



# 10 Research Contributions to Cancer Breakthroughs

The American Cancer Society is there for scientists at pivotal points in their career – to give them the support they need to keep great research going or to take their ideas from dream to reality. We are proud to have helped more than 20,000 investigators make important advances in prevention, early detection, treatment, and care for those with cancer.

Here are just 10 of the countless cancer advances we supported.

**1. Uncovering a key way to stop tumors from growing:** In 1971, while being supported with an ACS grant, Judah Folkman, MD, discovered tumor angiogenesis: the idea that tumors need blood vessels to grow and spread. In 2004, more than 30 years after Folkman's initial observations, the FDA approved the drug Avastin, which works by preventing the formation of new blood vessels. Avastin is used to treat lung, brain, kidney, cervical, ovarian, and metastatic colon cancers.

**2. Pioneering work in bone marrow transplants:** Beginning in 1963, ACS provided over a decade of funding that helped E. Donnall Thomas, MD, conduct research and clinical trials that led to successful bone marrow transplants in humans. Decades later, in 1990, Thomas received a Nobel Prize for his work. Bone marrow transplantation, and the related therapy, stem cell transplantation, have had a global impact – decreasing mortality in several blood cancers.

**3. Furthering knowledge of genes linked to breast cancer:** ACS-funded researchers continue to provide a better understanding of how BRCA1 and BRCA2 genetic mutations are linked to breast and ovarian cancers, decades after Mary-Claire King, PhD made her breakthrough discovery. The ACS's funding of Dr. King helped her find that tamoxifen reduced breast cancer incidence among healthy women carrying a BRCA2 mutation. In another ACS-funded study, she found that 1 in 4 African American breast cancer patients had mutations in BRCA1 and BRCA2.

**4. Laying the groundwork for a new multiple myeloma treatment:** ACS-funded researchers helped pave the way for the 2015 FDA approval of the multiple myeloma drug Darzalex (daratumumab), a treatment that targets a specific protein, called CD38. One such grantee was Kenneth Anderson, MD, who with ACS support conducted preclinical trials in mice that showed the drug effectively killed CD38-positive myeloma tumor cells. Darzalex has been shown to help patients live longer and healthier with multiple myeloma, a form of blood cancer.

**5. Finding a key driver of the blood cancer chronic myeloid leukemia:** ACS provided funding that helped Brian Druker, MD, and other key scientists conduct research on the chromosomal abnormality linked to chronic myeloid leukemia (CML). That work eventually led to the development of Gleevec (imatinib), the first anti-cancer drug to target CML. Prior to the early 2000s, patients with CML had very few treatment options. Gleevec, which was developed by a drug company, was approved by the FDA in 2001 and quickly became a game-changer for CML. Today the drug is also used to treat other forms of leukemia and other disorders.

**6. Gaining insights that inspired researchers to investigate and confirm that tamoxifen can both treat and sometimes prevent breast cancer:**

ACS funded foundational research, led by Bernard Fisher, MD, that completely changed the way doctors thought about treating breast cancer. Fisher and his colleagues showed that extreme surgery wasn't the only way to treat breast cancer. Instead, they focused on minimizing the amount of surgery necessary by also treating patients with drugs that could kill cancer cells throughout their bodies. This fundamental shift in breast cancer treatment was a key moment that spurred research that later led to the 1977 FDA approval of tamoxifen to treat metastatic breast cancer. After that, Fisher, with additional funding from ACS, studied the drug for breast cancer prevention. In 1998, the FDA approved tamoxifen for reduction of risk in women at high risk of developing the breast cancer.

**7. Investigating new approaches that would make possible the first targeted cancer therapy to receive FDA approval:**

With ACS support beginning in 1976, Ronald Levy would begin a decades-long effort to understand how monoclonal antibodies could be used against cancer. ACS then helped support clinical trials for Rituxan (rituximab), the first monoclonal antibody to show success against cancer. When the FDA approved Rituxan in 1997, it became the first new treatment approved for lymphoma in two decades. It was not only the first targeted drug for cancer to receive FDA approval, it was also a forerunner in the now vibrant area of immunotherapy, and has been used as a model for other major forms of chemotherapy.

**8. Performing studies that paved the way for the development of the breast cancer drug Herceptin:**

ACS provided funding that helped several researchers, including Dennis Slamon, MD, PhD, conduct foundational work that ultimately led to the development of Herceptin (trastuzumab). For women with HER2-positive breast cancer, Herceptin can be used to more effectively treat both early and late-stage breast cancers.

**9. Confirming the link between smoking and lung cancer:**

The Surgeon General's landmark 1964 report that concluded that smoking causes lung cancer was based in part on early ACS studies linking smoking with lung cancer and higher overall death rates. Since then, adult smoking rates have declined more than 40% to less than 20% today.

**10. Proving that obesity increases risk of premature death as well as establishing the link between obesity and death from certain types of cancer:**

Long-term population-based studies conducted by ACS researchers provided significant evidence to show the link between obesity and death from breast, colorectal, and other cancers.