

Researchers say to conquer cancer you need to stop it before it becomes cancer

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In a Perspective piece published this week in *PNAS*, cancer researchers from across the country, including faculty at University of California San Diego School of Medicine and Moores Cancer Center, write that a greater emphasis on immune-based prevention should be central to new efforts like the federal Cancer Moonshot program, headed by Vice

President Joe Biden.

"Science has devoted tremendous amounts of energy and resources to the treatment of [cancer](#), and in recent years, there has been significant progress. The cancer death rate has steadily declined for more than two decades," said Scott M. Lippman, MD, director of Moores Cancer Center and co-senior author of the *PNAS* paper. "But cancer still kills more than half a million Americans each year and afflicts many millions more. If we're ever to eradicate this scourge, we must work to prevent it from occurring altogether."

The authors, whose expertise encompasses immunology, genomics, epigenomics, computational biology, vaccines and medical genetics at institutions ranging from University of Washington and La Jolla Institute for Allergy and Immunology to the National Cancer Institute (NCI), Dana-Farber Cancer Institute and the Sidney Kimmel Comprehensive Cancer Center, say new research tools and other developments now make it possible to decipher in detail how different cancers begin, how benign or precancerous tissues turn malignant and deadly.

"Oncogenic transformation is a series of steps," said Elizabeth M. Jaffee, MD, co-senior author, co-chair of the Cancer Moonshot Blue Ribbon Panel and deputy director of the Kimmel Center at Johns Hopkins University School of Medicine. "The body's immune system is capable of intercepting pre-malignancies and preventing cancer. It does so countless times every day in all of us. That natural ability is what we want to leverage. Building upon our innate defenses against cancer is the foundation of new immunotherapies, which have shown great promise in a very short time."

But much more must be done, say the authors. Efforts like The Cancer Genome Atlas (TCGA) and genome-wide association studies (GWAS), which look for common genetic variants in different people to see if any

variant is associated with a trait or, in this case, a cancer, have significantly advanced basic research in immune oncology and precision therapy. Both should be dramatically expanded to [cancer prevention](#), the authors write.

Continued and new development of cancer vaccines will be critical, said Lippman, noting that the human papilloma virus (HPV) vaccine, co-developed by NCI Acting Director Douglas R. Lowy, MD, and co-author John Schiller, PhD, provides almost 100 percent protection against strains linked to several types of cancer.

Earlier this year, the Human Vaccines Project, a global public-private partnership of academic research centers, industry, non-profits and government agencies to accelerate development of next-generation vaccines and immunotherapies, announced that UC San Diego, with The Scripps Research Institute, J. Craig Venter Institute and La Jolla Institute for Allergy and Immunology, would serve as a hub for vaccine research.

The authors cited several cancers that were particularly ripe for immediate prevention efforts, including Lynch syndrome, an inherited condition that increases the risk of many cancers, including of the digestive and gynecologic tracts; clonal hematopoiesis, an age related precursor to leukemia; and cervical intraepithelial neoplasia, abnormal growth of cervix tissue caused by HPV that can progress to cervical cancer.

"Prevention research has made strides, but progress has been anecdotal and isolated," said Lippman. "If the goal is eradication of cancer, we need a radically new focus, investment and approach to premalignant diseases and cancer prevention, one that is supported and sustained by broad, deep efforts like the Cancer Moonshot and Human Vaccines Project."

More information: Preventive vaccines against precancerous lesions, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1608077113

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