The Evolution of Biomarker-driven Therapies in Lung Cancer

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Through Time

Around the World


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Explore the Rise of Biomarker-driven Therapies in Lung Cancer
Drs. Stanley Cohen, an American biochemist, and Rita Levi-Montalcini, an Italian neurologist, discovered epidermal growth factor (EGF) for which they would later win a Nobel prize. Further research into EGF would lead to the first biomarker-driven therapy for lung cancer. 

*Pictured: Drs. Stanley Cohen and Rita Levi-Montalcini*
Lung cancer was revealed to be more than one disease and was differentiated into two primary types: small-cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). While first-generation chemotherapy agents were widely used to treat SCLC, NSCLC proved to be more challenging.

Pictured: Microscopic views of different types of lung cancer

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American Dr. John Mendelsohn recognized that tumor cells often had mutated EGF receptors (EGFR) and proposed that this be a target for anti-cancer treatment.⁴

*Pictured: Dr. John Mendelsohn⁵*
In 1990, mutations in epidermal growth factor receptors (EGFR) were identified as “molecular drivers” of lung cancer,\(^4\) heralding a new era of biomarker-driven therapies for the disease.

By the late-1990s, clinical trials with EGFR-inhibitors were demonstrating dramatic responses in patients with non-small cell lung cancer (NSCLC).\(^5, 6, 7\)

*Pictured: Extracellular domain of epidermal growth factor receptor in complex with EGF\(^5, 7\)*
Japan was the first country to approve a biomarker-driven therapy for lung cancer – an EGFR-inhibitor – in 2002.\(^8\)

In 2007, the French National Cancer Institute (INCa) initiated a program to encourage molecular testing nationwide.\(^9\) Molecular testing is used to analyze an individual patient’s tumor and identify biomarkers, so that oncologists can prescribe the most appropriate medicine.

In 2007, a Japanese team identified anaplastic lymphoma kinase (ALK) rearrangements in non-small cell lung cancer (NSCLC), providing another target for treatment.\(^10\)
The first biomarker-driven medicine for anaplastic lymphoma kinase (ALK) receptor rearrangements in NSCLC was approved by healthcare regulators around the world.

In 2013, three professional organizations issued an evidence-based guideline for the molecular testing and analysis of lung cancers that are required to guide EGFR- and ALK-directed therapies.\textsuperscript{11}

\textit{Pictured: Fusion of echinoderm microtubule-associated protein-like 4 (EML4) with the kinase domain of ALK}\textsuperscript{58}
More than half of lung adenocarcinoma cases, a type of NSCLC, now have an identifiable molecular driver, offering multiple therapeutic targets for lung cancer treatment.

Next-generation diagnostic tests are also being developed to identify multiple biomarkers simultaneously and help a patient’s healthcare team determine the appropriate course of treatment more efficiently.
CLICK ON THE HOT SPOTS

Then Click on the Tabs Above for Country-Specific Information
In 2012, about 25,400 new cases of lung cancer were diagnosed (14% of all cancers).\textsuperscript{13}

In 2012, about 20,100 people died of lung cancer (27% of all cancer deaths).\textsuperscript{13}
In 2013, at least 4 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.
In 2012, about 214,000 new cases of lung cancer were diagnosed (13% of all cancers).\textsuperscript{16}

In 2012, about 167,500 people died of lung cancer (27% of all cancer deaths).\textsuperscript{17}
American Dr. John Mendelsohn recognized that tumor cells often had mutated EGF receptors (EGFR) and proposed that this be a target for anti-cancer treatment. This discovery set the stage for the first human clinical trial of an EGFR-inhibitor for lung cancer.

In 2013, at least 49 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.
Country Statistics
Scientific Contributions by Country
Local Patient Resources

Bonnie J. Addario Lung Cancer Foundation
CancerCare
Free to Breathe
Lung Cancer Alliance

Lung Cancer Foundation of America
Lung Cancer Research Foundation
LUNGevity
Uniting Against Lung Cancer

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In 2012, about 34,280 new cases of lung cancer were diagnosed (8% of all cancers).\textsuperscript{18}

In 2012, about 28,285 people died of lung cancer (13% of all cancer deaths).\textsuperscript{19}
In 2013, at least 2 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.20
In 2012, about 40,300 new cases of lung cancer were diagnosed (12% of all cancers).\textsuperscript{21}

In 2012, about 35,500 people died of lung cancer (23% of all cancer deaths).\textsuperscript{22}
Cancer Research UK helped fund a key 2002 study that identified BRAF mutations in lung cancer.\textsuperscript{23}

In 2013, at least 9 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\textsuperscript{24}
In 2012, about 26,700 new cases of lung cancer were diagnosed (12% of all cancers).\textsuperscript{25}

In 2012, about 21,100 people died of lung cancer (21% of all cancer deaths).\textsuperscript{26}
Spanish researchers were the first to identify Kirsten rat sarcoma (KRAS) mutations in non-small cell lung cancer (NSCLC) in a 1984 study.\textsuperscript{27}

In 2013, at least 14 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\textsuperscript{24}
La Asociación Española Contra el Cáncer

Global Lung Cancer Coalition (GLCC)

Women Against Lung Cancer in Europe (WALCE)

Lung Cancer Europe (LuCE)

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In 2012, about 40,000 new cases of lung cancer were diagnosed (11% of all cancers).\textsuperscript{28}

In 2012, about 31,400 people died of lung cancer (20% of all cancer deaths).\textsuperscript{29}
In 2012, France initiated Biomarkers (BM) France, the world’s largest biomarker study on patients with advanced non-small cell lung cancer (NSCLC). First analysis of the data provided solid evidence for a nationwide BM screening policy.\textsuperscript{30}

In 2013, at least 12 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\textsuperscript{24}
La Ligue Nationale Contre le Cancer

Global Lung Cancer Coalition (GLCC)

Lung Cancer Europe (LuCE)

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In 2012, about 50,800 new cases of lung cancer were diagnosed (10% of all cancers).\textsuperscript{31}

In 2012, about 43,400 people died of lung cancer (20% of all cancer deaths).\textsuperscript{32}
In 2013, at least 11 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.²⁴
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In 2012, about 37,200 new cases of lung cancer were diagnosed (11% of all cancers).\textsuperscript{33}

In 2012, about 33,500 people died of lung cancer (20% of all cancer deaths).\textsuperscript{34}
Neurologist Rita Levi-Montalcini won a Nobel prize for co-discovering epidermal growth factor (EGF), a discovery that would lead to the development of the first biomarker-driven therapy for lung cancer.¹

In 2013, at least 15 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.²³⁴
Women Against Lung Cancer in Europe (WALCE)

Global Lung Cancer Coalition (GLCC)

Alliance for Lung Cancer Advocacy, Support, and Education (ALCASE Italia)

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In 2012, about 7,242 new cases of lung cancer were diagnosed (9% of all cancers).\textsuperscript{35}

In 2012, about 6,465 people died of lung cancer (14% of all cancer deaths).\textsuperscript{36}
In 2013, at least 3 active clinical trials were underway to advance the development of lung cancer treatments.\textsuperscript{54}
The Cancer Association of South Africa

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In 2012, about 70,200 new cases of lung cancer were diagnosed (7% of all cancers). In 2012, about 63,759 people died of lung cancer (9% of all cancer deaths).
In 2013, at least 3 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.39
Cancer Patients Aid Association (CPAA)
Indian Cancer Society

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In 2012, about 55,800 new cases of lung cancer were diagnosed (12% of all cancers).\textsuperscript{40}

In 2012, about 50,800 people died of lung cancer (17% of all cancer deaths).\textsuperscript{41}
In 2013, at least 4 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\textsuperscript{42}
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In 2012, about 652,800 new cases of lung cancer were diagnosed (21% of all cancers).\(^{43}\)

In 2012, about 597,100 people died of lung cancer (27% of all cancer deaths).\(^{44}\)
In 2013, at least 26 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.⁴⁵
Chinese Alliance Against Lung Cancer (CAALC)

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In 2012, about 22,800 new cases of lung cancer were diagnosed (10% of all cancers).\textsuperscript{46}

In 2012, about 17,800 people died of lung cancer (22% of all cancer deaths).\textsuperscript{47}
In 2013, at least 20 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\textsuperscript{45}
In 2012, about 94,800 new cases of lung cancer were diagnosed (14% of all cancers).\textsuperscript{48}

In 2012, about 75,100 people died of lung cancer (20% of all cancer deaths).\textsuperscript{49}
Japan was the first country to approve a biomarker-driven therapy for lung cancer — an EGFR-inhibitor — in 2002.\(^8\)

In 2007, a Japanese team identified anaplastic lymphoma kinase (ALK) rearrangements in non-small cell lung cancer (NSCLC), providing another target for treatment.\(^10\)

In 2013, at least 7 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\(^{15}\)
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In 2012, about 11,300 new cases of lung cancer were diagnosed (9% of all cancers).  

In 2012, about 8,000 people died of lung cancer (19% of all cancer deaths).
In 2013, at least 8 active clinical trials were underway to investigate the role of molecular drivers in lung cancer to advance the development of biomarker-driven therapies for the disease.\textsuperscript{52}
References


References


References


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