Title :Bio-medi English

What is radiation?

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🔊[00:00]

All right. Today radiation.

We're going to talk about radiation.

Radiation is something that is just like carbon it is all around us. Right?

We're being exposed to radiation all the time.

For example, right now in this room what kind of radiation is there in this room?

Then you tell me what kind of radiation is it in this room right now?

No idea?

What is radiation?

What does that mean?

Sometimes we think radiation we think it is a bad thing, right?

Oh radiation can hurt us.

Well, that's true.

Some radiation is harmful, but much of radiation that we're talking about is not harmful, right?

So what is it?

What is radiation?

Radiation is a process by which energy is emitted, that means sent out, so energy is released or sent out from something, and it travels through a medium or a space and then gets absorbed by something else.

Okay? Very basic.

Energy comes out and energy gets absorbed by something else.

Sometimes that energy is very strong, and it can change the thing that is absorbing it.

And that if it is a human being if it changes our molecules or changes something inside of us, then it can mutate us, change our DNA.

Not good, right?

Maybe the mutation is very good

If you watch TV, watch movies, maybe you watch the X-man movie, right?

X-man? Are you familiar? What are X-man?

What does that mean if you're in X-man?

What happen to your body? You have a mutation, right?

You're a mutant.

[03:00]

If you're exposed the high levels of radiation, it can make a mutation.

All right? That would be bad.

Some mutation can be good however.

Anyway, today we're just talking about different types of radiation.

There is ionizing radiation.

And there is non-ionizing radiation.

What does that mean?

Well, that's why I gave you vocabulary.

What is ion?

You can see, ion you probably know, ion is admole molecules with total number of electrons it is not equal to number of protons.

Therefore, you're going to get a positive charge or negative charge molecule.

Today we're going to be talking about ion and ionizing material, and today we are talking about ionizing radiation.

What is this symbol?

Alpha, Beta, Gamma.

Three types of ionizing radiation.

So ionizing radiation. What does that mean?

What does Alpha, Beta, Gamma radiation is ionizing, what does that mean?

(Student speaking)

Captain and Anion?

What do you mean?

(Student speaking)

Okay I think you're getting there.

This type of radiation has enough power, enough energy to knock electron of molecule.

Changing it, changing the charge of the molecule and making that thing unstable or if you look your vocabulary again, radioactive, Okay?

Radioactivity what is that?

Today we're going to talk about radioactivity.

Radioactivity particles which are emitted from nuclei as a result of nuclear instability.

[06:08]

So instability. Today we're going to be talking about instability.

Not stable. Something that is not stable.

If nucleus is not stable, then it is going to break down or decay, okay?

It gets rid of parts of that are going to decay, so it is breaking down, it is releasing some energy.

When we have an alpha decay or alpha radiation, it releases an alpha particle.

Alpha particle, you can see here. This is a helium particle.

Beta? What is beta radiation released?

It releases tiny particles, tiny electrons moving very quickly, and gamma is releasing energy, form of energy, and very short wavelength.

All of this is ionizing radiation, it can change molecules.

Non ionizing radiation is radiation that cannot change molecules.

That's not powerful enough or strong enough to change molecules.

This type of radiation is neutron radiation, electromagnetic radiation, for example X-rays.

Light is around us all the time that is radiation.

Thermal. What is Thermal means?

수현?

I already called on you. 세라?

What is thermal mean?

In the winter time, people wear thermal underwear.

(Student speaking)

Good, keeps you warm. Thermal something is, thermal, keeping you warm.

So thermal is talking about heat.

In this room, our bodies are taking in heat.

Heat is released from heater, okay?

And that heat travels through the air, and it enters to out body. That's the type of radiation.

Okay.

The other is one black body radiation, which is radiation that absorbs everything that goes into it.

It gives off something and also absorbed, so the color it is completely black.

[09:01]

Here is more information showing you this, different types of ionizing radiation.

We talked about alpha radiation.

You can see the atom decays into a new atom.

Here we have an unstable nucleus.

Unstable meaning, this is radioactive. Okay.

So it changes into, the nucleus changes and it releases the alpha particle.

What is an alpha particle?

Alpha particle. Two protons and two neutrons.

And if you know the elements, what element is number two?

Helium, Helium is number two.

This is a helium atom. Alpha is when a helium atom is released from the molecule.

Okay.

Helium beta, same.

We have an unstable nucleus, okay? Radioactive.

So nucleus changes what is emitted or what is let out is you can see.

The new atom by changing into a neutron and into a proton and electron.

The electron is called beta particle, very fast moving, very high energy.

The last is gamma radiation, again, we have unstable nucleus.

Nucleus changes.

Here we have what is emitted either alpha particle or beta particle can be emitted and then gamma is… energy, surplus energy, extra energy, is sometimes emitted and this is called gamma radiation has a very high frequency with a short wavelength.

High frequency happening many times, and it can travel through paper, it can travel through steel and sometimes can travel even through lead.

Alpha particles have very low frequency. Okay?

High energy, low frequency.

So alpha because of the low frequency can be blocked by even paper or it can be blocked by our skin.

Beta is a little bit high frequency than alpha.

It can travel through paper but it is stopped by aluminum.

Which type of radiation is the most dangerous to humans?

(Student speaking)

Why?

[12:03]

Okay, you're right, gamma.

It is very, we can see here pretty easily.

Our skin can stop alpha radiation beta radiation is little bit stronger, as far as being able to travel but gamma can enter our bodies, right?

And it can, if it is strong enough to can affect molecules inside of us, so we have to be careful, we are talking about gamma radiation, different types of gamma radiation.

Today during lecture we're going to talking about the benefits of radiation and the ways that we use radiation every day.

Radiation is something we use every day.

Many things that you do during your day.

You're probably not even thinking about how radiation is involved with those things.

Okay, so some of the things if you look at the overview right now, radiation has only been known about since 1890s so about 110 years not a very long time.

But scientists have developed many uses for radiation and many of these uses are for our benefits, benefit humans.

Radiation is used in many different fields of study.

Science, medicine, industry, or production.

Also generating electricity.

We need electricity to live, right?

Everything we do.

So radiation helps generate this electricity.

It has useful applications for areas like agriculture, medicine, space exploration, engineering, architecture, industry in manufacturing, government, geology, ecology and education.

Today we're going to talk about those different parts how we radiation is involved in these with all these different mediums, okay.

Radiation is used by doctors to diagnose illness.

It helps archeologist find the age of ancient artifacts.

Artifacts, what is an artifact?

What does ancient mean?

Long time ago.

Ancient artifacts, so when we find these things, when we find old things, how do we know?

How old is this chopstick that I found?

[15:03]

Or how old is this hairpin?

Right, we're going to talk about today.

They're able through radiation to tell the age of these items.

Electricity is produced by nuclear fusion which is splitting the atom and reliable source of electricity is needed to give us light, help groom us, feed us, groom us that means it does keep us clean.

And keep our homes and businesses running.

And we can see here many of the uses that we use right now.

Diagnose and treat illnesses.

Who can give an example for what is an illness or sickness that we treat with radiation?

How about you?

What is a sickness someone gets sick and that treated with radiation?

What sickness?

You don't know English?

What is 암?

Cancer!

People get cancer and they get radiation treatment, right?

The radiation is sent into their bodies to try change those cells, try to change the cells, make it break down and kill it, okay?

Those cells have a harder time renewing themselves and help these cells are able to withstand the radiation and become healthy again.

Also radiation is used to kill bacteria and preserve food without chemicals and refrigeration.

Good example of this.

Many of you probably go to E-mart, you go to E-mart or you go to different restaurants and you're thirsty.

But the water is self-service.

So you go over to a little box, right?

Metal box.

Looking in the box what do you see?

A light, what color?

Blue? Or what's the another kind of purplish, right?

What's another name of purple?

Begin to with V.

Violets.

Ultraviolet light.

Ultraviolet light is used to make things clean, to kill germs.

So when you open that little case at E-mart, and get your cup out it is going to be sanitary, it is going to be clean.

[17:57]

Those lights are used to keep it clean.

Do the lights make your cup radioactive?

Do they change the property of the cup?

No!

So you can see the radiation doesn't change the cup, doesn't make the cup dangerous for you.

But it does kill bacteria and germs.

So radiation is very convenient for us some way.

Radiation allows us to process sludge which is a mix of dirty and rock for fertilizer and soil conditioner.

It helps us locate underground natural resources.

For example, petroleum, we talked about last week, and oil.

Helps us make smoke detectors, act your house, right?

If you get the fire in your house, beep beep you get some warning, well there is radioactive material inside your smoke detector.

It helps us make things like non stick fry pans and ice cream.

It helps grow stronger crops for agricultural use.

Satellites!

Satellites that's are on the space.

You have to think radiation.

Radiation is what gives them a power.

It provides electrical needs for space labs, helps us design tools, techniques, and equipment and measure air pollution.

Last week, we talked about CO2 in the atmosphere.

We can measure that using radiation.

And we talked about the age of things.

How old is something?

Radiation can help prove the age of artwork and help determine authenticity.

Authenticity, is it true or is it fake?

Sometimes, people try to fake criminals we try to fake a picture, like a Davinch's something, Davinch might have done, she tried to make a fake copy.

But through using radiation, we can test see if those materials are really from a long time ago or from modern times.

So radiation can help us with these things.

Through this lesson, you are going to be introduced biological effects of radiation.

The intension of this lesson today is to make you aware of the benefits of radiation as well as some of the hazards or dangers and help informed you about regulating radioactive materials.

When we finish with this lesson, I hope that you can talk about radiation used in science, used in industry, and used in medicine already we talked about them a little.

[21:05]

And identify different man-made radiation sources that result in exposure to the public.

Okay, we start reading here, the backgrounder, and before we start reading, I talked about an exposure to radiation.

Exposure to radiation there is natural radiation, of course, and there is man-made radiation.

We'll just talking about that.

Natural radiation, everyone of us is exposed to natural radiation because natural radiation can come from where?

The sun!

Right, the light from the sun or from the stars or from up in space.

The earth is constantly being hit with radiation from space, right?

So this radiation can be beta usually beta, or gamma radiation.

So you can see some of that radiation can be dangerous.

The sun, huge energy source sending down many different kinds of light, okay?

And some of the light can be bad for us.

If you stay up in the sun, what happen to your skin?

Yeah, you can get a sunburn, you can also pick up things radiation is bad for you and you can get skin cancer, right?

So we know that some of the radiation from cosmic sources can be very dangerous for us.

Also those radiation on the earth.

Terrestrial radiation.

Terrestrial meaning the ground, okay?

So in soil, water, or vegetation you can find things like uranium which is dangerous and thorium which can be dangerous.

Both of these are radioactive icetobes.

Internal radiation, internal.

What does internal mean?

Internal means inside of us.

All of us here today have radioactive icetobes in our bodies.

One of them is carbon, carbon-14.

Carbon-14 is radioactive icetobes of carbon.

What is an icetobes, what does it mean?

[24:10]

은선! Can you read what is an icetobe?

Your vocabulary page.

(Student speaking)

Different types of atom of the same element.

So carbon, how many neutrons does stable carbon have?

How many?

Twelve!

But carbon-14 has 14, okay?

And that's what makes it unstable.

Carbon-14 can decay, send out radiation.

Okay!

So we have natural radiation and then we have man-made radiation.

Man-made radiation, medical X-rays we talked about this, electromagnetic radiation.

There is radiation that comes from tobacco.

We know tobacco is the stuff which is in cigarettes, right?

You're a cigarette smoker if you smoke your cigarette your whole life, what can happen?

Many people get cancer, lung cancer. Right?

So smoking, why did they get lung cancer? Because there is radiation you can get from tobacco.

Televisions.

We talked about smoke detectors, combustible fuels like gas and coral and oil.

Burning those fuels produces radiation.

Nuclear medicine, and building materials.

Maybe 30-40 years ago, many materials they're using to build buildings very radioactive, very dangerous.

Does anybody know the material, asbestos?

I don't know the Korean word.

Anyway, asbestos was material used in building.

And the workers had to, people who worked making buildings, building these buildings, would be using these material asbestos to put in.

And it would stick on their clothes and stick under their skin, and it was very highly radioactive.

And a lot of these workers would get very sick.

They had to be treated in hospital.

[27:04]

So now we're starting to be more careful and we're learning more about this radioactive asbestos and keeping them out of building materials.

All of you are very familiar with lead in your pencils.

That is dangerous for us if you're ingested because it is radioactive.

So anyway this is man-made radiation can be harmful for us.

Different types of radioactive materials.

So all of this radiation how much of it is going to you? How much are you getting?

Well, you can see much of the radiation that we're received of course is natural radiation.

We get that from Radon 55% of radiation we get is comes from the cosmic sources.

Radiation that is already in our bodies 11%.

Radiation in the ground is 8%.

Cosmic radiation coming from the sun or stars.

And then you can see other types of radiation. Man made radiation.

The most radiation we received from man-made radiation is medical X-rays going to the doctor.

In Korea I notice the doctors are very quick to give an X-ray here.

I think more quick than in America.

If I go to the doctor and say “I have some back pain and X-ray, go to the X-ray,” “oh my fingers hurt and X-ray” without even looking.

So too many X-rays.

Is that good for you?

I just wonder here and question to think about for tonight.

Nuclear medicine 4%.

Things that we consume, products, for example wrist watch.

Some watches that you wear on your wrist can give out radiation.

We know smoke detectors.

So we can see the percentages here.

82% is from natural sources and wow only 8% is man-made.

But the last if you can make this last, you’re going to be helped your person.

Let’s start reading backgrounder.

Let’s start with you. Backgrounder.

While the earth…

(Student speaking)

[30:39]

Okay.

That’s what I was telling you about before.

The other people who are get a high explosion I told you.

People that are working in places that use radiation.

So people who work at nuclear power plants, people that are X-ray technicians, right?

People that give you the X-ray. They have to be very careful because they’re constantly being exposed to this radioactive materials.

Okay, very good.

Let’s go into radiation and medicine.

Next reader.

(Student speaking)

Ok, very good. X-rays.

Have you heard about x-ray, right?

What can we see when we look at x-ray?

You can see the bone, right? Why?

The x-ray can go through the bone.

X-ray can go through your skin.

They go through the soft material, but they can go through the bone.

They can go through the dense materials.

so if you have an accident, something hard in your head, like this rock in homer's head, x-ray can go through it, right?

So you can see this hard, dense thing. ok?

Like the saying in the book, it is like shining a light through a paper.

Your fingers are in the other side.

[33:01]

Sometimes you can see a finger through the paper because the light travels through the paper.

But it is not going through your finger.

X-ray is the same thing.

X-ray is very useful. We can see if there's a problem with your bone, you have a break, I broke my finger in America five years ago.

And I didn't go to a hospital quickly enough, so when I got back to Korea they looked at it and they said we have to put a screw into your bone.

Because it is separated.

So they put a screw in and now I get a x-ray of my hand, what can I see?

You can see very closely it is a screw.

You can see a screw going through because screw is hard, but now it is no problem, ok!

Next!

(Student speaking)

So now we know why they use x-ray and now with a technology we have machines we hook up these x-ray machines to computers.

And then we can take many x-rays from different angles very quickly, called CT scan or CAT stan.

What happens is you get into a CAT machine, and you hear this wirring, and the machine goes around your body part, maybe it is your head.

What is it doing?

It is taking x-ray from many different angles.

And then, they can get very good picture of that, because it is insection.

Here you can see someone's head.

This person had stroke.

They had to do the CT scan.

They want to look at where's the problem.

What's the problem?

CT scan shows because there's so many x-rays going through.

It will show you the shape of soft part, internal organs.

You can see the person's brain. you see.

Here's the damage! depending on what section they are looking at, they can find exactly where's the damages.

Also they can tell types of problem.

Is it a hemologic stroke? or is it ischemic stroke?

Two different types of stroke.

[36:14]

Ok. You can see here!

So, this type of radiation have saved thousands of people's lives and what's so good about it?

Long time ago, if you go to the doctor and said oh, I have a headache.

Um.. well,let's cut your head and open and see what the problem is.

Well, we didn't have that technology, right? we didn't know how to use radiation. right?

And they didn't know how to do.

Where's the pain? Oh, here? Ok?

They didn't know what they were really looking for.

So now we didn't have to cut, open the person's body.

We use radiation without even opening you up.

It is very useful. Ok, Good! Next!

(Student speaking)

We talked about cancer.

[39:00]

Cancer is one of the most dangerous diseases, right?

Cancer is life threatening.

But if we find quickly enough, radiation can be used to kill those cells and stop them from growing and spreading.

How does it work?

What can we do?

What are we doing with medicine?

They administer that means they give people some of radioactive materials.

They injected it or they put it into the bodies, ok?

This radioactive substance is going to put into the right area.

The problem is maybe your pancreas or your kidneys or your thyroid, or your liver or your brain and when this radioactive material put in, it is breaking down, so they can track it.

And they can see what's the damage inside your body by following particles through your body.

One of the radioactive isotope that they are using is procedures iodine.

We are going to talking about it.

Ok? Next! Radiation and science!

(Student speaking)

Very good. ok? Radiation and science! well.

We talked about medicine how radiation is used in medicine?

Radiation and science is used in the same ways to tell us what things are passing through plants, just like radiation going through the body in medical x-rays.

What things are passing through plants, animals.

What things are in the environment?

What things in the atmosphere? Ok?

Testing pollution. What types of pollution are in the air?

All this can be done using radioactive materials. Ok?

It helps us to learn more about what soils are good for plants.

[42:05]

If they can put radioactive material inside the plant they can read.

If they're not doing well, maybe the plant is dying or sick, they can radioactive material inside the plant and find out what's inside these plants.

What minerals making these plants sick, ok?

And then what minerals are making these plant sick, ok? and then what minerals are making these plants healthy! ok?

That's how radiation is used for plants.

Also radiation can be put into the ground.

Can go through the ground and they identify sources of fuel, natural gas, petroleum, coal.

Ok?

Because we can track the radiation material going through the earth.

We can tell us how the size of these oil fields, or the size of these natural gas deposits.

And ocean currents, current meaning the direction of water, so using radioactive materials we can find, track or follow ocean currents.

And that's how we know about ocean currents. we have on earth today, ok? next! finding the ages of things.

We talked about how they did that using this radioactive isotopes of carbon. carbon 14?

Last week, we talked about every living things we have carbon, right?

15% of your body weights is carbon.

A small amount of that carbon is carbon-14, which is radioactive isotopes of carbon, ok?

Well, what's happening is c-14 is also in the atmosphere.

Because cosmic rays from the sun change particles in the atmosphere and change some of the carbon to the radioactive carbon-14.

[45:11]

So you can see what's happening in the saying is that, when things die, the carbon, they don't take carbon anymore. ok? when you die, there's no more carbon intake.

What happens, though, c-14 in your body is decayed, radioactive decay which is releasing particle, and counting.

This particle, when things died we can tell how old something was.

It takes a very long time for carbon to come out of your body.

So testing amount of carbon in your body or in this dead organisms, we can find out pretty exactly how old that object is, ok?

And what's it called? Carbon-dating. all right?

Carbon dating, not dating like going out and meeting some boys, found out how old something is.

Okay. Let's go to radioactive help to solve crime.

Next reader?

(Student speaking)

Okay. Great.

We already read that part, didn't we?

Very good. Carbon dating.

Told you we're going to radiation have solved the crimes.

[48:14]

(Student speaking)

Do you watch CSI?

Do you know CSI?

You know that show?

What do they do on that TV show?

They find things.

Why?

What happened usually?

What is their job?

What is their job, CSI?

Scientific investigators.

They are investigating so they find clues, right?

There is some crime, CSI very amazing show because whenever there is crime they seem to find many clues, right?

Oh look at this, a piece of skin.

Alright... or always they happen to find some amazing clue, right?

Okay they find these clues... what do they do?

They have to test it, right?

They are going to test it.

Much of this testing is done using radiation exposing this product to radiation and then being able to read exactly the genetic makeup of this item.

Pulling out different things that makeup this item, okay.

Next reader.

If material...

(Student speaking)

Very good.

Okay, good job.

So what they do is they find some material.

Okay.

Let's say for example this salt shaker, okay.

They expose the materials to radiation.

Neutron fields, okay?

Neutron radiation.

What happen is some of these neutrons are picked up, okay?

Taking in these molecules which changes the molecule makes it unstable, makes it radioactive.

And so when it becomes radioactive it picks up one of these neutrons, you see here sodium usually 23 stable molecule but when it picks up the neutron it is going to be unstable it is going to be radioactive.

[51:10]

And so what happens is that over time it is going to emit some energy or emit a signal.

A gamma ray, okay?

Gamma radiation and they can measure this and by measuring it they can find out exactly what this material is made up of, okay?

All right.

Next reader.

(Students speaking)

Okay, good.

So this process you see CSI when they do this or investigators or scientific investigators when they are testing these types of materials using this type of radiation is called activation analysis.

And this is what is also used when we talked about paintings or art work they are testing it to see if it is true or it is a fake.

They use this type of radiation technique, okay.

Radiation in industry.

Next reader.

(Students speaking)

Making them radio active...

Okay, very good.

We talked about this little bit already.

Radiation used to kill germs, and this type of radiation can be used on food or on water cups we talked about, okay?

What's amazing about it, what's good about this radiation, is that killing the germs, killing bacteria or fungi or other micro organisms, and it is not changing the property of that thing.

It is not making the food radioactive, and it is not changing anything about that food except for killing these germs.

That's very useful.

[54:04]

It doesn't make it harmful, and it doesn't make it radioactive.

Only it kills the germs. Very good for us.

So what is it also do? It takes longer for the food to decay or go bad.

So if you have bananas, you like bananas, oh I love the bananas.

You go to the stores and you buy some bananas that are not treated with radiation they're going to spoil more quickly than bananas that are treated with radiation for example.

So helping us save time and save energy.

Also in hospitals the doctors they want to keep their tools clean.

Well, they have to keep to it in chemicals and they have to clean it, they have to wipe it, takes a lot of time and energy.

And a little bit expensive.

Using radiation now, we can keep the tool sterilized or clean without having to use chemicals, without using heat.

They have to heat it up very much to make kill the germs.

Radiation can do this without all the extra work.

Okay. In the future, they're hoping that we can disinfect water or kill germs that are in the sewage when you flush the toilet.

There are a lot of germs in there.

Right now we're talking about radiation and industry, radiation and production.

We talked about radiation X-rays that can be used to sterilize food, sterilize hospital equipment, clean medical equipment, disinfect water, and treat sewage water.

Sewage under the ground.

Bad smell?

Okay, continue, where are we reading?

Good.

For example…

(Student speaking)

[57:04]

If something is sterilized, that means it is completely clean of any germs or anything that are going to be harmful.

If you talked about a person or an animal is sterilized, you know what that mean?

If an animal is sterile, that means it can't have babies, can't produce babies.

So not good to be sterile if you're a woman because or a man… because then, well it depends on what you want, if you want to have a children, being sterile is a problem. Because you can't not…

Here sterilized means completely clean.

Okay, Next?

(Student speaking)

Okay, we talked about ultraviolet light.

The light that purple light you see to disinfect things.

It is going to be used in the future, hopefully more and more in the future, you're going to see ultraviolet light being use to disinfect maybe the water that you drink.

In Korea right now the water from your faucet in your house, it is not so clean. Right?

So many people you have to buy some special machine to clean your water.

In the future, maybe that would be changed.

Also you go swimming. If you like to go swimming, you go to a swimming pool.

And you swim, swim, swim and you get done and when you go home and look into the mirror and look at your eyes.

What do you notice? What color are they? They're little red.

My sons, I have two sons they love water. They love swimming.

They swim in the pool and drinking the water and opening their eyes.

I don't like that.

It is not so good.

I want them to learn swimming.

They get done, and “Dad, papa, why my eyes are so red?

What is making their eyes red? What is in the water?

You’re already answering. So let’s see.

What chemical is in the water? 안나?

[01:00:13]

In the reading. Says in the reading.

Chlorine.

Chlorine is in the water.

Chlorine, Is that a good chemical?

In the reading here says it is toxic.

What is toxic mean? Poisonous.

It is really dangerous chemical actually.

If you drink too much of it or exposed too much of chorine, you can get really really sick.

Chlorine is very toxic.

So what we’re going to do, hopefully in the future, we can treat this water in swimming pools with radiation.

And radiation will kill all the germs; and then we don’t have to worry about getting red eyes, your hair. When you go swimming a long time, it is dry and it looks not nice.

So people don’t want to go swimming.

Radiation can solve that problem.

Continue, Next reading?

(Student speaking)

Good.

Okay, agriculture we talked about.

It improves food production. It can make food last longer time and we can make plants stronger. So it is very good for agriculture and that our plants.

Also it can control insects. These days farmers, they grow their 고추, or 감자, or 쌀, rice. What did they do to protect that from insects they're trying to eat it?

Pesticids.

They use pesticides. Pesticides are chemicals right?

Chemicals are very toxic for the pest for the insects. They kill the insects if they eat it.

So pesticide. Cid mean die and pest mean bug.

[01:03:02]

But the pesticide kills the bugs, but are pesticide good for humans?

No, they're not.

That's why if you go to the supermarket and you buy vegetables or fruits. Don't just pick it up and eat it. I don't suggest.

Even they maybe cleaned a little bit. You want to clean it completely.

Because pesticides are toxic chemicals and if you take too many it can make us sick.

Hopefully in the future, radiation can be used on these crops, this 감자, or the 고추, you can use radiation and that can make the plants safe from insects.

Insects don't want to touch it.

Another way is by gathering insects exposing that insects to radiation which makes them sterile.

So they can't have babies.

And if we can make the insects sterile; then they can't reproduce, they can't have babies, and it controls the amount of insects, so there's two ways radiation can help agriculture with insects.

Okay. Continue. Next read

(Student speaking)

Okay good.

Engineers. Right. Engineers use radiation too.

Engineers that design buildings, we talked about architecture, architecture means making buildings.

And in Korea you see many buildings. Many, right now here at Chung-nam there, constructing buildings.

What material do they use to make these buildings?

In Korea what is the...

(Student speaking)

Cement right? Cement.

Cement is a very good, very good material. Very strong, and it also can, has the ability to move a little bit okay?

So it is a very good building material, one of the best, but cement needs to be perfectly... mixed, right?

[01:06:03]

Because if it is not, it can have some defects, some problems.

And then, cement is very dangerous if you build with it because if one part is not as strong as another part, you're going to have a building that is weak, and maybe fall down.

Okay.

So how do they test this cement to find out if it is perfectly mixed? Or to find out if there's any defects or problems?

Radiation.

And in here, she was reading radiography.

Radiography is what they use, and radiography is very similar to x-rays, like an x-ray machine.

It sends radiation into the material, building material, and it can tell them if there's any problems any defects, any cracks or problems in the material.

So, it is very useful for engineers.

Also, like they're saying, it can measure how thick the material is. Okay?

Without having to drill into the material, they can put radiation and see Ah, the thickness.

All right? Good.

Also engineers car, working on automobiles, engines, car engines.

You have a problem with your car, you bring it to the car engineer.

"There's a problem, I'm not sure." Okay,

Taking apart in engine is a very, very long job and also it can take a lot of time, energy, and maybe they don't find the problem.

So they use radiation, and by using radiation they can trace a path through your engine and find out where the problem is without having to take it apart. Okay?

So the radiation can save us a lot of time and a lot of money. Okay?

Next?

(Student speaking)

Very good. Okay?

So just kind of an ending here.

You can see, we talked about uranium.

Uranium is used to produce electricity.

Uranium is a radioactive isotope, a radio-active product, and it is used for producing electricity, much of the electricity that we use here on earth. Okay?

Also, radioactive materials help power up satellites, we talked about that.

We have satellites up in space far far from our planet earth that are gathering information, collecting samples.

Power we're giving to these satellites, most of the powers from the sun, but also from radiation. Okay?

We can send, radiation can travel through for a long, long time right?

Because it is waves, okay?

So we can send these radiation up into the space to power our satellites that are far from earth.

Also, giving electricity to space stations. Stations in space, okay?

We talked about cleaning up pollutants.

Pollution from factories, pollution in our atmosphere.

In here it is talking some different pollutants.

Sulfur dioxide, nitrogen dioxide, okay?

These chemicals are bad, so electron beam radiation is used to break up these dangerous gases and return the particles into the atmosphere and clean up the air that we breathe.

So as you can see, radiation and radio-active materials, they play a big role, a very significant role in our lives.

We use all the time right?

From the food that we eat, to the treatment that we get in the hospitals, okay?

To our cars, and our buildings.

All of this is made safe for us through the help of radiation.

The last part in the reading here is giving an example of a normal family, a family's normal day routine.

And it talks about all the different parts, all the different things that happen with radiation how they're exposed to radiation.

So I will read just listen.

Dad gets up in the morning and puts on a clean T-shirt.

His polyester cotton blend shirt is made from chemically treated fabric that has been eradiated, eradiated meaning treated with radiation.

Before being exposed to the soil releasing agent, the radiation makes the chemicals bind to the fabric, keeping its shirt pressed and fresh all day.

[01:12:05]

The shirt is not radioactive.

Okay.

So radiation is used to put chemicals on your clothing and those chemicals, when they use radiation, stick onto your clothes.

And what is the purpose?

Well it keeps your shirt nice and clean, dirt can't stick onto them as easily, okay?

And it also keeps them without getting wrinkled, so they don't get wrinkled okay.

So radiation is used for clothes. All right.

In the kitchen, Jenny is frying an egg.

That non-sticking pan she is using has been treated with gamma rays, and the thickness of the egg shell was measured by a gauge containing radioactive material before going into the egg carton.

Thin breakable eggs were screened out. Okay.

So the daughter is in the kitchen, she's frying an egg.

The fry pan that she uses, you know in Korea you have Tefal, very good material.

How do they make these Tefal pans that are so stick free?

You want to cook an egg, when I was young, my parents had a fry pan and you cook an egg you have to use a lot of oil, if you don't use oil, you try to get the egg... Oh no. Terrible, big mess.

But now we have Tefal. How did they make that?

Well, using radiation.

Radiation helps products that chemicals stick onto the pan, okay, and then you can cook an egg without any butter or any oil, right?

So making it more healthy for you to eat.

Also the eggs, eggs have shells, and eggs are natural so sometimes the shells are not as thick as other shells.

How can they measure how thick something is? Well we already talked about, right?

Radiography, how it can measure the thickness, so radiation is used to measure the thickness.

So all the eggs are the same.

But unfortunately, I love to eat eggs,

I eat three eggs every morning at least, okay? That's my breakfast, three raw eggs.

But my wife she says, you eat so many eggs.

So she buys me the cheap eggs. I get the cheapest eggs.

[01:15:00]

So I think my eggs are not treated with the radiation they don't measure because sometimes my eggs, I try to break it, and I have to hit three four times finally and other time.....

Right? So, my wife...very cheap eggs.

Radioactive, I need the measure.

I need my eggs to be measured.

Okay. The turkey mom is taking out of the refrigerator for tonight's dinner was covered with eradiated polyethylene shrink wrap.

Once polyethylene has been eradiated, it can be heated above its usually melting point.

And wrapped around the turkey to provide an air-tight cover. Okay.

These products, polyethylene, is like a clear plastic right?

You've seen it before you cover your food with it. Okay

But that plastic has been treated with radiation.

And the radiation, what it does, is it makes it stronger, it makes the plastic stronger and it makes it...it makes the melting point, for example plastic if you heat it up, it melts at a pretty low temperature.

But treated with radiation, it can raise the melting point. Okay?

And it can also make it more air tight, so air can't get in.

So we protect our food with it.

Just here in Dae-jun there are many companies that work with products like this.

For example, do you know SK Energy? Which is in...near Expo apartments.

What's the name of that?...Okay.

Anyway, at that company, they work with products like this, where they use radiation to make things better, so they're constantly improving.

If we can make the melting point higher, if we can make this more air-tight okay?

So they're making products better and better using radiation. Okay?

As dad drives to work, he passes reflective signs that have been treated with radioactive tritium and phosphorescent paint.

During lunch, brother Bob has some ice cream.

The amount of air whipped into the ice cream was measured by radio isotopic gauge.

After you and your family return home this evening, some of you may have soda and others may sit and relax.

Nuclear science is at work here.

[01:18:00]

A soda bottle was carefully filled with a radiation detector prevented spill over, and your family is safe at home because of the ionizing smoke detector using a tiny bit of americium 241 will keep watch over you while you sleep.

So many of the things that you are using today, so many of the things that you see, street signs, ice cream, we talked about smoke detectors, all these things are thinks to radiation right?

So many good uses of radiation but we also have to be a little careful, right?

Because ionizing radiation that can change our molecules is very dangerous for us if we get too much.

So if we protect ourselves from dangerous radiation, but we understand the benefits of radiation; then we are going to be much happier and have much easier lives.

Okay guys that is it. Thank you for listening.

Your homework, you have five questions on the back of your vocabulary.

These questions... can be answered from the lecture material that you have.

Number 4, the fourth question, is an opinion, Okay?

That's your opinion, talking about medical X-rays.

Now, I told you in Korea they tend to give X-rays very easily.

I don't know that's their thing here.

Do you think that the extra radiation you receive which is about 40 millirems per year, every time you get an X-ray, this is the amount of radiation that your body is receiving.

So, if you get many X-rays, do you think getting all these X-ray is better than not getting them? Okay?

Do you understand?

So that's your opinion. So just tell your opinion and explain a little bit.

And.....everything else I think you can answer from the today's lecture.