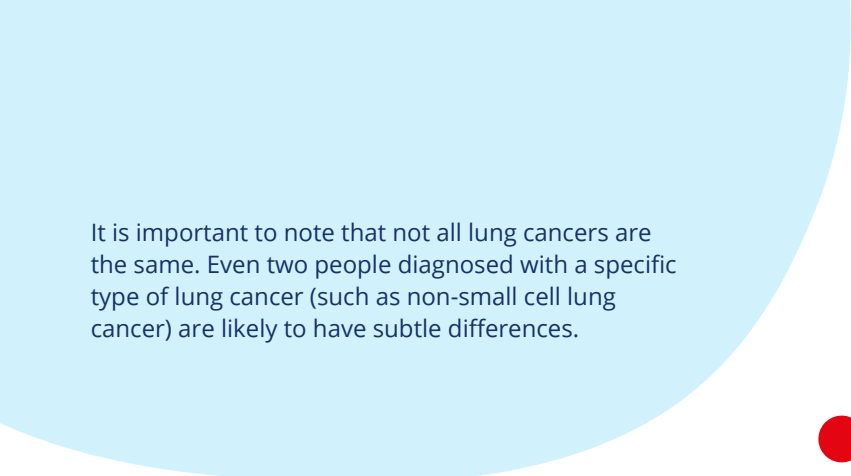




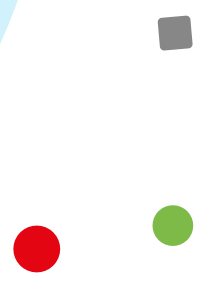
Living with lung cancer:

WHY BEING TESTED FOR DIFFERENT 'BIOMARKERS' MIGHT BE IMPORTANT

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It is important to note that not all lung cancers are the same. Even two people diagnosed with a specific type of lung cancer (such as non-small cell lung cancer) are likely to have subtle differences.



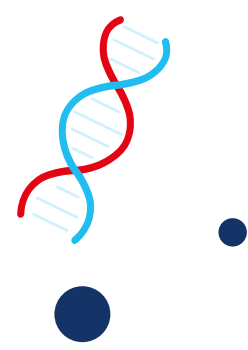
WHY DO DIFFERENCES MATTER?

Gathering as much information as possible on a person's cancer is becoming increasingly important as it can **help healthcare teams decide what the best care could be** for that individual – what is often referred to as personalised care.

TESTING FOR BIOMARKERS

A key piece of information that can be very helpful to know, is whether or not a person's lung cancer has **specific characteristics** in it – these are often called **biomarkers**.

Every day we learn more and more about these biomarkers, and, in some cases, treatments are specifically designed around them.





HELP AND MORE INFORMATION ARE AVAILABLE

If you have lung cancer and you would like to **understand more about biomarkers** and why it may be helpful to your clinical team to test for a range of these, this booklet is a good place to start.

Other resources are also available on the **Lung Cancer Europe website**. And remember, if you are unsure of your options, speak to your local clinical team or patient organisation.

Anne-Marie Baird
President, Lung Cancer Europe

WHAT IS A BIOMARKER?

Think of biomarkers as **'flags'** – there to mark a spot, make you aware of something or guide your way.

These 'flags' are made by your body and can be found in different places within it. For example, **biomarkers can be found in your blood, bodily fluids, cells and tissues** – including tumour (cancer) tissue.¹

WHAT DO BIOMARKERS DO, AND WHY ARE THEY IMPORTANT?

Biomarkers **provide signals** to the rest of the body, and they can also provide your healthcare teams with vital information.

Testing for them can help identify the signals driving a particular condition or disease. The results of a biomarker test can therefore tell us more about a particular condition, such as **predicting the prognosis of your cancer type**. It can also support your clinical team in making **informed decisions about your treatment**, so that this is **targeted for your specific cancer type**.^{2,3}

BIOMARKERS CAN BE PIECES OF 'ALTERED' DNA

We can think of DNA as the instructions the body uses to make nearly everything you need.⁴ If a section of DNA is altered, the body will have a small piece that is not quite right. Biomarkers can take form as genetic alterations.³

In lung cancer, there are **many examples of biomarkers** that are pieces of altered DNA. For instance, **ALK+** and **EGFR+** lung cancer arises when the respective ALK and EGFR genes become altered. As a result, the proteins they are responsible for producing become abnormal, and lead to cancer growth.³

HOW MANY BIOMARKERS ARE THERE IN LUNG CANCER?

Research into new biomarkers has been advancing in recent years, and it continues to progress.²

THERE ARE
AROUND
~14 BIOMARKERS
CURRENTLY
IDENTIFIED FOR
SMALL CELL LUNG
CANCER.⁵

THERE ARE
AROUND
~20 BIOMARKERS
IN NON-SMALL CELL
LUNG CANCER.¹

Using this information, it is sometimes **possible to adapt a treatment plan**. This can happen if a biomarker test result indicates a specific biomarker which could align with a particular treatment. Equally, it is important to remember that not all biomarkers have specific treatments for them and that treatment options may vary depending on where you live.³

TESTING FOR ONE, OR MULTIPLE BIOMARKERS

Thanks to major advances in science and medicine in recent decades, we can look at lung cancer in much more detail. For example, **we can now look for lots of biomarkers in one go**. This is what we term multi-biomarker testing or, in some cases, **next generation sequencing (NGS)**.⁶

TESTING FOR SINGLE OR MULTIPLE BIOMARKERS: WHAT'S THE DIFFERENCE?

Traditional sequencing methods meant we could look for biomarkers, but only one at a time. Using this technology, researchers collected lots of information about our DNA and they were able to develop new, more advanced testing methods.⁷

We now look for multiple biomarkers at the same time, using a process called **'Next Generation Sequencing' or, NGS.**

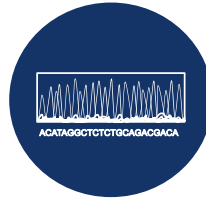
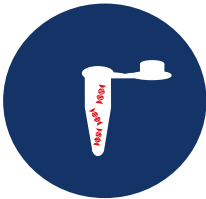
NGS has the ability to look at multiple (sometimes millions) of strands of DNA at once.⁶ A computer will then help to identify if there are any biomarkers. This way, it is possible to quickly and precisely identify if there is any altered DNA that may be contributing to the cancer – and may therefore be a potential target for a medicine.⁷

WHAT DOES AN NGS TEST INVOLVE?

To have an NGS test, **a biopsy will take place**, which allows your healthcare professional team to access some of your DNA.⁸

A tissue biopsy is a medical procedure that involves taking a **small sample of body tissue** so it can be examined and tested. You are normally awake during the procedure, though the area is numb, and it should take about **30 to 45 minutes.**⁹

In some cases, you may be offered a liquid biopsy or blood biopsy, which tests for biomarkers in the blood rather than within the tumour tissue.²



WHAT HAPPENS NEXT?

Now that the doctor has your tissue sample, they can pass it on to the scientists who can **conduct NGS testing** on it; putting it into a large machine that will help extract the DNA and **replicate it many times** so that it can be **tested for multiple biomarkers**.⁶

You could be waiting around 1-2 weeks for results, although this may vary based on where you live.^{3,9}

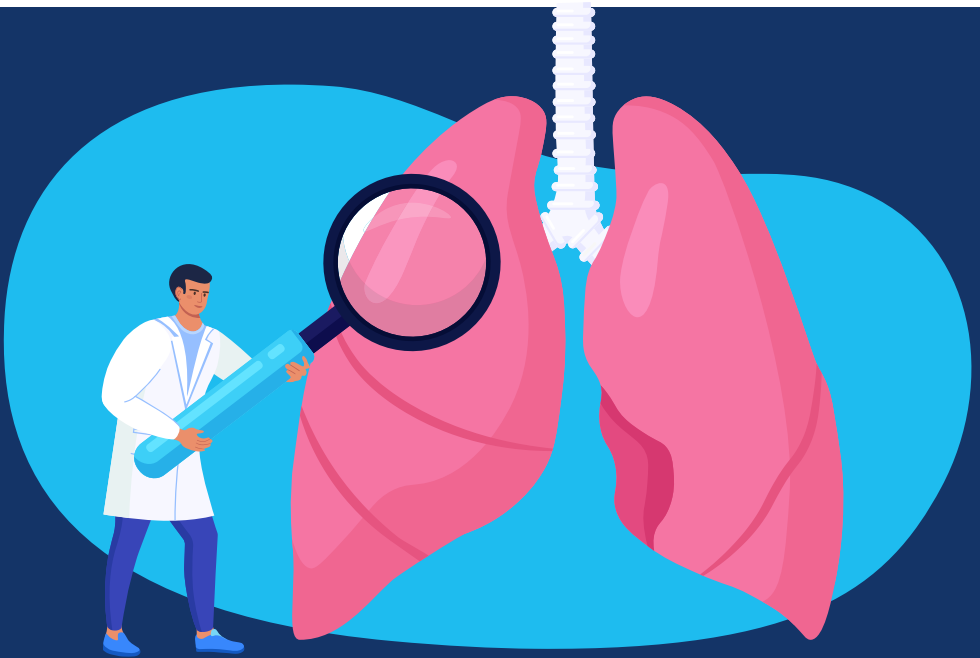
Once this process is completed, they will be able to tell which part of your DNA has alterations and therefore, if there is a personalised treatment for you.



WHAT HAPPENS IF A BIOMARKER IS IDENTIFIED?




Testing positive for a biomarker means that the **alteration in your DNA** is one which is recognised. This means that there might be a 'personalised' treatment available which may be able to treat your specific cancer.² The information that NGS testing provides might also show that you have a **biomarker which may prevent certain medications from working**. Knowing this information could prevent you from getting a treatment that may not treat your cancer effectively.²

However, not all biomarkers have matching treatments and availability can vary across different locations.² As such, once you get the results, you should **discuss with your doctor** what options are available to you.



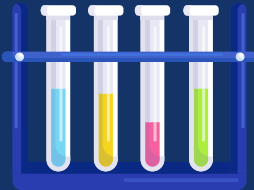
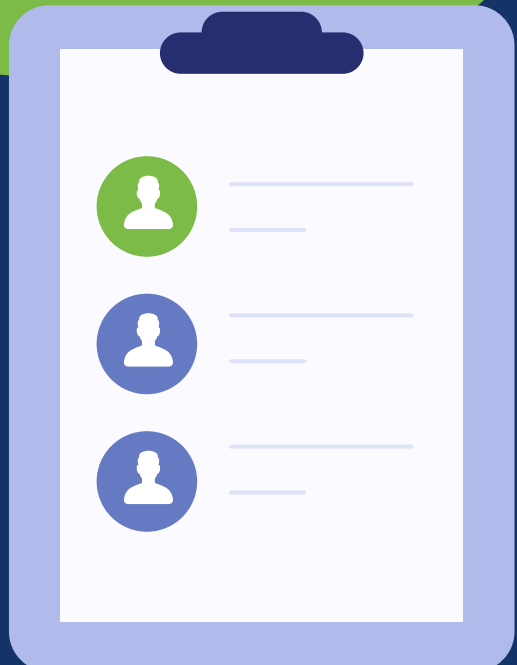


It is also **important to remember** that the human body is very complex. Sometimes, a biomarker can be identified, and we think a treatment will work, but it turns out it is not the right one. This could be because:

-  Sometimes different cancer cells have different biomarkers
-  Biomarkers can change over time
-  The cancer in your body can affect how the treatment works²

WHAT TO DO IF YOU TEST NEGATIVE

For some people, a biomarker test via NGS **might not reveal any matches** for known treatments. In this instance, it is still important information for you and your doctor to know, in case a new treatment is made available that may be a suitable for the alteration in your DNA.



AVAILABILITY OF NGS TESTING

NGS testing is available in many countries across Europe. However, it is not always routinely accessible in all countries. If you would like to find out whether NGS testing is an option for you or someone you care for, speak to your doctor or local patient organisation for more information and guidance.







WHAT SHOULD I DO IF I WANT TO GET NGS TESTING?

If, after reading this booklet, you decide you might want to be considered for NGS testing, you should **speak to your doctor at your next consultation**. Your clinical team will be able to give you an overview of the timings for the biopsy appointment and typical time to analyse the results of the NGS test.



HERE ARE SOME INITIAL QUESTIONS YOU COULD THINK ABOUT ASKING YOUR HEALTHCARE TEAM:



-  Am I eligible to have a biomarker test?
-  If I want a biomarker test but I am not eligible, why is that?
-  Will I have to have another biopsy, or can I have a blood biopsy?
-  Will someone be able to help explain the results and what they mean for me?
-  Will the results of the test impact my current treatment plan?
-  Will I be tested for all potential biomarkers, if not, why?



Sometimes, **doctors may keep some of your biopsy tissue** if you had one when you were initially diagnosed with lung cancer. If they didn't, and you do not want another tissue biopsy, you may be able to have a liquid or blood biopsy.³

Blood biopsies can show biomarkers that are present in the blood sample, however this does not include biomarkers that potentially are present elsewhere, such as in the cancer cells. This is why it is important to aim for a tissue biopsy as well.²

If you would like more information or support, it may be worth reaching out to a **local support group** who will be able to provide you with impartial information on NGS testing, the process and what happens with certain results.

Across Europe, you can contact:

LuCE (Lung Cancer Europe) by visiting their website and filling in the contact form, at www.lungcancereurope.eu/contact-us/



REFERENCES

1. Biomarker testing, explained. ALK Positive. Available at <https://rb.gy/erkn14>. Last accessed: May 2023.
2. Biomarker Tests and Cancer Treatment. American Cancer Society. Available at <https://rb.gy/5xd>. Last accessed: May 2023.
3. Lung Cancer Biomarker Testing. American Lung Association. Available at <https://rb.gy/z9u0v>. Last accessed: May 2023.
4. Deoxyribonucleic Acid (DNA) Fact Sheet. National Human Genome Research Institution. Available at <https://rb.gy/hks7zu>. Last accessed: May 2023
5. Taniguchi, H., Sen, T. and Rudin, C.M. (2020). Targeted therapies and biomarkers in small cell lung cancer, *Frontiers in Oncology*, 10. Available at <https://rb.gy/9ys>. Last accessed: May 2023.
6. Next Generation Sequencing. Science Direct. Available at <https://rb.gy/bpjtcp>. Last accessed: May 2023.
7. Guan, Y.-F. et al. (2012). Application of next-generation sequencing in clinical oncology to advance personalized treatment of cancer, *Chinese Journal of Cancer*, 31(10), pp. 463–470. Available at: <https://rb.gy/491>. Last accessed: May 2023.
8. Tests for lung cancer. Cancer Research UK. Available at <https://rb.gy/k3jcqa>. Last accessed: May 2023.
9. Needle biopsy through the skin for lung cancer. Cancer Research UK. Available at <https://rb.gy/yzw>. Last accessed: May 2023.

