NON-SMALL CELL LUNG CANCER (NSCLC)
BIOMARKER TESTING LANDSCAPE

Progress in NSCLC

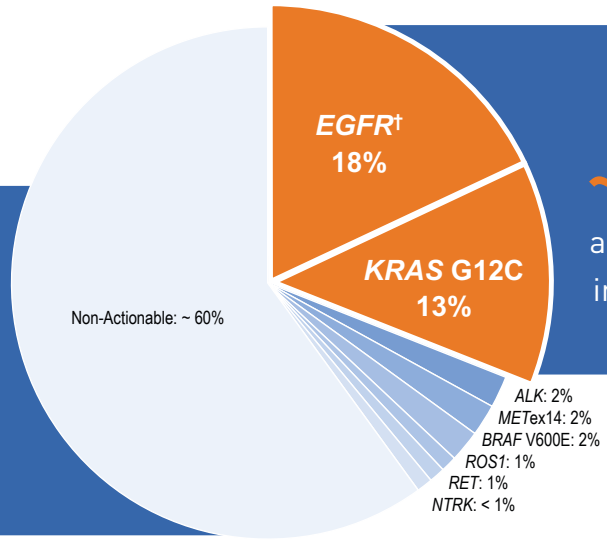
The biomarker landscape has evolved in recent years

- **More than 20 targeted therapies** have been approved **for use in NSCLC**[1]
- **~ 60% of cancer therapies** launched in the US between 2015 and 2020 **require or recommend biomarker testing prior to use**[5]

Prevalence of Actionable Oncogenic Drivers in NSCLC

~ 2 in every 5

patients with non-squamous NSCLC have an actionable driver mutation[6,*]



KRAS G12C and *EGFR* make up **~ 75%** of all actionable drivers in non-squamous NSCLC[6]

*From a 2020 analysis of patients with NSCLC in the AACR Genie database (v8.0, N=14,485) and prevalence of *KRAS* G12C and mutations or alterations with an annotation of "FDA-recognized biomarker predictive of response to an FDA-approved drug in this indication" in non-squamous patients.[6]

†*EGFR* prevalence does not include exon 20 insertions, which can be found in ~ 2% of the overall NSCLC population.[7]

Guidelines Recommend Broad Molecular Testing for Eligible Patients With Advanced NSCLC[8,9]

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) Recommendations[8,‡,§]

	Molecular Biomaker								Immune Biomaker		Molecular Biomaker	
Actionable	*EGFR*	*KRAS* G12C	*ALK*	*MET*ex14	*BRAF*	*ROS1*	*RET*	*NTRK1/2/3*	PD-L1	Emerging	*MET*amp	*HER2*

Testing should be conducted as part of broad molecular profiling

Single-biomarker immunohistochemistry testing recommended

Expanded-panel testing recommended

‡The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for NSCLC provide recommendations for certain individual biomarkers that should be tested and recommend testing techniques but do not endorse any specific commercially available biomarker assays or commercial laboratories.[8]

§The NCCN Guidelines® for NSCLC recommend broad molecular testing to identify rare driver variants for which targeted therapies may be available to ensure patients receive the most appropriate treatment.[8]

- **CAP/AMP/IASLC guidelines recommend testing for actionable and emerging biomarkers utilizing a comprehensive panel or targeted testing**[9]

AACR, American Association for Cancer Research; ALK, anaplastic lymphoma kinase; AMP, Association for Molecular Pathology; BRAF, proto-oncogene B-Raf; CAP, College of American Pathologists; EGFR, epidermal growth factor receptor; HER2, human epidermal growth factor receptor 2; IASLC, International Association for the Study of Lung Cancer; KRAS, Kirsten rat sarcoma; MET, mesenchymal-to-epithelial transition; NCCN, National Comprehensive Cancer Network; NSCLC, non-small cell lung cancer; NTRK, neurotrophic tyrosine receptor kinase; PD-L1, programmed cell death ligand 1; RET, rearranged during transfection; ROS1, c-ros oncogene 1; TMB, tumor mutational burden.

Guideline-Recommended Biomarker Testing May Improve Patient Outcomes[10,*,†]

Adherence to testing for guideline-recommended biomarkers, regardless of therapy

Decreased mortality risk by **11%**

*This was a retrospective study of 28,784 patients diagnosed with advanced NSCLC. Adherence to biomarker testing consisted of patients with evidence of testing for any biomarker, including *EGFR*, *ALK*, *BRAF*, *KRAS*, *ROS1*, or PD-L1 between 14 days prior to and 90 days after diagnosis of advanced NSCLC and the main outcome, overall survival (OS), was agnostic to treatment.[10]

†Multivariable analysis was adjusted for age at diagnosis of advanced NSCLC, sex, smoking status, and stage at initial diagnosis of NSCLC.[10]

Many Patients With Newly Diagnosed NSCLC Do Not Receive Broad Molecular Testing[11]

~ 50%
of metastatic patients received comprehensive biomarker testing[11,‡]

Regardless of patient characteristics such as age, race, and smoking status, **biomarker testing** should be conducted in **all eligible patients** with advanced NSCLC[12]

‡A retrospective, observational study assessing real-world biomarker testing patterns in 3,474 patients with metastatic NSCLC from community oncology practices within The US Oncology Network between 2018 and 2020.[11]

Additional Considerations for Comprehensive Biomarker Testing

Addressing Tissue Insufficiency

- Multigene testing can reduce the number of ordered assays and conserve tissue needed to assess all actionable biomarkers[12]
- Rapid On-Site Evaluation (ROSE) assesses sample adequacy for molecular diagnostic studies to potentially help reduce rebiopsy rates[13]
- Liquid biopsy, which has a high degree of concordance (> 98.2%[§]) and improved turnaround time, can be used when tissue collection is not feasible[14]

Shortening Turnaround Time (TAT)

- Broad molecular testing at diagnosis may take less time than consecutive single-gene testing, a process of elimination approach[15]
- Reflex testing protocols can reduce average TAT by 37 days[16]

Consistent Reporting

- Consider including all actionable biomarkers at the beginning of the report using established nomenclature for genetic alterations[17]

§Overall concordance across four genes (*EGFR* exon 19 deletion and L858R, *ALK* fusion, *ROS1* fusion, and *BRAF* V600E).[14]

Learn more at FindKRASG12C.com

References. **1.** Majeed U, et al. *J Hematol Oncol*. 2021;14:108. **2.** National Institutes of Health. www.cancer.gov. Accessed October 6, 2021. **3.** Food and Drug Administration. www.fda.gov. Accessed October 6, 2021. **4.** Food and Drug Administration. www.fda.gov. Accessed October 6, 2021. **5.** IQVIA Institute. www.iqvia.com. Accessed October 6, 2021. **6.** Data on file, Amgen; [Analysis of AACR Genie v8]. **7.** Riess JW, et al. *J Thorac Oncol*. 2018;13(10):1560-1568. **8.** Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Non-Small Cell Lung Cancer v.6.2021. ©National Comprehensive Cancer Network, Inc. 2021. All rights reserved. Accessed October 6, 2021. To view the most recent and complete version of the guideline, go online to NCCN.org. NCCN makes no warranties of any kind whatsoever regarding their content, use or application and disclaims any responsibility for their application or use in any way. **9.** Lindeman NI, et al. *Arch Pathol Lab Med*. 2018;142(3):321-346. **10.** John A, et al. *Adv Ther*. 2021;38(3):1552-1566. **11.** Robert N, et al. Presented at: American Society of Clinical Oncology Annual Meeting; June 4–8, 2021; Virtual Meeting. Abstract 9004. **12.** Pennell NA, et al. *Am Soc Clin Oncol Educ Book*. 2019;39:531-542. **13.** Ofiara LM, et al. *Front Oncol*. 2014;4:253. **14.** Leighl NB, et al. *Clin Cancer Res*. 2019;25(15):4691-4700. **15.** Pennell NA, et al. *JCO Precis Oncol*. 2019. doi:10.1200/PO.18.00356. **16.** Anand K, et al. *Clin Lung Cancer*. 2020;21(5):437-442. **17.** Li MM, et al. *J Mol Diagn*. 2017;19(1):4-23.

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