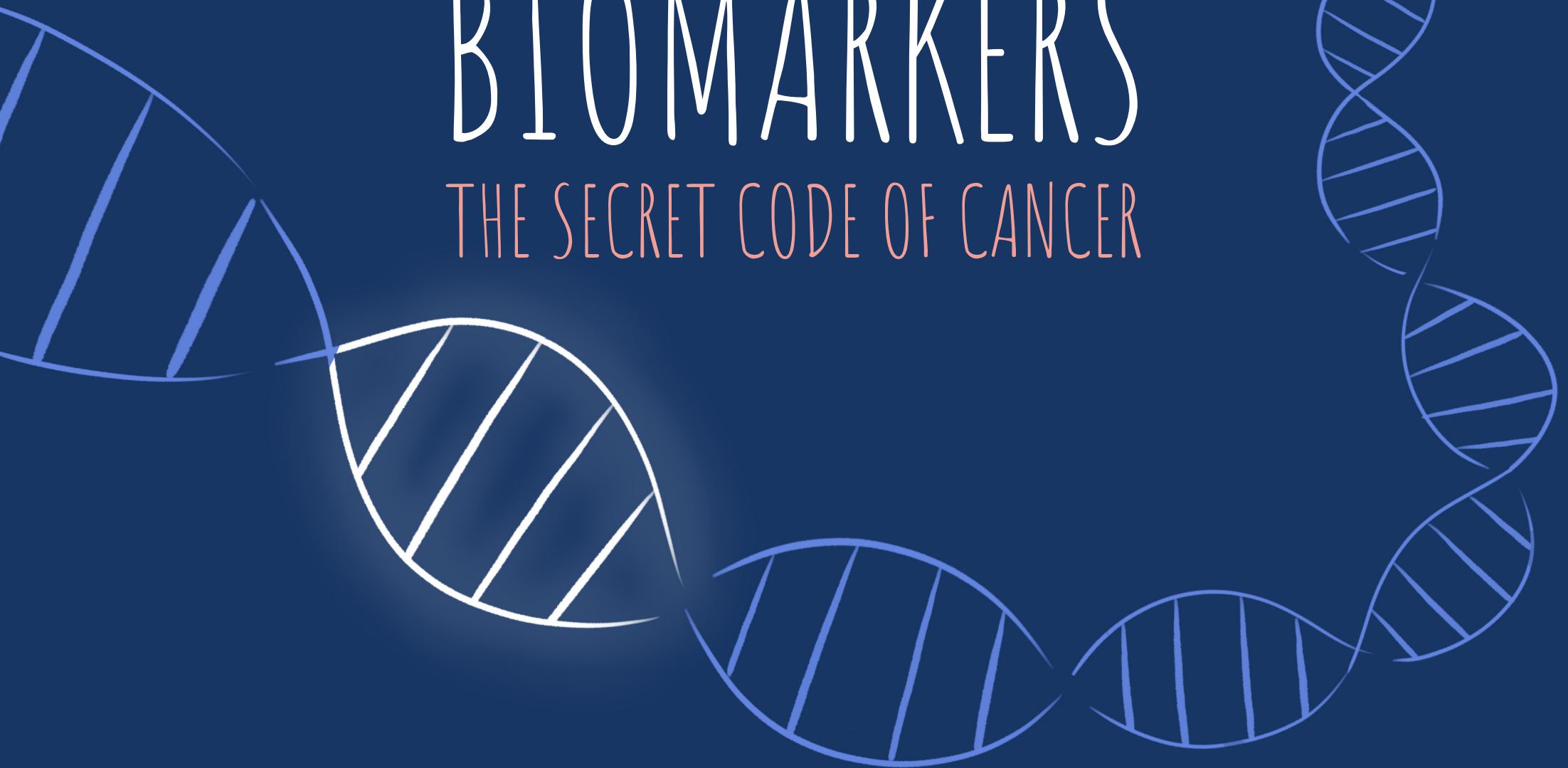


BIOMARKERS

THE SECRET CODE OF CANCER





OMPRN

Ontario Molecular Pathology
Research Network

Written by Karen Haas

Edited by Kyster Nanan

Illustrated by Caitlyn Skelton, Designs that Cell

It was a pleasant, late spring day. Wayne was in the city gathering things for a trip. He met his friend, June, for lunch.

“Tell me about your trip,” she said.

“I’ll be joining friends up north. Our plan is to rent kayaks, go hiking, and maybe explore caves. We’ll be camping the whole time. It’s going to be an adventure!”

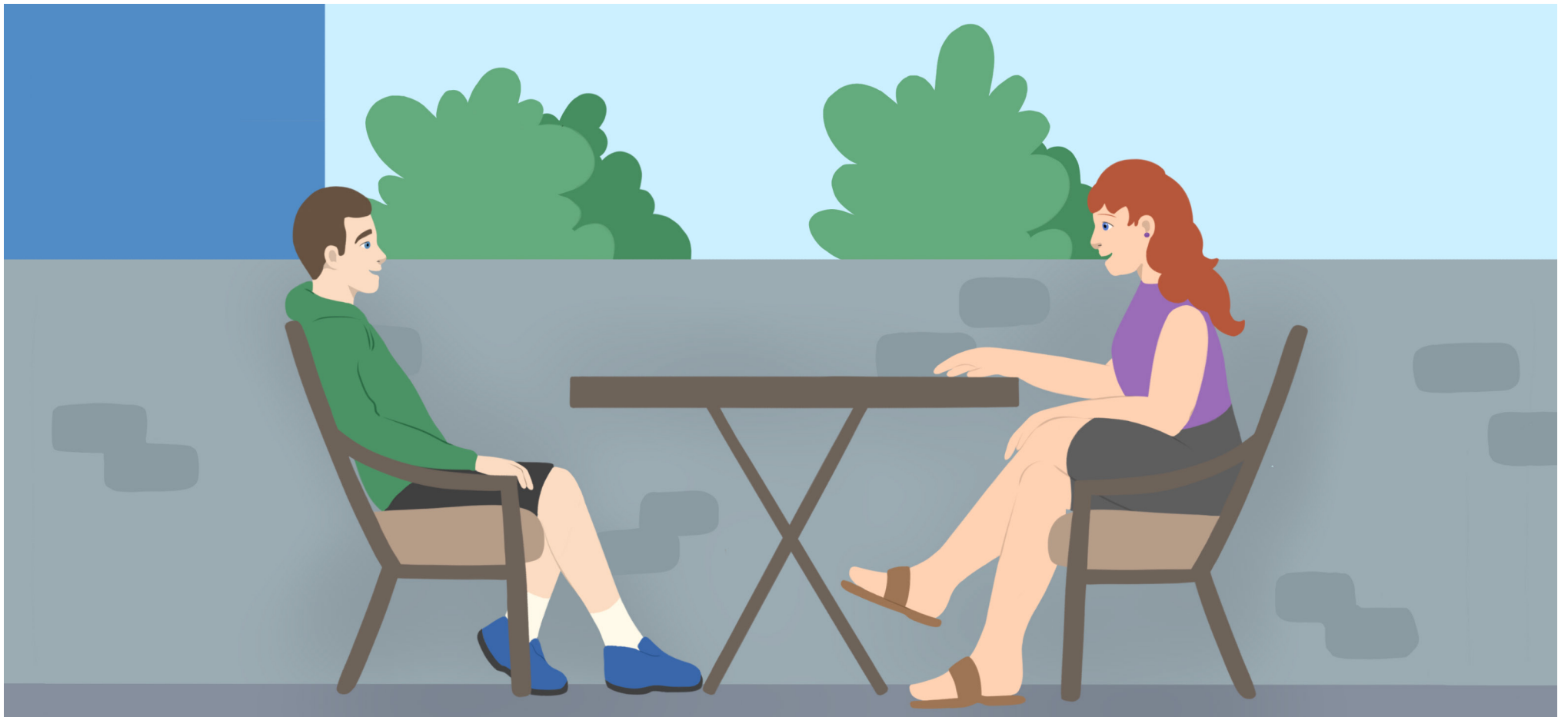
“Camping. Ugh! That reminds me of a trip my family went on when I was younger,” said June. “The scariest thing happened when we came back from a hike one day. There was a bear at our campsite, looking for food!”

“What did you do?”

“We quietly backed away and went to the Ranger’s station,” said June. “He knew what to do.”

“I hope nothing like that happens to me!”

“I’m sure it will be okay. I hope you have fun! But just remember to be careful.”



After lunch, Wayne went for a somewhat routine test at the hospital.

When he was getting ready to leave, a nurse said, "Wayne, Dr A would like to have a chat with you in his office."

"But I don't have an appointment with the doctor," said Wayne.



"How are you feeling?" asked Dr A.

"I'm fine," said Wayne. "Is something wrong?"

"Well, there was something on the scan . . ."

Wayne felt numb. What the doctor had told him sounded serious. He was being admitted to the hospital. He had to let his family know that there was something wrong and that he wouldn't be home for dinner.



Later that evening, after Wayne's family had left his room for the night, he lay staring at the ceiling. He tried to block out the sounds of alarms and voices from the hallway, and drifted into a restless sleep.

The next morning, after Wayne was taken for another scan, Dr A and two other doctors came into his room. Wayne and his mom held their breath.

“Wayne, there’s no easy way to tell you this,” said Dr A. “There are a few areas in different parts of your scan that look like tumours. We need to do some tests to know whether it’s cancer. We’ll start with something called a biopsy, which means that we’re going to take a small sample of tissue from one of the potential tumours so that we can run some tests.”

“This is Dr G. She is a medical oncologist who specializes in diagnosing and treating cancer. And this is Jimmy. He is a physician assistant, and he is especially helpful in bridging any gaps between admin, nursing, and clinical issues. We’re part of your medical team, and you can ask us any questions.”



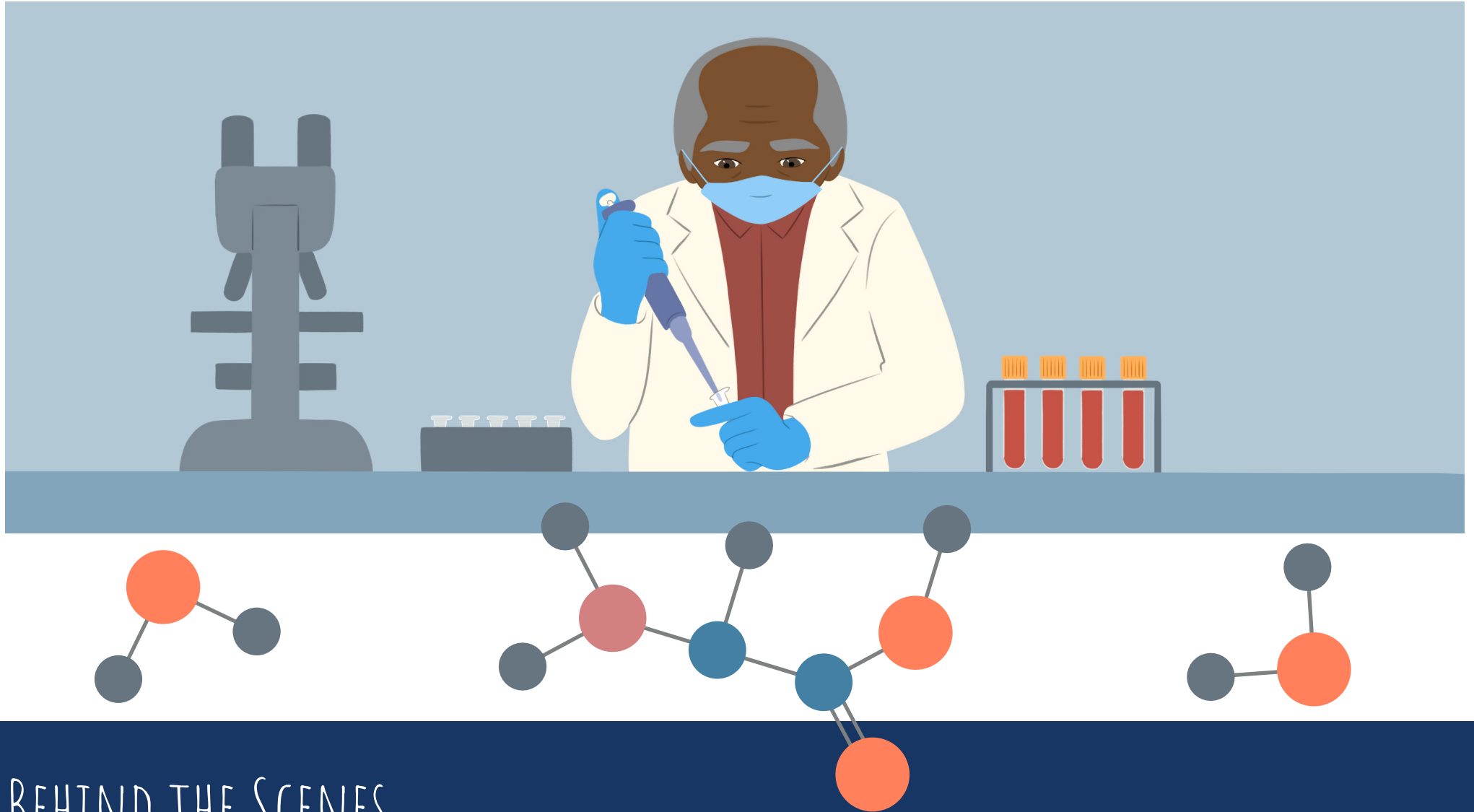
Thinking about his upcoming trip, Wayne said, "Well this is annoying."

His response to the news was a surprise to the doctors, but Wayne was a practical twenty-one year old who thought logically about most things.



Wayne and his mom relayed the news to the rest of the family who were at home waiting by the phone. There were tears, but everyone was assured that Wayne was in good hands.

Wayne had a biopsy and his tissue and fluid samples were sent to a molecular pathology lab.



BEHIND THE SCENES

At this point, we leave the visible world and dive into the world of molecules.

Molecules are collections of atoms. Water, for example, is a molecule composed of hydrogen and oxygen atoms (H_2O). Proteins, which make up our muscles, and DNA, which make up our genes, are molecules composed of different atoms.

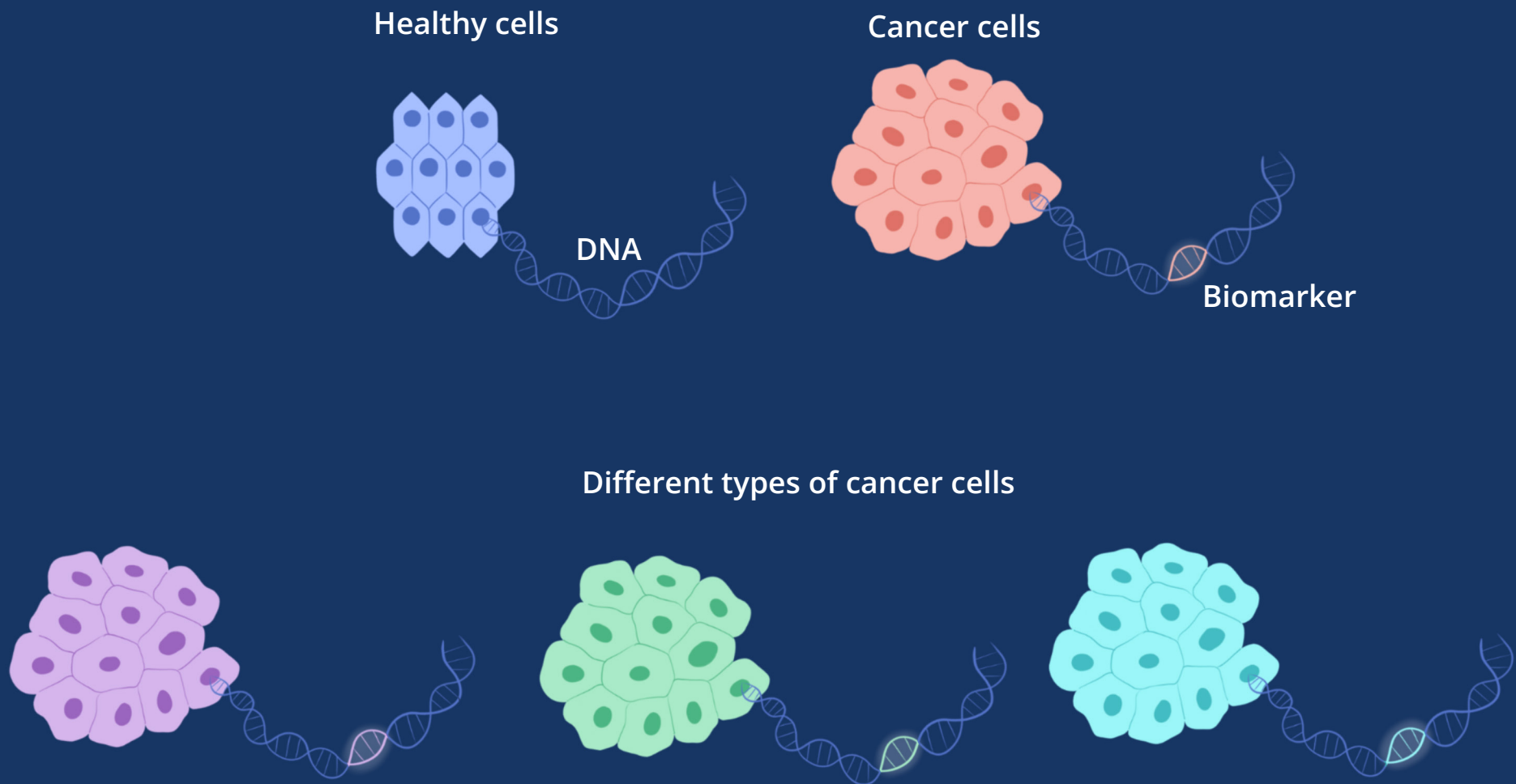
Molecular pathology is a field of medicine that studies the molecules in your body in order to help doctors manage illness. The work of molecular pathologists is typically unseen by the patients and members of the healthcare team because it takes place in labs. Molecular pathologists perform different tests on the molecules from biopsy samples, and they look for biomarkers.

A **biomarker** is a molecule whose presence indicates a phenomenon, such as a disease. Various types of molecules, such as DNA, proteins, and hormones, can serve as biomarkers.

There are many types of cancer and they often cannot be distinguished by family history and appearance alone (what we call histology). To help inform an accurate cancer diagnosis, biomarkers are used.

The DNA in cancer cells is usually different from the DNA in regular cells, and each cancer subtype DNA is usually unique. Therefore, cancer DNA can be used as a biomarker for cancer subtypes.

Molecular pathologists extract DNA from samples of tissue, blood, and other body fluids. They then use a technique called DNA sequencing to look for cancer biomarkers.



Did you know? There are some cancers, like breast, lung, and colorectal cancers, that have many biomarkers. Other cancers, like Central Nervous System cancers and sarcomas, have few reliable biomarkers.

A few days after Wayne's biopsy, Dr G and the head of the molecular pathologist team met with Wayne and his family.

"We're not exactly sure what we're looking at, Wayne," said Dr G. "But we do know that you have cancer."



Cancer? How could this be? Wayne felt fine, and he was an active young man. He and his mom were in tears.

“This is Dr N, a molecular pathologist. He’s here to help explain things,” said Dr G.

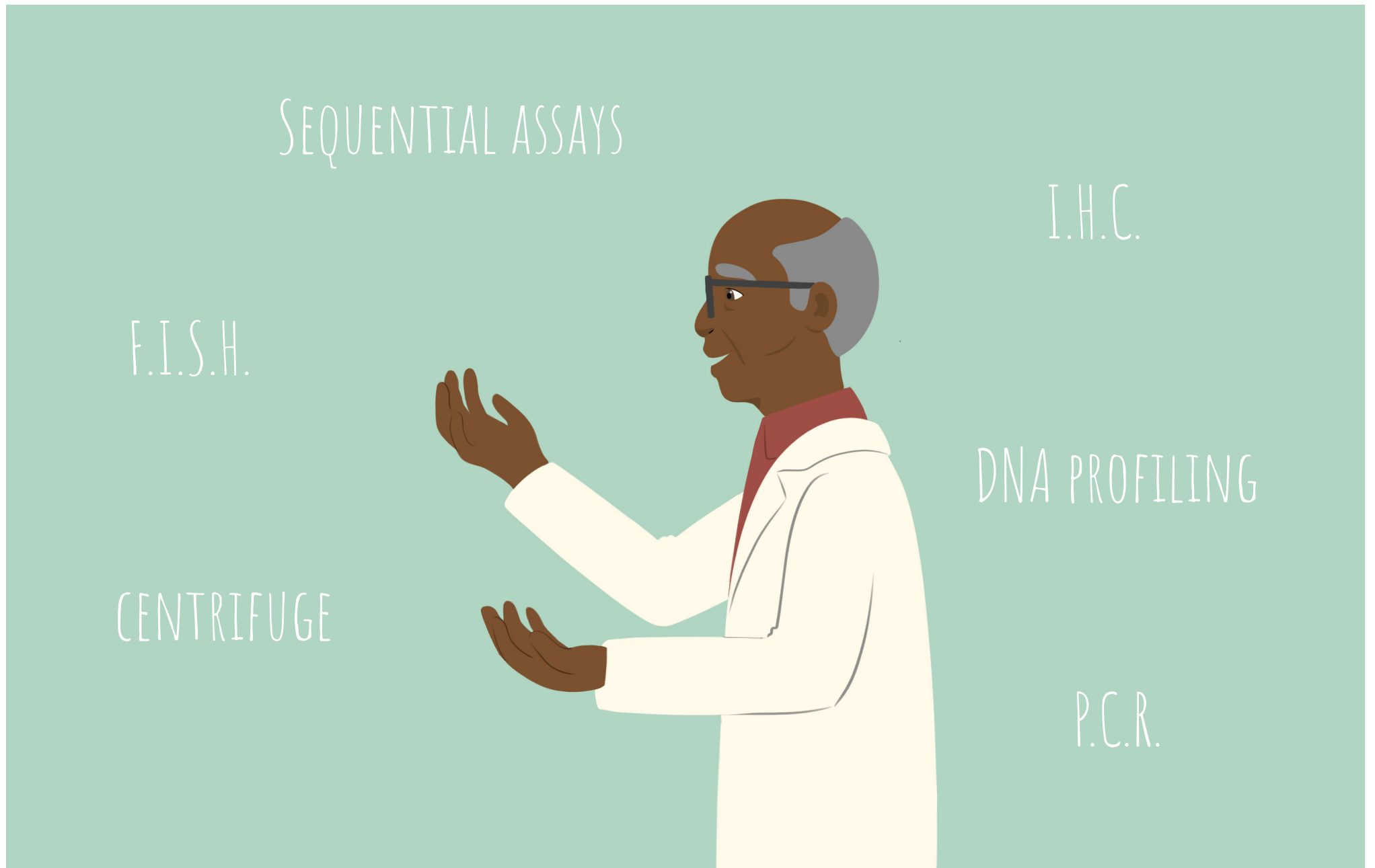
“Hi Wayne. I’m so sorry that we are meeting like this,” began Dr N. “I’ve been performing different test on the molecules from your biopsy and we found strong evidence of cancer. The molecules are important because they can act as biomarkers and tell us a bit about what’s going on in your body. The biomarkers will help us with the exact diagnosis, and your diagnosis will help us plan your treatment.”



Wayne felt like he was back in school, and though some of what Dr N said was confusing, he found it interesting. "Do biomarkers make faster diagnosis possible?" he asked.

"That's a great question," said the molecular pathologist. "Biomarkers make a diagnosis more accurate, and because biomarkers have a greater sensitivity, they can, depending on the technique, detect disease at an earlier stage compared to other indicators."

Dr N noticed that Wayne and his mom were listening intently. He began to elaborate on the techniques using many scientific terms and acronyms.



Dr N stopped. He realized that Wayne looked confused.

"I don't want to overload you with information right now," said the molecular pathologist. "But we can definitely chat about this in the future."

"That would be great," said Wayne. He felt quite overwhelmed.



"We're going to discharge you from the hospital while we wait for the pathology test results," said Dr G. She gave Wayne some instructions about what to do at home and told him when to return for an appointment.

Several days later, Wayne and his mom arrived at the hospital for their scheduled appointment. They were anxious to hear the news.

Just as they were stepping off the elevator, Wayne's phone rang.

"I'm so sorry, the pathology test results aren't back yet," said Dr G. "It might take another week for the team to complete the tests and analyze the results. For now, do things that you enjoy and we'll see you next week at the same time."



Naturally, it was challenging to focus on anything except the looming news, but Wayne spent time with friends and family, just as the doctor had ordered.



One week later, Dr G called Wayne to let him know that the results were back.

He and his mom went straight to the hospital. They were tense as the medical oncologist walked into the consultation room.

"Hi Wayne," said Dr G. "This is what we're facing..."



What the doctor said was difficult to accept and understand.

Based on the biomarker test results, Wayne had a diagnosis and a treatment plan specifically for him. This was news to Wayne, who always thought that cancer was cancer and everyone received the same treatment based on the cancer's location.



“The biomarkers found by the molecular pathologists told us a lot about your cancer,” explained Dr G. “We now know the type of cancer, the stage and aggressiveness of the cancer, and the recommended treatment. Once you are on treatment, the biomarkers will also show us if the treatment is working, and whether or not the tumours are stable, growing, or decreasing.”

“Here is your treatment plan. Let’s go through the details, and please ask me anything...”



Wayne began treatment soon after his diagnosis.

No one could be certain what the future would hold, but knowing that there was a specialized treatment plan for his unique cancer helped the young man and his family take on life one day at a time.



Stay tuned for the next story to see how biomarkers continue to be involved in Wayne's treatment.

Do you want to know more about biomarkers and other molecular pathology? Check out the Patient Resources page on the OMPRN website. Be sure to visit often as more lessons will be uploaded soon.



ontariomolecularpathology.ca