DoD Lung Cancer Research Program (LCRP)

Each year, the Department of Defense's office of the Congressionally Directed Medical Research Programs (CDMRP) assesses scientific opportunities to advance research in specific areas. The investigators supported by individual programs are making significant progress against targeted diseases, conditions, and injuries. This list is not intended to be a full representation of accomplishments, but rather a sampling of the broad portfolio of research and advances resulting from congressional appropriations.

Year	LCRP Research Contributions	Additional Information and Hyperlinks
2009	Dr. Chris Moskaluk and colleagues established the first national early lung cancer biospecimen repository (Lung Cancer Biospecimen Resource Network [LCBRN]).	• LCRP Research Highlight • Lung Cancer Biospecimen Resource Network
2009	Dr. Nouri Neamati identified several novel CXCR2 inhibitors that selectively inhibited NSCLC cell progression and arrested cells in the G0/G1 phase. These compounds are being investigated further as a potential treatment for chronic obstructive pulmonary disease (COPD) and lung cancer.	• Ha H and Neamati N. 2014. Pyrimidine-based compounds modulate CXCR2-mediated signaling and receptor turnover. Mol Pharm 11(7): 2431-41. • Ha H, Bensman T, et al. 2014. A novel phenylcyclohex-1-enecarbothioamide derivative inhibits CXCL8-mediated chemotaxis through selective regulation of CXCR2-mediated signalling. Br J Pharmacol 171(6):1551-65.
2009	Drs. Samir Hanash, Adi Gazdar, Stephen Lam, and David Gandara collaborated to successfully identify a number of potential screening biomarkers and established collaborations that have resulted in significant new projects in the lung cancer field. This includes a large, prospective clinical trial (Biospecimen Banking and Biomarker Validation for Lung Cancer Early Detection in Cohort Receiving Low Dose Helical Computed Tomography Screening), aimed at validating biomarker panels for early lung cancer detection; and another multi-institutional Patient-Centered Outcomes Research Institute grant. The biomarkers are being pursed and show significant promise as diagnostic biomarkers for the early detection of lung cancer.	• Taguchi A, Hanash S, et al. 2013. Circulating pro-surfactant protein B as a risk biomarker for lung cancer. Cancer Epidemiol Biomarkers Prev 22(10):1756-61. • Ruhaak LR, Stroble C, et al. 2016. Serum Glycans as Risk Markers for Non-Small Cell Lung Cancer. Cancer Prev Res (Phila) (4):317-23. • Sin DD, Tammemagi CM, et al. 2013. Pro-surfactant protein B as a biomarker for lung cancer prediction J Clin Oncol 31(36):4536-43. • Wang YW, Ma X, et al. 2016. ITPKA gene body methylation regulates gene expression and serves as an early diagnostic marker in lung and other cancers. J Thorac Oncol 11(9):1469-81. • Wikoff WR, Hanash S, et al. 2015. Diacetylspermine is a novel prediagnostic serum biomarker for non-small-cell lung cancer and has additive performance with pro-surfactant protein B. J Clin Oncol 33(33):3880-86.
2010	Dr. Avrum Spira, Dr. Peter Schnall, and colleagues established the Detection of Early Lung Cancer Among Military Personnel (DECAMP) clinical consortium, seeking to improve the process of diagnosing individuals at high risk of developing lung cancer.	• LCRP Research Highlight • Detection of Early Lung Cancer Among Military Personnel
2011	Dr. Jing Chen demonstrated that tyrosine 26 phosphorylation of the glycolytic enzyme phosphoglycerate mutase 1 (PGAM1), a common occurrence in cancer cells, provides a metabolic advantage to cancer cell proliferation and tumor growth. Translational studies using a recently developed novel PGAM1 inhibitor (PGMI-004A) exhibit promising efficacy and minimal toxicity.	• LCRP Research Highlight • Hitosugi T, Zhou L, et al. 2013. Tyr26 phosphorylation of PGAM1 provides a metabolic advantage to tumours by stabilizing the active conformation. Nat Commun 4:1790. • Hitosugi T, Zhou L, et al. 2012. Phosphoglycerate mutase 1 coordinates glycolysis and biosynthesis to promote tumor growth. Cancer Cell 22(5):585-600.

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2011	Dr. Pier Scaglioni demonstrated that pharmacologic inhibition of focal adhesion kinase (FAK) in mutant K-RAS lung cancers with mutations in INK4a/ARF or p53 significantly reduces the viability and survival of these cancer cells. These findings led to a multicenter Phase 2 clinical trial of defactinib, a potent inhibitor of FAK, to treat K-RAS-mutated NSCLC patients.	• LCRP Research Highlight • Konstantinidou G, Ramadori G, et al. 2013. RHOA-FAK is a required signaling axis for the maintenance of KRAS-driven lung adenocarcinomas. Cancer Discov 3(4):444-57.
2011	Dr. Maximilian Diehn developed a non-invasive method, dubbed Cancer Personalized Profiling by Deep Sequencing (CAPP-Seq), for isolating and detecting rare, cancer-associated mutations in circulating DNA from blood to measure disease burden. Researchers are now working toward clinical trials to see whether CAPP-Seq can improve patient outcomes and decrease costs. This technology may be applicable across all cancers.	• LCRP Research Highlight • Newman AM, Bratman SV, et al. 2014. An ultrasensitive method for quantitating circulating tumor DNA with broad patient coverage. Nat Med 20(5):548-554.
2011	Dr. Hannah Rabinowich established a novel mechanism of cross-regulation between autophagy and apoptosis via the Atg7/caspase-9 complex. This complex will be targeted to inhibit autophagy and enhance apoptosis to overcome tumor cell resistance to EGFR tyrosine kinase inhibitors.	• Han J, Hou W, et al. 2014. A complex between Atg7 and Caspase-9: A novel mechanism of cross-regulation between autophagy and apoptosis. J Biol Chem 289(10):6485-97.
2011	Dr. Trudy Oliver demonstrated that Sox2 cooperates with loss of Lkb l to promote squamous lung tumors in the mouse. This discovery has led to the creation of a mouse model for squamous cell lung cancer that can be utilized for preclinical drug discovery.	• LCRP Research Highlight • Mukhopadhyay A, Berrett KC, et al. 2014. Sox2 cooperates with Lkb1 loss in a mouse model of squamous cell lung cancer. Cell Rep 8(1):40-9.
2011	Dr. Prasad Adusumilli demonstrated that mesothelin is a good biomarker for aggressive K-Ras and EGFR mutant, metastasizing tumors, and developed an immunotherapy (CAR-T cell) for lung adenocarcinoma patients with mesothelin-expressing tumor cells. This work led to a clinical trial of mesothelin-targeted CAR-T cells to determine the efficacy, safety, and outcomes of this immunotherapy for patients with mesothelioma, lung cancer, or breast cancer.	• LCRP Research Highlight • Kachala SS, Bograd AJ, et al. 2014. Mesothelin overexpression is a marker of tumor aggressiveness and is associated with reduced recurrence-free and overall survival in early-stage lung adenocarcinoma. Clin Cancer Res 20(4):1020-28. • Adusumilli PS, Cherkassky L, et al. 2014. Regional delivery of mesothelin-targeted CAR T cell therapy generates potent and long-lasting CD4-dependent tumor immunity. Sci Transl Med 6(261):261ra151.
2011	Dr. Dingcheng Gao developed a successful animal model of the epithelial-to-mesenchymal transition (EMT), which allows scientists to visualize the epithelial-to-mesenchymal transition. Using this model, he determined that untransitioned epithelial cells are responsible for many metastases (contrary to previous hypotheses), but cells that have undergone EMT confer therapy resistance and make up most metastatic tumors post-chemotherapy.	• Fischer KR, Durrans A, et al. 2015. Epithelial-to-mesenchymal transition is not required for lung metastasis but contributes to chemoresistance. Nature 527(7579):472-6.
2012	Dr. Jeffrey Engelman utilized patient-derived resistant lung cancer cell lines to identify drug candidates and combinations effective against drug-resistant lung cancers. The NCI Cancer Therapy Evaluation Program is sponsoring a clinical trial based on these results, which will investigate the effectiveness of combining a BCL-2 inhibitor with an EGFR inhibitor in treating lung cancer patients harboring T790M EGF mutations.	• LCRP Research Highlight • Crystal AS, Shaw AT, et al. 2014. Patient-derived models of acquired resistance can identify effective drug combinations for cancer. Science 346(6216):1480-86.

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2013	Dr. Charles Rudin examined the genetic and epigenetic changes that contribute to the shift from NSCLC to SCLC after the development of resistance, with hopes of developing better treatment strategies to overcome TKI resistance.	• LCRP Research Highlight • Niederst MJ, Sequist LV, et al. 2015. RB loss in resistant EGFR mutant lung adenocarcinomas that transform to small-cell lung cancer. Nat Commun 6:6377