a good society.

[Friends of Cancer Research](#) (*Friends*) is the nation's leading voice in advocating for policies and solutions that will get treatments to patients in the safest and quickest way possible. *Friends* has a unique model that creates groundbreaking partnerships and develops innovative policy and scientific solutions to improve health outcomes and cancer care. Working with federal health agencies, congressional leadership, academic research centers, and private sector industry, *Friends* tears down the barriers that stand in the way of conquering cancer.