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FALL 2022

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# RECENT HEADLINES

KEEP UP WITH THE LATEST RESEARCH

## 235,760

Estimated number of adults in the U.S. who will get a lung cancer diagnosis this year.

SOURCE: American Society of Clinical Oncology

## 54%

How much cancer death rates have declined in U.S. men in the last 20 years.

SOURCE: American Society of Clinical Oncology

## 30%

How much cancer death rates have declined in U.S. women in the last 20 years.

SOURCE: American Society of Clinical Oncology

## ARE WOMEN MORE PRONE TO GET KRAS G12C?

Researchers are gathering all the information they can about who's most likely to have a cancer gene mutation called KRAS G12C—the latest for which targeted drugs are now available. In a new study, researchers analyzed 32,138 Black, white, and Asian men and women with 10 different cancers. Here's what they learned: KRAS G12C mutations were far and away the most common in non-small-cell lung cancer. Women with lung cancer were more likely to have the mutation than men. White and Black people were three to four times more likely to have the gene change than Asians.

SOURCE: *New England Journal of Medicine*

## 198,038

Estimated number of U.S. adults who will get a diagnosis of non-small-cell lung cancer this year.

SOURCE: American Society of Clinical Oncology

## GENE MUTATIONS LEAD TO MORE HOPEFUL TREATMENT OPTIONS

About 2 out of 3 people with non-small-cell lung cancer (NSCLC) have gene mutations in their cancer cells that could make more effective targeted drugs an option for them. New research that analyzed the cancer cells of more than 3,000 people with NSCLC shows that among those people with targetable gene mutations, about 1 in 65 have more than one such mutation. That could mean more and better treatment options for the people who get the tests that identify these genes.

SOURCE: *Frontiers in Oncology*



LIBRE DE DROIT VIA GETTY IMAGES



# WANT TO KNOW MORE ABOUT TESTING FOR MUTATIONS IN NSCLC?

GET ALL THE INFORMATION YOU NEED FROM YOUR DOCTOR

By Rachel Reiff Ellis

Reviewed by Brunilda Nazario, MD, WebMD Chief Physician Editor, Medical Affairs

**Bring these questions to your next visit so you will be more equipped to understand genetic testing for your lung cancer.**

## Q. WHEN SHOULD I HAVE GENETIC TESTING?

Many cancer centers now do genetic testing as a routine part of diagnosis and staging for lung cancer. But for others, it may not be a given part of your visit, so it's important to find out what to expect.

"When patients come to my office, I write down their diagnosis and their stage, and then tell them there are a few things that we need to do—one of which is molecular testing," says Bruna Pellini, MD, assistant member of the Department of Thoracic Oncology at H. Lee Moffitt Cancer Center and assistant professor at Morsani College of Medicine at the University of South Florida in Tampa.

## Q. HOW DO YOU DO THE TEST?

Your doctor has two options for genetic testing: a tissue biopsy or a liquid biopsy. If you've already had a tissue biopsy as part of your diagnosis or past surgery, you don't necessarily need another one for testing. Your doctor may be able to run tests on that sample.

"If you have stage II lung cancer

and a year later the disease relapses, the mutation that is driving the cancer is not going to go away," Pellini says. "So [the lab can] always use a surgical specimen that has a lot of material that was collected a year or two ago."

Sometimes the amount of DNA is too small in a sample to test it, so your doctor may need to do a second tissue biopsy, or a liquid biopsy, which is a simple blood test.

"Let's say you had a bronchoscopy for your diagnosis, so you had a fine needle aspiration instead of a core biopsy, and there's not enough DNA," Pellini says. "The alternative is to collect a blood sample and do what we call liquid biopsy."

## Q. CAN YOU DO COMPREHENSIVE BIOMARKER TESTING?

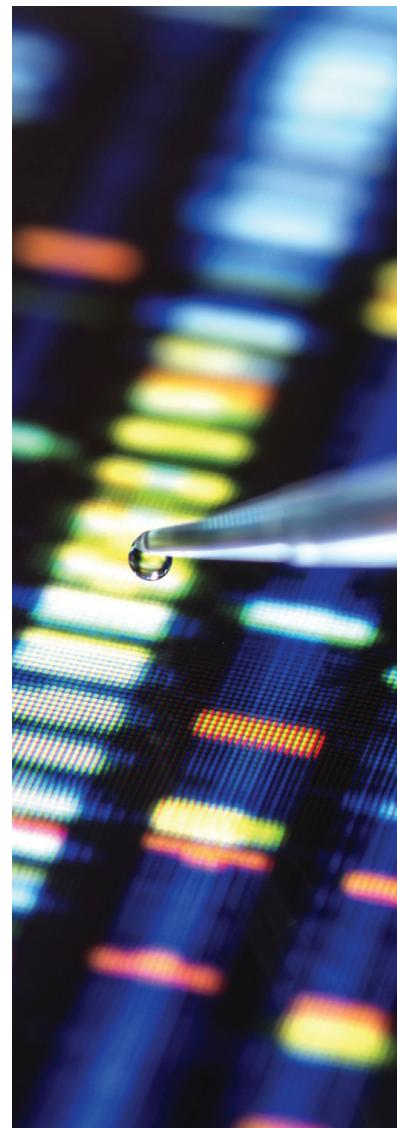
This is a test that checks for hundreds of mutations at once, Pellini says. "It's virtually impossible to keep up with the new approval for medications, so the best thing to do is just to do one test to test them all."

This gives your doctor a full picture, or "genomic profile," of your unique tumor. The results will show if you have a marker that can be treated with an FDA-approved targeted therapy or if you're more likely to benefit from immunotherapy.

## Q. HOW LONG WILL IT TAKE TO GET RESULTS?

The answer will depend on what kind of clinic you go to and what your doctor orders. "I'm spoiled because I practice at a cancer research center, so we have a one-stop shop here," Pellini says. "Typically, it takes 2 to 4 weeks for tissue biopsy and 7 to 10 days for liquid biopsy."

If your doctor practices in the community, she says, then results could take a little longer. "For a tissue-based test, they'll have to send [your biopsy sample] to an outside vendor that has the genomic testing," Pellini says. "And then the clock starts ticking from the time that the company received it, so it can take a month to 6 weeks."





## THIS IS WHY I LUMAKRAS® (sotorasib)

**For people living with non-small cell lung cancer (NSCLC) who tested positive for the KRAS G12C biomarker, IT'S THE FIRST ONCE-DAILY ORAL TREATMENT THAT'S NOT CHEMOTHERAPY.<sup>1,2</sup>**

### What is LUMAKRAS®?

LUMAKRAS® is a prescription medicine used to treat adults with non-small cell lung cancer (NSCLC):

- that has spread to other parts of the body or cannot be removed by surgery, **and**
- whose tumor has an abnormal KRAS G12C gene, **and**
- who have received at least one prior treatment for their cancer.

Your healthcare provider will perform a test to make sure that LUMAKRAS® is right for you. It is not known if LUMAKRAS® is safe and effective in children.<sup>1</sup>

**LUMAKRAS® IS A TARGETED TREATMENT OPTION APPROVED FOR NSCLC PATIENTS WITH THE KRAS G12C MUTATION THAT CAN BE FOUND WITH A BIOMARKER TEST.<sup>2,3</sup>**

### Important Safety Information

#### What should I tell my healthcare provider before taking LUMAKRAS®?

- Before taking LUMAKRAS®, tell your healthcare provider about all your medical conditions, including if you:
  - have liver problems
  - have lung or breathing problems other than lung cancer
  - are pregnant or plan to become pregnant. It is not known if LUMAKRAS® will harm your unborn baby.
  - are breastfeeding or plan to breastfeed. It is not known if LUMAKRAS® passes into your breast milk.

Do not breastfeed during treatment with LUMAKRAS® and for 1 week after the final dose.

- Tell your healthcare provider about all the medicines you take, including prescription and over-the-counter medicines, vitamins, dietary and herbal supplements. LUMAKRAS® can affect the way some other medicines work, and some other medicines can affect the way LUMAKRAS® works.
- Especially tell your healthcare provider if you take antacid medicines, including Proton Pump Inhibitor (PPI) medicines or H<sub>2</sub> blockers during treatment with LUMAKRAS®. Ask your healthcare provider if you are not sure.

**Please see Important Safety Information for LUMAKRAS® throughout.**

## KRAS G12C IS ONE OF THE MOST COMMON BIOMARKERS IN NSCLC<sup>4</sup>

### HOW DO I KNOW IF I HAVE KRAS G12C?

The only way to know if you have KRAS G12C is by asking your doctor for a biomarker test.<sup>3</sup> Biomarkers are molecules inside your body that can tell your doctor what kind of NSCLC you may have.<sup>5</sup>



**KRAS G12C is found in 1 in 8 NSCLC patients.<sup>4</sup>**



**If you have the KRAS G12C biomarker**, it could mean there's a targeted treatment option specially designed for your type of lung cancer.<sup>1</sup>



**ASK YOUR DOCTOR IF YOU TESTED POSITIVE FOR THE KRAS G12C MUTATION AND IF LUMAKRAS® IS RIGHT FOR YOU.**

### LUMAKRAS® may cause serious side effects, including:

- **Liver problems:** LUMAKRAS® may cause abnormal liver blood test results. Your healthcare provider should do blood tests before starting and during treatment with LUMAKRAS® to check your liver function. Tell your healthcare provider right away if you get any signs or symptoms of liver problems, including: your skin or the white part of your eyes turns yellow (jaundice), dark or "tea-colored" urine, light-colored stools (bowel movements), tiredness or weakness, nausea or vomiting, bleeding or bruising, loss of appetite, and pain, aching, or tenderness on the right side of your stomach-area (abdomen).
- **Lung or breathing problems:** LUMAKRAS® may cause inflammation of the lungs that can lead to death. Tell your healthcare provider or get emergency medical help right away if you have new or worsening shortness of breath, cough or fever.
- Your healthcare provider may change your dose, temporarily stop, or permanently stop treatment with LUMAKRAS® if you develop side effects.

### The most common side effects

- The most common side effects of LUMAKRAS® include diarrhea, muscle or bone pain, nausea, tiredness, liver problems, cough, changes in liver function tests, and changes in certain blood tests.
- These are not all the possible side effects of LUMAKRAS®. Call your doctor for medical advice about side effects.

Please see LUMAKRAS® [Patient Information](#).

**Please see Important Safety Information for LUMAKRAS® on the next page.**

**LUMAKRAS®**  
(sotorasib) 120 mg tablets



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  - have lung or breathing problems other than lung cancer
  - are pregnant or plan to become pregnant. It is not known if LUMAKRAS® will harm your unborn baby.
  - are breastfeeding or plan to breastfeed. It is not known if LUMAKRAS® passes into your breast milk. Do not breastfeed during treatment with LUMAKRAS® and for 1 week after the final dose.
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**CLICK HERE TO LEARN MORE**

**References:** 1. LUMAKRAS® (sotorasib) Patient Information. Amgen; 2021. 2. LUMAKRAS® (sotorasib) Prescribing Information. Amgen; 2021. 3. Kalemkerian GP, et al. *J Clin Oncol*. 2018; 36: 911-919. 4. Data on file, Amgen; [Analysis of AACR Genie v8]. 5. Pakkala S, Ramalingan S. *JCI Insight*. 2018; 3: e120858.



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For more information, go to [www.LUMAKRAS.com](http://www.LUMAKRAS.com)  
or call 1-800-77-AMGEN (1-800-772-6436).

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# TARGETED THERAPY

## BIOMARKERS PROVIDE A BLUEPRINT TO TREATMENT

By Rachel Reiff Ellis

Reviewed by Brunilda Nazario, MD,  
WebMD Chief Physician Editor, Medical Affairs

Cancer biomarkers are specific proteins or gene mutations that affect how your cancer cells grow, multiply, die, and respond to other substances in your body. Doctors also call them molecular markers, genotypes, signature molecules, or genomic alterations. They give your cancer cells a unique “fingerprint” doctors can analyze to learn more about your disease.

“Essentially they’re what keeps cells acting like a cancer,” says Jacob Sands, MD, thoracic medical oncologist at Dana-Farber Cancer Institute in Boston, and spokesperson for the American Lung Association.

Your doctor can remove extra tissue during a biopsy to test it for biomarkers. If your biopsy happens before you ask for

testing, you can ask your doctor if there is leftover tissue from the biopsy they can test, or if you can have a liquid biopsy (blood draw). You may need a second biopsy.

### WHAT TESTING TELLS YOUR TEAM

Once your doctor knows exactly what’s causing your tumor to grow, they can better predict which treatment may slow or shrink it. This is called targeted therapy. Biomarker testing can also look for levels of a protein called PD-L1 to see whether immunotherapy would be a good treatment option for your cancer. Your results may also make you a good candidate for certain clinical trials.

“It ends up really impacting decision making,” Sands says. “So as we come to a better understanding of which alterations drive the cancer and then develop ways of actually targeting the cells that have those alterations, that changes the standard of care. It’s made lung cancer treatment dramatically more effective in the last 10 years.”

### QUALITY OVER QUICKNESS

Sands says it’s also important to know that although test results take

### QUESTIONS FOR YOUR DOCTOR

- + Did/can I have biomarker testing?
- + What are my results?
- + Are there targeted treatments for me?
- + Do I qualify for clinical trials?

1 to 2 weeks to come back, it’s usually OK—and sometimes even better—to wait for this information before starting treatment.

“If someone is having a lot of symptoms, we may start chemotherapy alone, but I don’t start immunotherapy until I have that genomic testing back,” he says.

Biomarker testing doesn’t result in a targeted treatment for everyone. But even if you don’t match with a targeted therapy, testing can still help you and your doctor pick the best treatment.

“We do testing to make sure that we start the best treatment, not just the first treatment,” Sands says.



# BIOMARKER TESTING

## LEARN THE BASICS

By Rachel Reiff Ellis

Reviewed by Brunilda Nazario, MD, WebMD Chief Physician Editor, Medical Affairs

Lung cancer comes in many different forms. One way a doctor can get helpful details about your specific tumor is by looking at your biomarkers. Biomarkers are pieces of information such as the presence or absence of proteins on a tumor or genetic mutations (or changes) in a tumor's DNA. They give your doctor a clearer picture of what they're working with.

"You can think of biomarkers like you would the characteristics that help you distinguish one person from another, like when you say, 'A woman with brown eyes and blond hair' versus just 'A woman,'" says

Erin M. Bertino, MD, medical oncologist specializing in pleural cancers at The Ohio State University Comprehensive Cancer Center in Columbus, OH.

## TYPES OF BIOMARKERS

Some markers tell your doctor the type of lung cancer you have (for example, adenocarcinoma versus squamous cell). Once they know your cancer type, your doctor can use other biomarker information to decide which treatment will likely work best for you.

There are two main markers of importance that help doctors direct their treatment.

**Driver mutations** are changes in genes that make your cancer grow. Examples include mutations in epidermal growth factor receptor (EGFR), anaplastic lymphoma kinase (ALK), ROS1, BRAF V600E, NTRK, RET, MET, and KRAS.

**Immunotherapy biomarkers** can show how a cancer interacts with your immune system. Testing for these biomarkers can help determine whether certain types of immunotherapies may work well to treat your cancer. An important example is PD-L1.

"As far as biomarkers that influence treatment right now, I'd say PD-L1 is kind of the king," Bertino says.

If you have high levels of PD-L1, she says, you're more likely to respond to immunotherapy alone without chemo. Low levels of PD-L1 puts you in a



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gray area—you may do a combination of chemo and immunotherapy or immunotherapy alone. When you're PD-L1 negative, it means combination therapy is likely to be more effective than immunotherapy alone.

## HOW BIOMARKER TESTING IS DONE

Bertino recommends comprehensive biomarker testing, which checks for all biomarkers at once. Your doctor can do this by doing a tissue biopsy or a blood biopsy (liquid biopsy).

In tissue biopsies, a doctor takes a little piece of the tissue and extracts the DNA and the RNA to see what looks abnormal and find a mutation or a change in the tumor's gene.

For a liquid biopsy, a doctor takes a small sample of blood, and if you have enough tumor DNA floating around in the sample, they can extract that tumor DNA from the blood and do the same test that they do on the tissue.

"The standard probably is testing the tissue itself," says Jorge E. Gomez, MD,

spokesperson for the American Lung Association and medical director of the solid tumor oncology inpatient unit at The Mount Sinai Hospital in New York. "We use the tissue testing in almost everybody, and we use the liquid testing in patients where we can't get biopsies."

## WHO IT'S FOR

Before biomarker testing, everyone with lung cancer got the same treatment. Now, doctors can use biomarker information to customize treatment. But does everyone benefit from it?

"I think it should be universally done, because if we don't do it, we're missing opportunities to give people, for instance, a less toxic therapy," Bertino says. Biomarker testing can rule out chemotherapy as an option and direct you to more targeted options, she says.

"In my view, every person diagnosed with non-small-cell lung cancer should get biomarker testing," Gomez says.

Specifically, he says, all people with adenocarcinomas should have it because the biomarkers that currently have good treatments are mostly for adenocarcinomas.

## BIOMARKERS WITH FDA-APPROVED TREATMENTS FOR NSCLC

Many types of NSCLC have a biomarker with a targeted treatment. These include:

- + EGFR mutation
- + ALK gene rearrangement
- + ROS1 rearrangement
- + BRAF V600E mutation
- + NTRK fusion
- + MET amplification or MET exon 14 skipping
- + RET rearrangements
- + PD-L1
- + KRAS G12C mutation

+ "IN MY VIEW, EVERY PERSON DIAGNOSED WITH NON-SMALL-CELL LUNG CANCER SHOULD GET BIOMARKER TESTING."

—JORGE E. GOMEZ, MD,  
SPOKESPERSON FOR  
THE AMERICAN LUNG  
ASSOCIATION



GORDENKOFF/VIA GETTY IMAGES



# LIVING WITH NSCLC

## HOW A KRAS G12C POSITIVE STATUS SHAPED MY CANCER OUTCOME

By Laurie Seligman

Reviewed by Brunilda Nazario, MD, WebMD Chief Physician Editor, Medical Affairs

My symptoms started as a tickle in my throat. The feeling made me cough, and to soothe it I started taking cough medicine. I downed that orange syrup twice a day for months, going through bottle after bottle. Then one day, I was attempting to move furniture in my bedroom and I hurt my back. I called the doctor about my pain, I also mentioned offhandedly, “Oh, and I have this cough.”

After hearing a crackle in my lungs through his stethoscope, I got an X-ray and a diagnosis of pneumonia. I was surprised because it didn’t feel like there was anything wrong with my lungs. An azithromycin prescription seemed to clear up the problem.

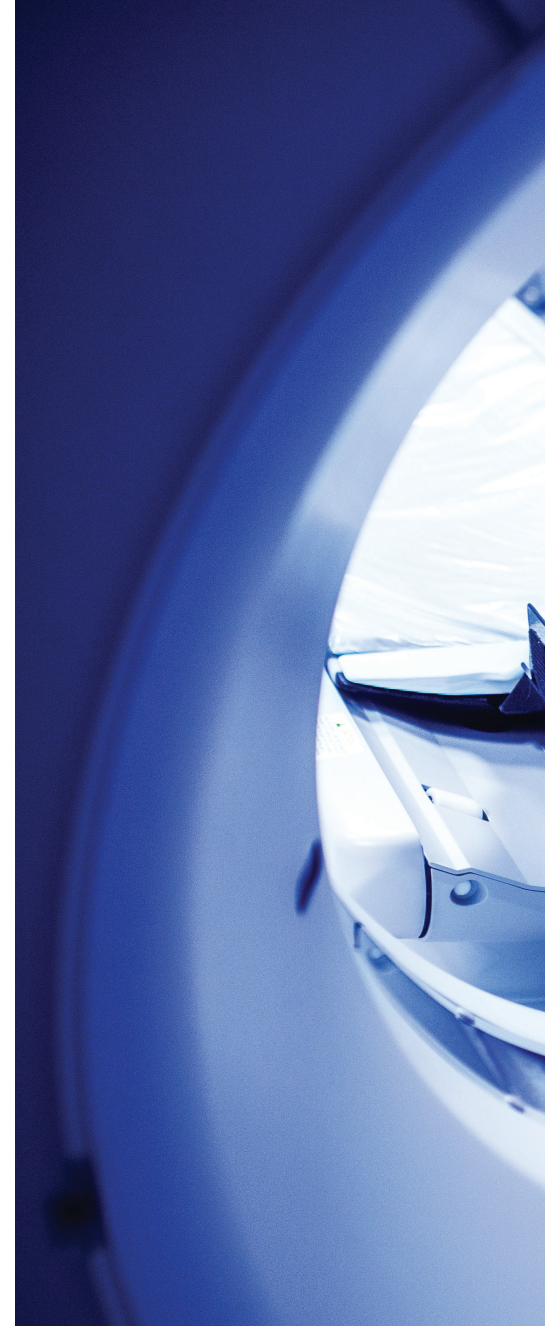
But as soon as the medicine ended, the cough came back. The doctor prescribed a second course of the medicine, and again the cough got better, but I still wasn’t out of the woods. After a second X-ray, the doctor said it was normal for pneumonia to take a month or two to clear up, and that he’d put in an order for another X-ray in about a month or two. He didn’t seem concerned, so I wasn’t concerned.

So I waited until the first of the year when I knew I was getting new insurance to schedule the X-ray. At the appointment, the nurse told me the radiologist had recommended a CT scan. It was the first I’d heard of it—no one had mentioned more than an X-ray to

me. This is when I learned it’s vitally important to get a copy of your report. This had clearly not been a “wait and see” situation. I wasn’t prepared for a CT scan, so I told them just to do the X-ray and if there was a problem, I’d come back.

A couple of days later, sure enough, I got word that I needed more testing. Right then and there I knew what it was. How, I don’t know, but when I talked to my brother later in the day, I told him, “I think I have lung cancer.”

The CT scan confirmed my suspicions. I got a battery of tests and a biopsy, which showed scar tissue. The oncologist had a second biopsy done, and that showed I had a malignant



ANDREI ORLOV/VIA GETTY IMAGES



## LAURIE'S TIPS

- + **Connect.** Lung cancer support groups and foundations led me to genetic testing.
- + **Tune out Dr. Google.** Talk to your doctor for up-to-date and accurate information.
- + **Be proactive.** Nobody has more skin in the game than you do. Speak up for yourself. Ask questions. And get copies of your records!
- + **Take notes.** Go to the doctor with a list of questions. Record the visit or bring someone else with you. Four ears are better than two.

tumor in my right lobe—stage III adenocarcinoma, negative for EGFR and ALK and low on PDL. I started 36 rounds of daily radiation and seven weekly rounds of chemotherapy followed by two full-dose rounds of chemo. My hair fell out. My scans showed the tumor shrank slightly, and I was put on a full course of immunotherapy. The treatment destroyed my thyroid function, but my SUV—standard uptake value, a measurement of cancer activity—went down. I was stable.

Less than 2 years later, my shortness of breath came back. A PET scan showed cancer in a lymph node near my clavicle. This is when genetic testing entered my story. A year prior, at a

LUNGevity conference, I had a conversation with a doctor about whether he thought I should have genetic testing. He said, “When you are no longer stable, that’s when you need it.” This was that time—I was progressing.

I emailed a contact from the Go<sub>2</sub> Foundation for Lung Cancer just after my PET scan results, and she encouraged me to do it, saying, “You need to find out what is driving your cancer.” So I pushed my oncologist, and she finally did a blood biopsy. That’s how I found out I was KRAS G12C positive.

I believe that genetic testing saved my life. If there had not been a course correction in my treatment, I would be

dead. At one point my doctors recommended hospice. But 2 days after starting targeted treatment, I felt changed. I thought it was my imagination. Four days in, I knew I was getting better. Two weeks in, I was off all cough medicine. I even stopped taking cough drops.

Five and a half weeks in, I had my first scan, and it showed a significant reduction in the tumor. A second scan showed even further reduction, and finally my doctor told me I had shown a “complete response” to treatment. I didn’t know what that meant, but it sounded good. I had to look it up. It means “the disappearance of all signs of cancer in response to treatment.”



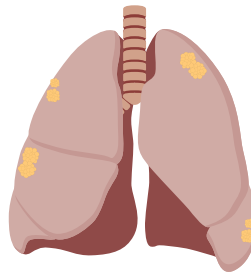
# STATS & FACTS

By Sonya Collins

Reviewed by Brunilda Nazario, MD, WebMD Chief Physician Editor, Medical Affairs

65%

Amount of people with non-small-cell lung cancer whose tumors have gene mutations that could lead to better, more effective treatment choices.



<50%

Amount of people with non-small-cell lung cancer who get comprehensive biomarker testing, which could lead them to more effective treatment.

8

Number of genes that can harbor mutations that might make more effective targeted drugs a treatment option.



1 in 4

Approximate number of non-small-cell lung cancer cases that involve mutations in the KRAS gene, including KRAS G12C mutations.

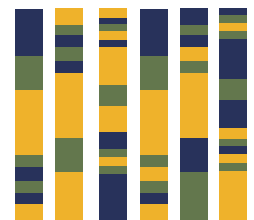


84%

Amount of lung cancer cases that are the non-small-cell type.

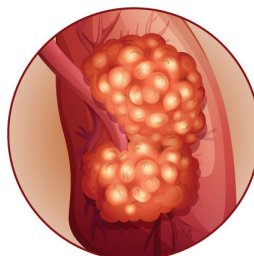
1 in 65

Number of people with non-small-cell lung cancer who have more than one mutation that could impact treatment choices.



1 in 8

Number of people with non-small-cell lung cancer whose tumors have a KRAS G12C mutation.



2x

Two-year survival rates of people with non-small-cell lung cancer who receive targeted drugs compared with those who receive chemotherapy only.



SOURCES: American Society of Clinical Oncology, *Genome Medicine*, American Society of Clinical Oncology 2021 Meeting, *Frontiers in Oncology*, American Cancer Society, *Cancer Control*, *Lung Cancer*, *New England Journal of Medicine*

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