



NCI Alliance for Nanotechnology in Cancer

Nanotechnology offers new and exciting avenues towards early diagnosis, treatment, and prevention of cancer. To capitalize on this potential, the National Cancer Institute (NCI) launched the NCI Alliance for Nanotechnology in Cancer. Alliance research has combined the development of novel nanomaterials and nano-devices with their effective use in contemporary cancer biology and oncology.

NCI ALLIANCE FOR NANOTECHNOLOGY IN CANCER

Launched in 2004, the NCI Alliance for Nanotechnology in Cancer program is a comprehensive, structured effort, encompassing the public and private sectors, to converge multidisciplinary research in cancer nanotechnology. The program is administered by the NCI Office of Cancer Nanotechnology Research and engaged in efforts to harness the power of nanotechnology to radically change the way we diagnose, treat, and prevent cancer. Furthermore, the effort is designed to accelerate the application of the best capabilities of nanoscale platforms into the realm of contemporary oncology.

ACCOMPLISHMENTS (2005-2015)

Since its inception, the Alliance researchers have made important advances in using nanotechnology to address comprehensive problems in cancer biology and oncology.

Alliance research led to robust science and technology and established:

- Sensors for multiplexed detection of DNA and proteins;
- Capture devices for circulating tumor cells to monitor therapy response;
- Bio-activatable nanoparticle for triggered drug delivery;
- Multifunctional nanoparticle drug delivery systems;
- Nanoparticle systems to overcome drug resistance;
- Multi-modality imaging constructs for surgical guidance;
- Carbon nanotubes-based X-ray instrumentation for portable imaging devices.

Alliance in Numbers. The Alliance researchers:

- Generated over 3000 peer-reviewed publications that have been collectively cited over 83,000 times;
- Developed a strong intellectual property portfolio with over 220 disclosures and patents filed by Alliance researchers;
- Formed over 85 companies directly associated with Alliance to commercialize technologies developed in academia;
- Conducted 17 cancer related clinical trials from testing 8 Alliance affiliated therapeutics;



- Trained over 1250 individuals in cancer nanotechnology research to support public and private workforce;
- Evaluated over 300 different nanoparticle formulations at the Nanotechnology Characterization Laboratory (NCL). Data produced by NCL was used in 9 successful IND and IDE applications to the FDA.

Alliance researchers built the research community foundation and contributed to translating its research to the clinic

- Established effective multidisciplinary teams around scientific focus areas of the program to aid the convergence of multiple fields of science and technology;
- Established and operated the Nanotechnology Characterization Laboratory (NCL) as a major hub for nanomaterials characterization;
- Trained the next generation of cancer researchers at the convergence of cancer biology and nanotechnology;
- Leveraged NCI funding to receive additional grants from peer-reviewed government sources as well as philanthropic, industrial and venture investors;
- Launched many clinical trials associated with Alliance-developed technologies.

FUTURE STRATEGY

In order to address the continual evolution of the cancer nanotechnology field, we publish a Cancer Nanotechnology Plan every 5 years. The most recent *Cancer Nanotechnology Plan 2015* provides a comprehensive view on future developments in several promising areas of this dynamically changing field. Emerging areas include:

- Reformulation of candidate chemotherapeutics using nanotechnology;
- Combination therapies involving several drugs or different treatment modalities; Nanotechnology-enabled multiplex diagnostic and therapy monitoring devices;
- Nucleic acid-based nanotherapies;
- Nanoparticles capable of crossing biological barriers to improve therapies for cancers which are hard to treat;
- Engineered nanoparticles for effective immunotherapies;
- Multi-modal nanoparticle imaging constructs;
- Nanotechnology-based techniques to monitor and enable surgery in real-time.

The accomplishment of above cancer intervention goals will be aided by pursuing basic research on:

- Development of the next generation of nanomaterial platforms;
- Detailed studies of nanomaterial delivery mechanisms;
- Further understanding of nanomaterials safety and therapeutic efficacy;
- Increasing the current cancer biology knowledge base;
- Integration of modeling/simulation approaches to guide rational nanomaterial design.

More information on the plan can be found at:

<http://nano.cancer.gov/about/plan/>

ALLIANCE INFRASTRUCTURE

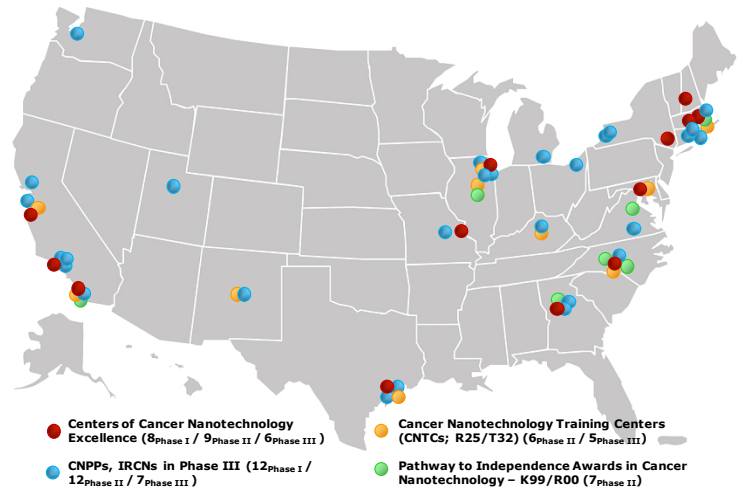
The innovative research supported by the Alliance is conducted by a network of investigators from diverse institutions and organizations. Currently, the NCI supports a constellation of:

Centers of Cancer Nanotechnology Excellence (CCNEs) are multidisciplinary centers focused on moving practical nanotechnology-focused cancer interventions to the clinic;

Innovative Research in Cancer Nanotechnology (IRCNs) are individual research projects addressing fundamental understanding of nanomaterials and nanodevices interactions with biological systems and/or mechanisms of their *in vivo* delivery;

Cancer Nanotechnology Training Centers (CNTCs) educate and train researchers from diverse fields in the use of nanotechnology-based approaches in cancer;

Nanotechnology Characterization Laboratory (NCL) performs and standardizes the preclinical characterization of nanomaterials intended for cancer therapeutics and diagnostics and originating from researchers in academia, government, and industry.



<http://nano.cancer.gov/action/programs/>

DATA SHARING

To address the challenges of data sharing, the Alliance has created the *cancer Nanotechnology Laboratory Portal (caNanoLab)* a web-based portal designed to provide broad access to nanomaterials data and to expedite and validate the use of nanoparticles in biomedicine, please visit the website:

<https://cananolab.nci.nih.gov/caNanoLab/>

FUNDING OPPORTUNITIES

To learn more about research funding opportunities relevant to nanotechnology and cancer, please visit our website:

<http://nano.cancer.gov/collaborate/funding/>

FOR MORE INFORMATION:

U.S. Department of Health and Human Services
National Institutes of Health
National Cancer Institute
Center for Strategic Scientific Initiatives

ATTN: NCI Office of Cancer Nanotechnology Research (OCNR)
Building 31, Room 10A-52, 31 Center Drive
Bethesda, MD 20892-2580
Telephone: (301) 451-8983
Email: cancer.nano@mail.nih.gov
Website: <http://nano.cancer.gov>