

EN

THE *LIFE-SAVING* MISSION OF **MISTER BIND** AND HIS COMPANIONS

WHAT ARE
RADIOTHERANOSTICS
FOR CANCER CARE?

**EXPANDED
EDITION!**
NOW WITH A NEW CHAPTER:
WHAT IS RADIATION?



Oncidium
foundation

PROLOGUE

The Oncidium foundation is a non-profit organization that aims to raise awareness, support and accelerate the development of radiotheranostics for cancer care, worldwide.

The concept of radiotheranostics is generating a lot of interest in the cancer care landscape, namely as it shifts from an approach where every patient is treated in the same way, to a more personalized and systemic method, adapted on a case-by-case basis.

However, there remains an important lack of knowledge about the existence and potential of this technique and several apprehensions about nuclear medicine in general.

This is why the Oncidium foundation endeavors to deliver educational content, in order to improve general knowledge and provide answers to common misconceptions and concerns.

Are you wondering what radiotheranostics are? Are you in contact with patients and wish to demonstrate how radiotheranostics work? Discover the mission of Mister Bind and his companions and find out more about radiotheranostics for cancer care.

Any questions?

Do not hesitate to contact us at contact@oncidium-life.org.

THE CHARACTERS

MR. BIND

THE LIGAND



HELLO THERE!

DR. DIA

RADIOISOTOPE FOR IMAGING

FOR EXAMPLE, FLUOR-18 OR GALLIUM-68



DR. THERA

RADIOISOTOPE FOR THERAPY

FOR EXAMPLE, LUTETIUM-177
OR ACTINIUM-225



THE DOCTORS

THE PATIENTS



CHAPTER ONE

WHAT ARE RADIOTHERANOSTICS?



RADIOTHERANOSTICS, ALSO KNOWN AS RADIOLIGAND THERAPIES, REPRESENT AN INNOVATIVE TECHNIQUE IN CANCER CARE.

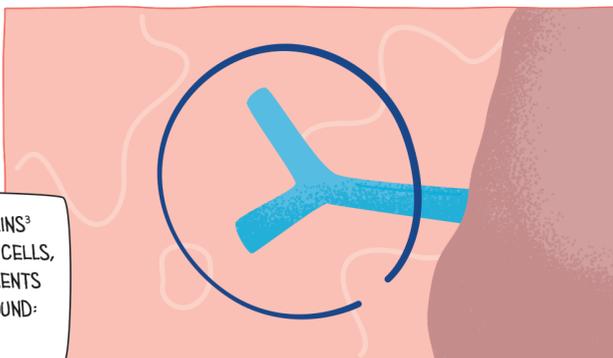
IT'S A CONTRACTION OF "THERA" FOR THERAPY, AND "NOSTICS" FOR DIAGNOSTIC.



"RADIO" MEANS THAT RADIOACTIVE SUBSTANCES ARE BEING USED.

DEPENDING ON THE RADIOACTIVE PRODUCT¹ WE USE, WE CAN EITHER DO DIAGNOSTIC OR THERAPY. BOTH ARE BINDING TO THE SAME BIOLOGICAL TARGET².

THE BIOLOGICAL TARGETS ARE THE PROTEINS³ EXPRESSED ON THE SURFACE OF CANCER CELLS, AND TO WHICH THE RADIOTHERANOSTIC AGENTS WILL BIND. THANKS TO ONE OF ITS COMPONENTS: THE LIGAND⁴ (MR. BIND).



CHAPTER TWO

HOW DOES IT WORK?

THIS METHOD IS IMPLEMENTED IN TWO PHASES

FIRST A RECONNAISSANCE MISSION, AND IF THIS ONE IS SUCCESSFUL, A DESTRUCTION MISSION.



MISSION 1
IMAGING

MISSION 2
THERAPY



FOR BOTH MISSIONS, THE PRODUCT WILL BE, IN MOST CASES, ADMINISTERED BY INTRAVENOUS INJECTION



AND BE COMPOSED OF TWO ELEMENTS:
A LIGAND (MR. BIND)

COUPLED WITH A RADIOACTIVE MOLECULE THAT
WILL BE DIFFERENT FOR DIAGNOSTIC (DR. DIA)

OR THERAPY (DR. THERA).

RADIOPHARMACEUTICALS

TOGETHER, THEY FORM A FANTASTIC TEAM
CALLED "RADIOPHARMACEUTICALS".

MISSION 1: RECONNAISSANCE



AFTER BEING INJECTED, OUR TEAM OF RADIOPHARMACEUTICALS SEARCHES FOR CANCER CELLS: THE IMAGING MISSION.

DR. DIA, WE RECEIVED A NEW MISSION! COME WITH ME AND LET'S IDENTIFY THOSE CANCER CELLS!

I AM READY, MR. BIND!

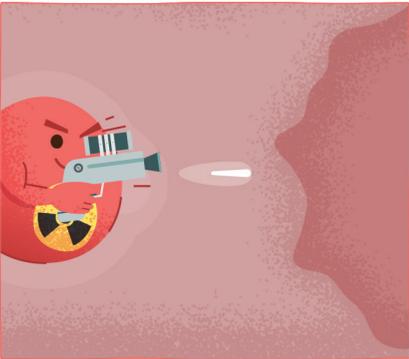
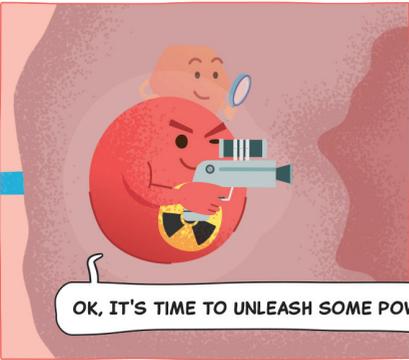
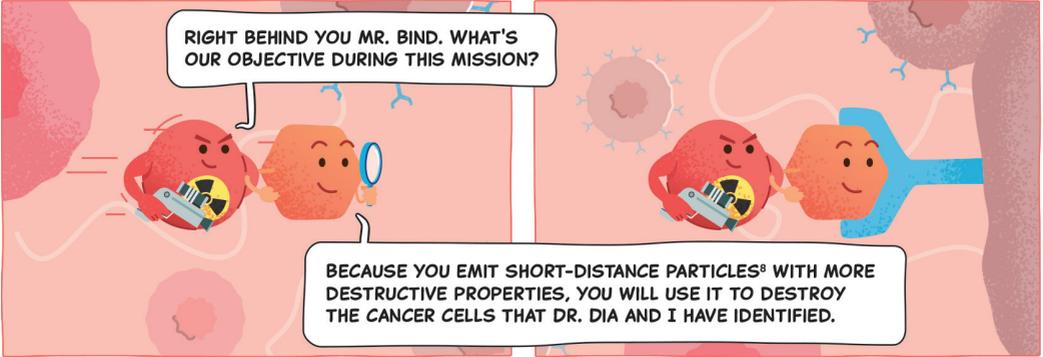
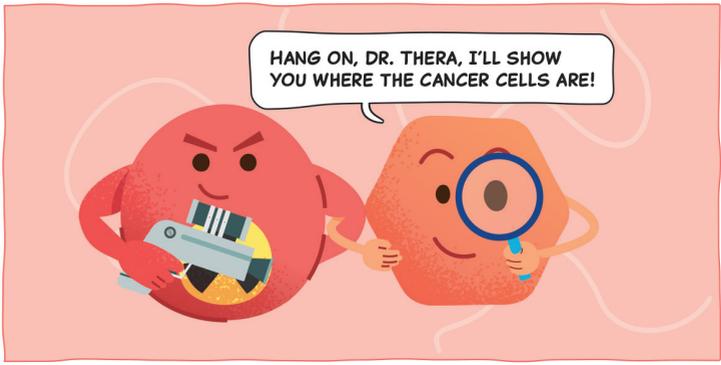
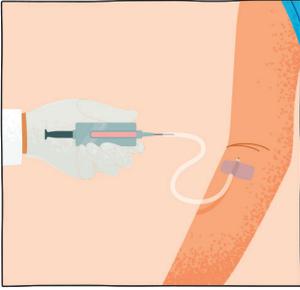
SO, ONCE YOU FIND THE BIOLOGICAL TARGETS, YOU BIND TO IT,

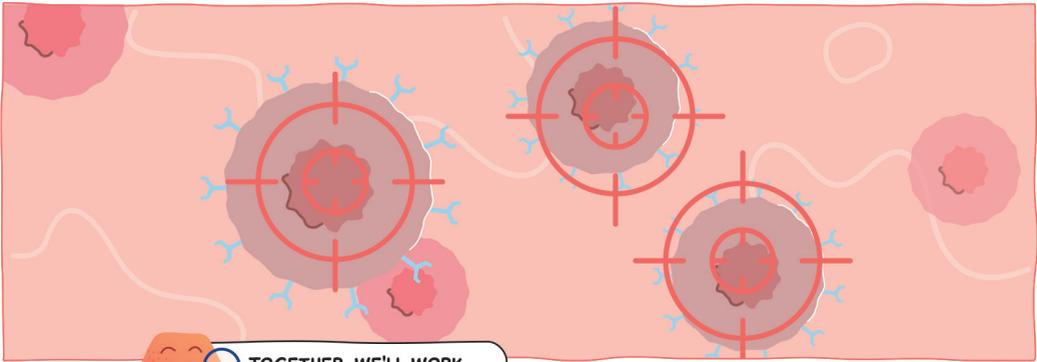
AND THE RADIATION I AM EMITTING AT THAT SPOT WILL BE DETECTED BY THE SCANNER.

THEN THE DOCTORS WILL BE ABLE TO VISUALIZE CANCER CELLS AND ASSESS IF THE TREATMENT WILL BE EFFECTIVE.

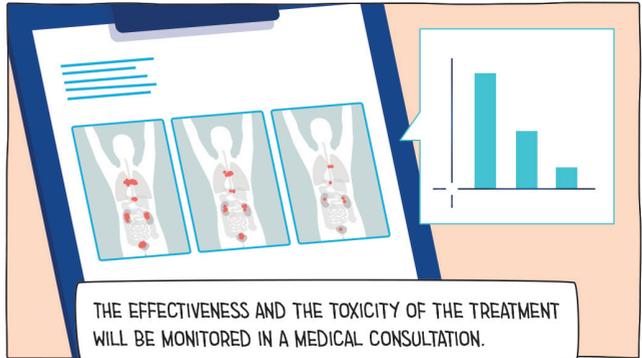
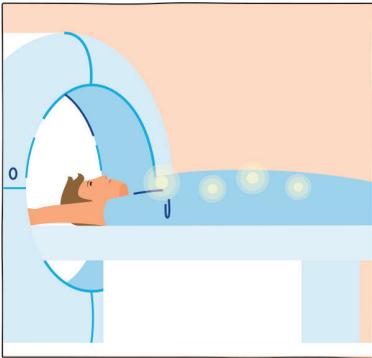
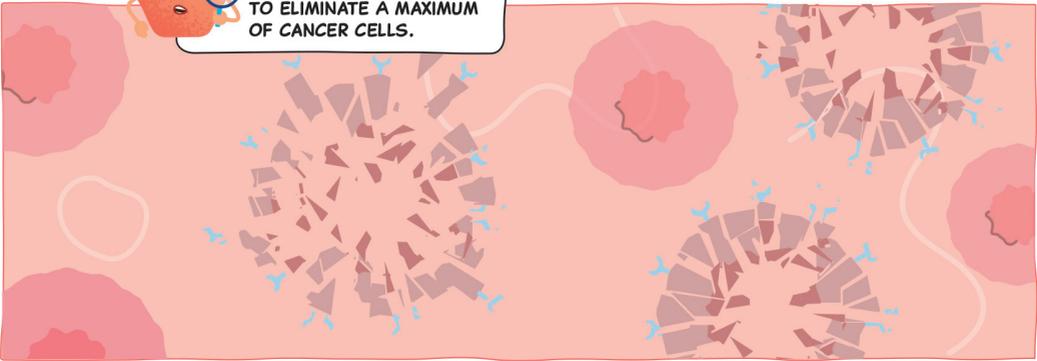
ONLY THEN WILL WE MOVE TO THE SECOND PHASE: THE THERAPY MISSION.

MISSION 2: DESTRUCTION





TOGETHER, WE'LL WORK TO ELIMINATE A MAXIMUM OF CANCER CELLS.



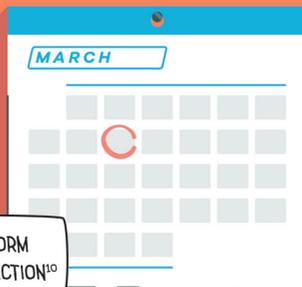
THE EFFECTIVENESS AND THE TOXICITY OF THE TREATMENT WILL BE MONITORED IN A MEDICAL CONSULTATION.



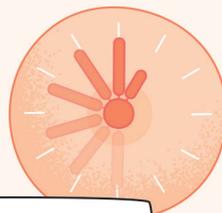
ALWAYS SEEK THE ADVICE OF YOUR DOCTOR FOR ANY QUESTIONS ABOUT A MEDICAL CONDITION OR ANY HEALTH-RELATED ISSUES AND BEFORE UNDERGOING ANY NEW MEDICAL TREATMENT.

WILL THE TREATMENT PROCESS BE REPEATED?

YES. USUALLY, WE PERFORM 3 TO 6 CYCLES OF INJECTION¹⁰



EVERY 4 TO 8 WEEKS.



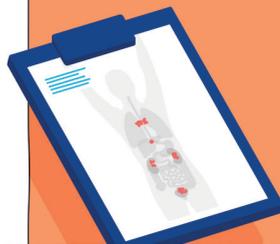
EACH OF THEM TYPICALLY LASTS ABOUT 30 MINUTES TO ONE HOUR.

DEPENDING ON THE INDICATION AND THE MOLECULE USED, THE STAY MAY VARY FROM A FEW HOURS TO A COUPLE OF DAYS.



YOU WILL COME BACK TO THE CLINIC FOR EACH TREATMENT DOSE AND FOR SEVERAL TESTS...

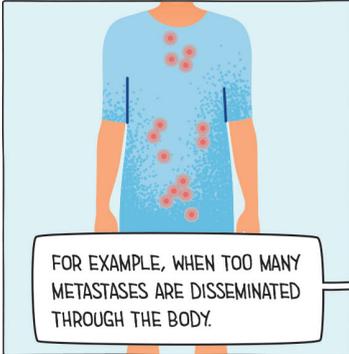
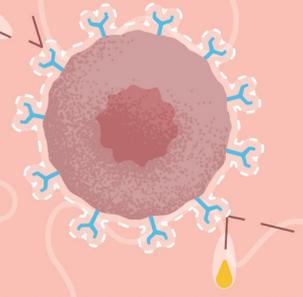
SYMPTOM ANALYSIS, BLOOD TESTS, AND IMAGING, TO MONITOR THE EFFECTIVENESS AND THE TOXICITY OF THE TREATMENT.



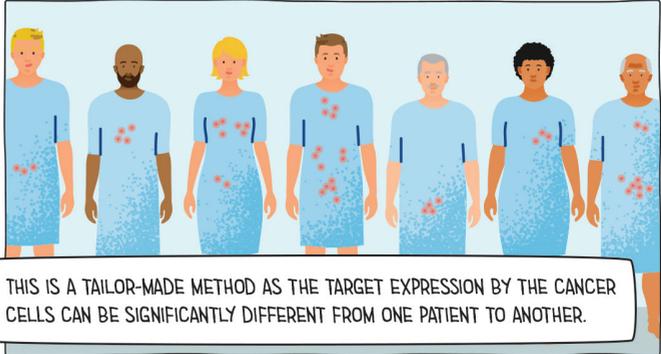
BASED ON THIS NEW EVALUATION, THE TREATMENT IS CONTINUED OR ADAPTED.

WHEN AND WHY CAN WE OPT FOR THIS TECHNOLOGY?

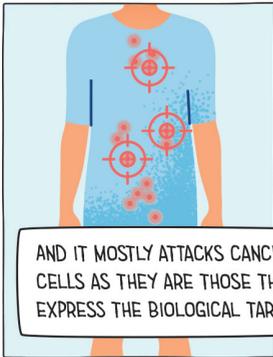
WELL, FOR THE TIME BEING, RADIOTHERANOSTICS CAN BE CONSIDERED FOR CANCERS THAT ARE RESISTANT OR UNRESPONSIVE TO OTHER TREATMENT TECHNIQUES.



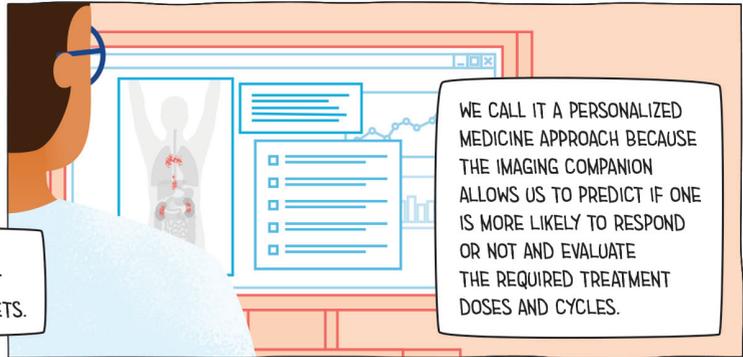
FOR EXAMPLE, WHEN TOO MANY METASTASES ARE DISSEMINATED THROUGH THE BODY.



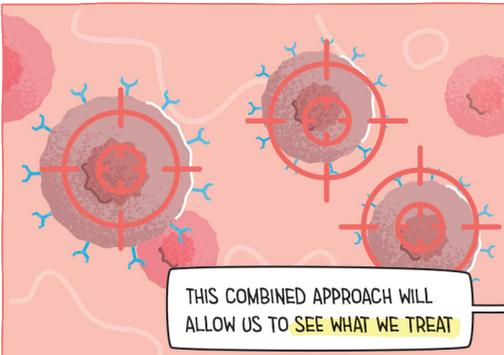
THIS IS A TAILOR-MADE METHOD AS THE TARGET EXPRESSION BY THE CANCER CELLS CAN BE SIGNIFICANTLY DIFFERENT FROM ONE PATIENT TO ANOTHER.



AND IT MOSTLY ATTACKS CANCER CELLS AS THEY ARE THOSE THAT EXPRESS THE BIOLOGICAL TARGETS.



WE CALL IT A PERSONALIZED MEDICINE APPROACH BECAUSE THE IMAGING COMPANION ALLOWS US TO PREDICT IF ONE IS MORE LIKELY TO RESPOND OR NOT AND EVALUATE THE REQUIRED TREATMENT DOSES AND CYCLES.



THIS COMBINED APPROACH WILL ALLOW US TO SEE WHAT WE TREAT



...AND TREAT WHAT WE SEE.

CHAPTER THREE

WHAT IS RADIATION?

WHAT IS RADIATION?

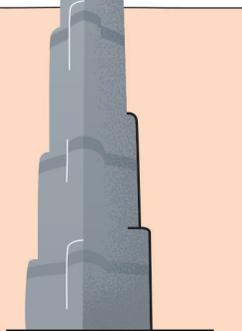
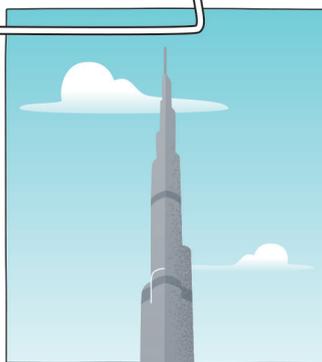
GOOD QUESTION! IT'S NORMAL TO HAVE THOSE KIND OF INQUIRIES! I WILL GIVE YOU SOME EXPLANATION ABOUT RADIATION

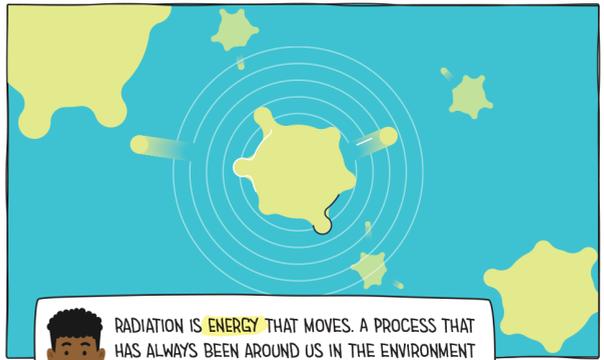
WHEN PEOPLE HEAR ABOUT 'NUCLEAR MEDICINE' AND RADIATION, THEY USUALLY THINK ABOUT THE NUCLEAR ENERGY ACCIDENTS OR ATOMIC BOMB.



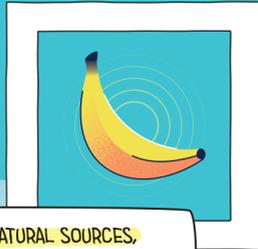
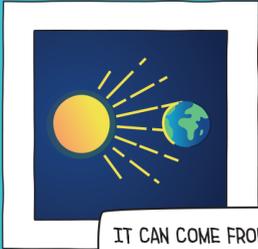
BUT BE REASSURED THAT NOT ALL RADIATION EXPOSURE IS THE SAME. THE EFFECTS WILL DEPEND ON THE TYPE OF RADIONUCLIDE, DURATION OF EXPOSURE AND OTHER FACTORS.

COMPARING THE RADIATIONS OF A NUCLEAR ENERGY ACCIDENT TO THOSE OF A RADIOTHERANOSTICS TREATMENT WOULD BE LIKE COMPARING THE SIZE OF BURJ KHALIFA (828 M - 2715 FT) TO THE SIZE OF AN ANT.

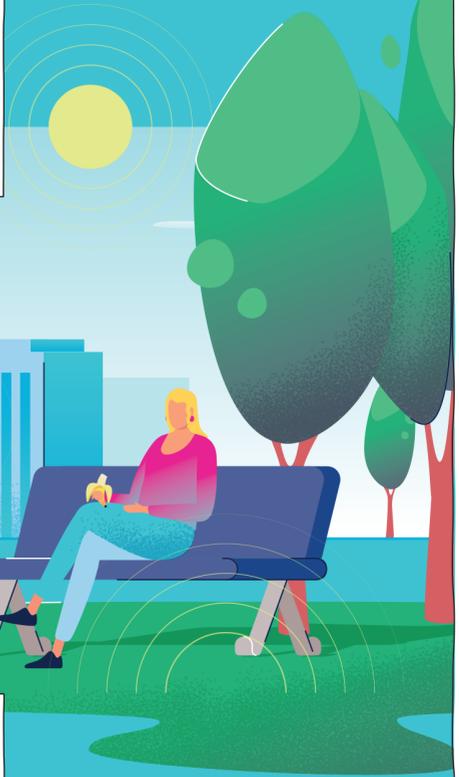




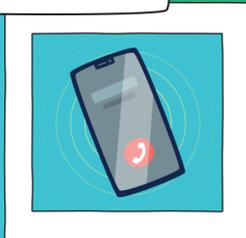
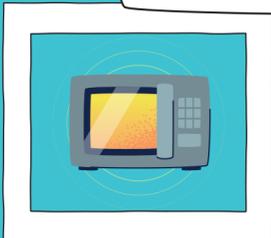
RADIATION IS **ENERGY** THAT MOVES. A PROCESS THAT HAS ALWAYS BEEN AROUND US IN THE ENVIRONMENT AND EVEN IN OUR BODIES.



IT CAN COME FROM **NATURAL SOURCES**, LIKE THE GROUND, THE FOOD, AND THE SUN,



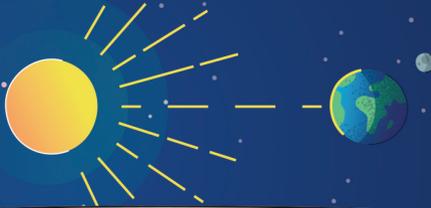
OR **MAN-MADE SOURCES**, SUCH AS MICROWAVES AND FROM MOBILE PHONES.



IF YOU EAT A BANANA FOR EXAMPLE, THERE IS A LITTLE AMOUNT OF RADIATION IN IT. IT'S ALL GOOD! THIS IS HARMLESS AS MOST OF THE RADIATION WE ENCOUNTER ACCOUNTS AT A VERY LOW AND SAFE LEVELS.



TO REACH THE MAXIMUM SAFE AMOUNT YOU'D NEED TO EAT **170 BANANAS PER DAY** DURING ONE YEAR! SO, BE REASURED, YOU CAN STILL EAT BANANAS.



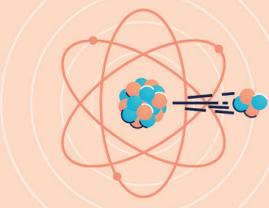
ANOTHER EASY EXAMPLE IS THE RADIATION THAT COMES FROM THE SUN: IT TRAVELS FROM THE SUN TO EARTH AND DELIVERS LIGHT AND HEAT THAT WE ALL BENEFIT FROM.

VITAMIN **D**



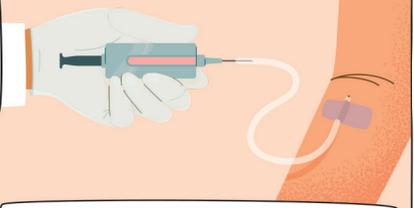
WHILE WE ALL NEED SOME EXPOSURE TO SUNLIGHT TO HELP OUR BODIES MAKE VITAMIN D, TOO MUCH UV CAN CAUSE SUNBURN!

THE RADIATION YOU WILL BE INJECTED COMES FROM **RADIOACTIVE ATOMS**

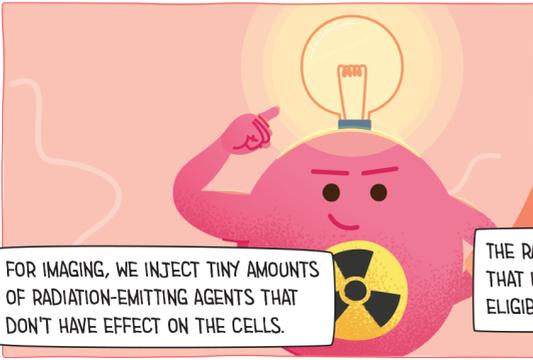


RADIOACTIVITY IS THE PROPERTY OF SOME **UNSTABLE ATOMS** (CALLED RADIONUCLIDES) TO **SPONTANEOUSLY EMIT RADIATION.**

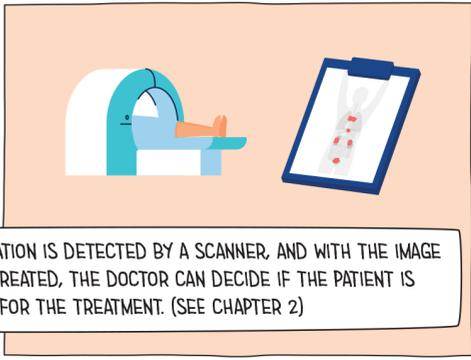
A RADIOACTIVE MATERIAL IS COMPOSED OF ATOMS THAT SLOWLY **GIVES OFF ENERGY** CALLED RADIATION, BECOMING A STABLE ATOM.



SO, APPLYING THIS TO **RADIOTHERANOSTICS**, IT INVOLVES **INJECTING RADIOACTIVE MOLECULES**, EITHER FOR IMAGING OR THERAPY.



FOR IMAGING, WE INJECT TINY AMOUNTS OF RADIATION-EMITTING AGENTS THAT DON'T HAVE EFFECT ON THE CELLS.

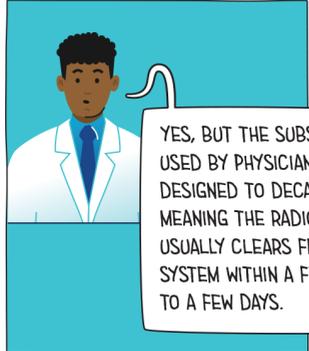


THE RADIATION IS DETECTED BY A SCANNER, AND WITH THE IMAGE THAT IS CREATED, THE DOCTOR CAN DECIDE IF THE PATIENT IS ELIGIBLE FOR THE TREATMENT. (SEE CHAPTER 2)



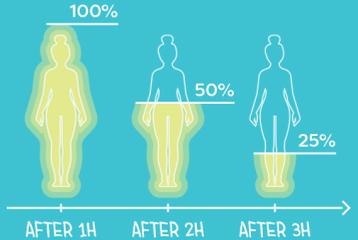
FOR THERAPY, WE WILL USE AGENTS INTENDED TO DESTROY CANCER CELLS WHILE MINIMIZING DAMAGE TO SURROUNDING TISSUES.
AFTER THERAPY, THE ADMINISTERED RADIOACTIVITY WILL GRADUALLY DECAY OVER THE FOLLOWING HOURS TO DAYS, DEPENDING ON THE NATURE OF THE PROCEDURE.

WILL I BE RADIOACTIVE WITH THIS TREATMENT?

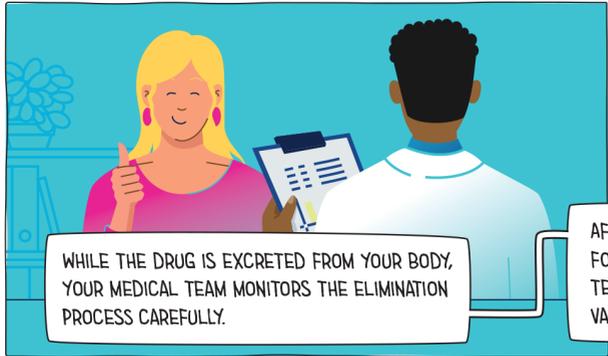


YES, BUT THE SUBSTANCES USED BY PHYSICIANS ARE DESIGNED TO DECAY QUICKLY, MEANING THE RADIOACTIVITY USUALLY CLEARS FROM YOUR SYSTEM WITHIN A FEW HOURS TO A FEW DAYS.

RADIOACTIVE SUBSTANCES LOSE THEIR ENERGY OVER TIME, AND IT'S MEASURED BY THEIR "HALF-LIFE": THE TIME IT TAKES FOR THE MATERIAL TO LOSE HALF OF ITS INITIAL RADIOACTIVITY.



Your Nuclear medicine physician will inform you about the half-life of the radioisotope you are being treated with.



WHILE THE DRUG IS EXCRETED FROM YOUR BODY, YOUR MEDICAL TEAM MONITORS THE ELIMINATION PROCESS CAREFULLY.



AFTER YOUR RADIATION LEVEL IS IN A SAFER RANGE FOR YOUR INTERACTION WITH OTHERS, THE MEDICAL TEAM WILL ALLOW YOU TO GO HOME. THIS TIME WILL VARY ACCORDING TO THE TREATMENT.



BUT IN THE FIRST DAYS, YOU WILL BE GUIDED TO FOLLOW SOME INSTRUCTIONS TO KEEP YOU AND YOUR LOVED ONES (INCLUDING YOUR FOUR-LEGGED FRIENDS) SAFE.



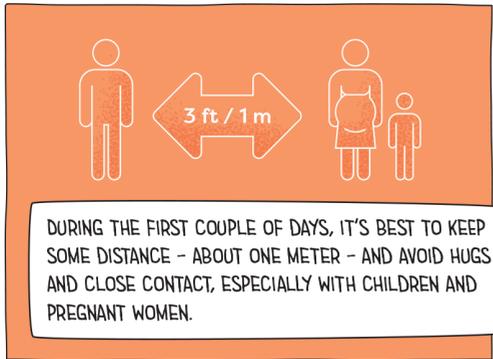
FOR EXAMPLE, STAY WELL-HYDRATED BY DRINKING PLENTY OF WATER AND URINATING FREQUENTLY.



MEN SHOULD SIT DOWN WHEN USING THE TOILET AND MAKING SURE TO CLEAN UP AFTERWARD.



WASH HANDS THOROUGHLY WITH SOAP AND WATER AND TAKE A DAILY SHOWER.



FOR SOME TIME DURING AND AFTER THE TREATMENT, YOU HAVE TO BE CAREFUL WITH YOUR CONTRACEPTION TO AVOID ANY RISKS.

DURING THE FIRST COUPLE OF DAYS, IT'S BEST TO KEEP SOME DISTANCE - ABOUT ONE METER - AND AVOID HUGS AND CLOSE CONTACT, ESPECIALLY WITH CHILDREN AND PREGNANT WOMEN.



KEEP IN MIND! THIS IS NOT AN EXHAUSTIVE LIST. YOUR MEDICAL TEAM WILL PROVIDE SPECIFIC RECOMMENDATIONS AND DETAILED GUIDANCE TAILORED TO YOUR SITUATION.



THERE YOU GO! YOU'VE LEARNED A LOT - AND NOW, I HOPE, YOU CAN FEEL MORE CONFIDENT AND COMFORTABLE WHEN IT COMES TO RADIOPHARMACEUTICALS



GLOSSARY

¹ RADIOACTIVE PRODUCT

A material that is physically unstable and transforms into a different material through a process called decay. During this transformation, it emits specific types of radiation (alpha or beta particles, gamma or X-rays).

² BIOLOGICAL TARGET

Specific molecules (called also proteins), found on the surface of (cancer) cells. These molecules play crucial roles in the cell's activities, such as growth, division, and nutrient transfer.

³ PROTEINS

Tiny building blocks that construct various parts of cells. They are essential for the structure and functioning of cells.

⁴ LIGAND

A chemical substance that can recognize and interact with certain large molecules on cell surfaces, such as receptors or enzymes (i.e., the biological target). This is the role played by one of the main characters: Mr. Bind.

⁵ RADIOPHARMACEUTICALS

A pharmaceutical form containing a radioactive substance combined with an active organic component (the vector). Depending on the type of radiation emitted, it can be used for diagnosing, staging diseases, monitoring treatments, or providing therapy in nuclear medicine. These pharmaceutical entities are illustrated here by the combination of Mr. Bind, and Dr. Dia (for diagnosis) and the combination of Mr. Bind and Dr. Thera (for therapy).

⁶ RADIATION

Energy that travels in form of waves or particles. There are four major types of radiation: α - (alpha), β - (beta), neutrons, and electromagnetic waves such as gamma or X-rays. Almost all natural products emit small amounts of radiation.

⁷ SCANNER

Medical imaging tool (e.g. X-rays, CT scans, PET scans, SPECT, MRI, etc.) enabling the visualization of the interior of a body based on the transmission (radiology) or emission of radiations (nuclear medicine).

⁸ SHORT-DISTANCE PARTICLES

A type of radiation emitted by radioactive substances. "Short-distance" means this radiation doesn't travel very far and loses its energy within a small volume.

⁹ RADIOACTIVITY

Property of certain atoms to emit particles spontaneously (electrons, protons, neutrons, nuclei) and/or energy (α - (alpha), β - (beta), gamma (γ -) or X-rays).

¹⁰ CYCLES OF INJECTION

For cancer treatments, like radiation therapy or chemotherapy, patients often receive multiple treatment sessions over several months. After a dose or combination of drugs is given, there's a rest period to allow the body to recover before the next treatment cycle begins.

SPECIAL THANKS

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Dr. Jeremie Calais, Dr. Richard Zimmermann, Dra. Cecilia Carreras Velazquez and Dr. Guilherme Rossi for their technical and scientific expertise and content revision;

Christophe Delarsille and Jacques Champagne for the conception and art direction;

And last but not least, Steven and Geraldine from Globule Bleu, for the design, illustration and realization.

This story is the result of the Oncidium foundation's hard work, creative brainstormings and great team spirit.

DISCLAIMER: The Oncidium foundation is not a team of physicians or healthcare experts and cannot advise on any specific clinical conditions.

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MY TREATMENT PLAN

Are you wondering what radiotheranostics are? Are you in contact with patients and wish to demonstrate how radiotheranostics work?

Discover the mission of Mister Bind and his companions and find out more about radiotheranostics for cancer care.

**WANT TO SEE MORE?
WATCH THE VIDEOS HERE**



**MORE INFORMATION
ABOUT RADIOTHERANOSTICS:**

oncidiumfoundation.org
contact@oncidium-life.org

