Funding for Yale Cancer Answers is provided by Smilow Cancer Hospital.

Welcome to Yale Cancer Answers with doctor Anees Chagpar.

Yale Cancer Answers features the latest information on cancer care by welcoming oncologists and specialists who are on the forefront of the battle to fight cancer.

This week, it’s a conversation about research into carcinogens in our drinking water with Doctor Vasilis Vasiliou.

Doctor Vasilou is department chair and Susan Dwight Bliss Professor of Epidemiology and Environmental Health Sciences at the Yale School of Medicine.
where Doctor Chagpar is a professor of surgical oncology.

So maybe we can start off by you telling us a little bit more about yourself and what it is you do.

Thank you very much. I’m by training an environmental toxicologist and we’re looking for environmentally induced disease, which are conditions essentially caused by external factors. This factor could include chemical or natural, as you said, water, biological, physical and psychological events that individuals are exposed to in their surroundings.
One of the things that we have, launched is we have been awarded by the National Institute of Environmental Health Sciences to have the Yale Superfund Center, which is focused on what we call emerging contaminants and those are chemicals of concern which are not regulated by the federal or the state government and it could be present in our water. Now there are implications, there are health implications of the presence of these chemicals in our water. And this is what we’re studying.
We're trying to find if they are indeed causing issues in human health and how we can really mitigate those chemicals from our drinking water. That is really concerning. I'm sure everybody who is listening is very concerned about our drinking water. We tend to take it for granted that living in a first world nation, we have clean drinking water that certainly would not cause us harm. So the concept that there may be chemicals that may induce cancer in our drinking water is certainly concerning. So can you talk a little bit more
about how you stumbled into this research and what you found so far?

Does the public have a need to be concerned, particularly when you say that these are not regulated by our state or federal governments?

Well the one that we are studying is a chemical called 1,4-dioxane, which is used as a stabilizer of other solvents.

The problem with this chemical is it cannot be filtered and it's also can be found in our household items such as detergents, shampoos and so on.

so eventually it'll end up into
the water table and eventually can end up in our drinking water. That’s the bad news. And the bad news also about this compound is what we call a possible human carcinogen, which means that there are studies in animals that confirm that this is carcinogens. However, there are not epidemiological studies to confirm that this chemical causes cancer in humans. So this is what we’re trying to get an answer about. And so we’re conducting studies in
animal models to find the mechanism by which can cause cancer in the animals. So we can find ways to develop biomarkers for human exposures. And at the same time, especially with our center, we’re trying to figure out if people are exposed to this. And for the area of Connecticut, actually we’re very good today. We don’t have that much of 1-4 dioxide in the drinking water. I would say almost nothing. However,
there are areas in United States that there are considerable levels of 1-4 dioxin in the drinking water. Now remember that this can be filtered only with expensive settings of what we called reverse osmosis which is really not affordable especially when people have wells and this systems cost between 6 and $10,000. So Long Island, for example, in New York and this an area that they had really high levels 1-4 dioxin in their waters. However, with all the efforts and this
00:05:10.670 --> 00:05:12.880 is why people should be feeling much better with the efforts of the state of New York, they have put big reverse osmosis on municipal wells where the public water comes from. So we have seen that in the last couple of years the water quality in the areas that used to be high levels of 1-4 dioxin is getting clean. But we still have other areas. For example, we have been contacted by Michigan, Ann Arbor,
Florida, that they have areas that they still have really high levels of this chemical.

Now the other thing I want to tell you is in addition to 1-4 dioxane, there are some other chemicals that everybody knows. You probably have heard of what we call the PFAS, the perfluorinated organic molecules that are present in your Teflon cookware and also on your clothing. These are man made chemicals that are present in your Teflon cookware and also on your clothing. And this has existed for many many years.
And the problem with these chemicals is they are very persistent in our body. So once they get to our body, it can be very difficult to be removed from our body. Actually the monumental thing is that about one week ago the EPA, the Environmental Protection Agency really put the regulatory issues for six of these compounds. However, the problem is there about 9000 of these compounds and this is a major issue. So in addition to 1-4 dioxin, you have the PFAS where they are just starting to be regulated.
However, the PFAS they’re everywhere. They are in Connecticut, throughout the United States, throughout the world. And this was because it was produced to generate fire resistant clothes, and stuff like that. So just a few questions to kind of go over some of the things that you’ve told us. So if these PFAS, we know that they are carcinogenic, is that right? Yes, we do. And so if they’re everywhere and they’re very difficult to get out of your body, do you really think that in the short
term there will be any impact in terms of regulation actually causing a reduction in cancer rates that are secondary to these PFAS molecules? Because, if I was exposed to PFAS using Teflon cookware in my younger years, and it’s very difficult to get out of the body, is the damage already done? I mean, is there any hope? Well, there is plenty of hope actually. Remember that our body has a lot of mechanisms to bypass all these insults, the environmental insults, even at the genetic level, you can.
have the repair of your DNA and so on.

So what we're trying to do, I mean, of course, and it's not only cancer, especially with the PFAS, there are a number of other issues that it could cause. It's not only your Teflon cookware. It is also in the carpet. It is in the plastic that you put in the water and everything. We know that it causes disease. There's a lot of research going on right now. However, the good news about the PFAS, they can be filtered much easier than the 1-4 dioxane. So there are now a lot of
filtering that is going on.

But we still have a lot of PFAS in the area and it is the one thing that I would advise is filtering the water especially in the areas that you know have higher levels than what the maximum level recommended to be there.

And with regards to the 1.4 dioxane, I mean, although the reverse osmosis equipment technology may be expensive, it seems to be a small price to
pay if we know that it can eliminate a potential carcinogen.
The question really is, do we know that it’s a carcinogen?
When you talk about, you know, animal studies, have there been epidemiologic studies that look at areas that have high levels of 1.4 dioxane versus low levels to see whether there’s a difference in cancer rates according to that to give you at least a signal as to whether this is causing cancers?
Excellent question.
there are not epidemiological studies. This is why the EPA and the International Agency for Research on Cancer, they call it a probable human carcinogen. So our center is funded in order to identify the molecular mechanisms of causing cancer. The 2nd is exactly what you’re saying and the basis of an epidemiological study is that we can find people that have been exposed to 1.4 dioxine. Then we can look at the history, Then we can look at the cancers. Then we can see if there is any
association for what we’re looking for.

If there is any causation relationship between the exposures and the cancer.

So the other thing that our center is funded for and as you said $10,000 is a small price.

But remember there are individual houses.

Now for an individual house to just get a reverse osmosis for $10,000 might not be that easy.

So what we’re trying to do, and this is our engineers here from the school of engineering,

is they were trying to develop small
devices utilizing what we call advanced oxidation processes. And those could be very cheap devices that can purify individual tap water. And the other program that we have also with our engineers is to develop sensors that we can detect the 1.4 dioxin in the water. It seems like the other idea, which you mentioned as well, is not to put the burden of the cost on individual households, but rather to manage it at municipal or state levels where before that water gets from the well or the dam or whatever.
to your tap that it goes through some reverse osmosis or filtering mechanism.

So that the water that you get from the tap, you can be sure it is safe.

And so it really is wonderful to hear that New York did that.

And I suppose the other study you can do, although I suspect it would take more time, is to look at those cancer rates before and after they implemented that technology.

Is that something that is being looked at?

And are other states thinking about doing the same?

Quite a few, not only for 1,4 dioxin, but also with the PFAS,
which is a much, much bigger and broader event throughout the country.

And they use a lot of filtration.

Now, I have to assure you most of the public water, the dams and everything, they’re very well controlled.

The problem is when there is a big well, like in Long Island, the public water comes from these big wells.

And as I said, the state of New York not only installed the reverse osmosis in all these sources of municipal water,
but they did something which is very good.

And I think more states now are going to follow in this legislation.

So what New York did is as I told you before, 1-4 dioxin is either a component, or it could be byproduct in a lot of our household items.

So manufacturers now are obliged to have 1-4 dioxane free or generating 1-4 dioxane free products. So by that way you decrease the number of 1-4 dioxane that ends up in your water.
1-4 dioxane could be a discharge of a manufacturing into the river or a lake, but also it can come from our household items. Well, we are going to take a short break right now for a medical minute, but please stay tuned to learn more about cancer causing carcinogens in our drinking water with my guest, doctor Vasilis Vasilou.

Support for Yale Cancer Answers comes from Smilow Cancer Hospital where their Prostate and Urologic Cancers Program provides a multispecialty team dedicated to managing the diagnosis,
evaluation, and treatment of bladder cancer.

The American Cancer Society estimates that nearly 150,000 people in the US will be diagnosed with colorectal cancer this year alone.

When detected early, colorectal cancer is easily treated and highly curable, and men and women over the age of 45 should have regular colonoscopies to screen for the disease.

Patients with colorectal cancer have more hope than ever before thanks to increased access to advanced therapies and specialized care.

Clinical trials are currently
underway at federally designated comprehensive cancer centers such as Yale Cancer Center and Smilow Cancer Hospital to test innovative new treatments for colorectal cancer. Tumor gene analysis has helped improve management of colorectal cancer by identifying the patient’s most likely to benefit from chemotherapy and newer targeted agents, resulting in more patient specific treatment. More information is available at yalecancercenter.org.
This is Doctor Anees Chagpar and I'm joined tonight by my guest, Doctor Vasilis Vasilou. We're talking about cancer causing carcinogens in our drinking water and right before the break, you had mentioned that New York State is actually doing a few things that are quite innovative to try to reduce the burden of these carcinogens in our drinking water. One was to establish reverse osmosis kind of at the source so that individual households don’t need to worry about installing reverse osmosis machinery because the water
has already gone through that process. But the second that you mentioned was banning some of the chemicals that actually caused these. So you had mentioned earlier that these may be found in household items, detergents, shampoos, etcetera. So if we reduce the burden of these chemicals in these household items, then less of it gets into the wastewater, less of it gets into the rivers, less of it actually ends up getting back to us in the form of our tap water. The question that I have for you, it’s great New York is doing this,
but we have a global economy,

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certainly a national economy where you know,

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you can buy things in Connecticut

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and live in New York or vice versa.

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So how effective is that going to be?

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And is this really something

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that should be a federal mandate,

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perhaps even a global mandate if we’re

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go going to get particular about it in

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terms of really having an effect on

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reducing these chemicals in the environment?

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That is a very good question, but

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I would say it’s very difficult

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to address that because when

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you start talking for economical impacts

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and stuff like that is very difficult to
Regulate for different countries and so on. But I think many states are trying to mimic what New York State did, especially in the case of 1,4 dioxin. Also many of the states, at least in United States and actually maybe all over the world, they’re very concerned about the PFAS. But there are some other chemicals that might be present in our water that could be of concern. And those are what we call the trichloromethanes which are formed as a byproduct of chlorine we use for disinfection.
to disinfect the water.

And when chlorine reacts with organic matter, it creates a strike and trichloromethanes have been associated with increase risk of bladder cancer and possibly with colon cancer. In addition to that, remember that we also have arsenic contamination of the water. Now arsenic could be an environmental pollutant, but also it occurs naturally in some areas and it may contaminate the groundwater. So it is very important to monitor our water. Municipals are doing that.
They’re checking the quality of the drinking water. So they are protecting the people there. Now for the PFAS it starts to become federal law that there have to be limits on that. So they’re going to follow on that particular limit as well. So reducing the exposure is 1, detecting the exposure is a second, and also mitigating the contaminants from our drinking water is the third. That’s what everybody is trying to do. And I think we’re going to have success and this is how we’re going to promote a better well-being.
I have for each of those three things is the responsibility, does that rest primarily with the individual household or with the state or federal government? In other words, should I be in my home, testing my water and should I be installing filters and or drinking filtered water? I mean, there’s a whole issue about bottled water and the plastic contaminants that that causes. Or is this really something that should be at the state or federal level, or municipality level even where the
00:21:22.272 --> 00:21:25.445 government will assure the quality
NOTE Confidence: 0.90034969
00:21:25.445 --> 00:21:29.040 of the water, they’ll do the testing,
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00:21:29.040 --> 00:21:31.736 they’ll do the filtering, etcetera.
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00:21:31.736 --> 00:21:33.400 So that
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00:21:33.400 --> 00:21:35.283 I can know that the water that’s
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00:21:35.283 --> 00:21:37.558 coming out of my tap is safe to drink.
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00:21:37.560 --> 00:21:39.450 And shouldn’t that be part of
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00:21:39.450 --> 00:21:41.480 what we all pay taxes for?
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00:21:41.760 --> 00:21:44.063 It is, and you’re
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00:21:44.063 --> 00:21:46.040 talking about the public water.
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00:21:46.040 --> 00:21:49.040 So yes, municipal, state and everything.
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00:21:49.040 --> 00:21:51.320 They’re responsible for checking the water,
NOTE Confidence: 0.799278166666667
00:21:51.320 --> 00:21:52.530 for cleaning the water and
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00:21:52.530 --> 00:21:54.119 they’re doing a very good job to
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00:21:54.120 --> 00:21:56.916 the extent that they can.
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00:21:56.920 --> 00:21:59.195 Now the problem is with private wells.
In private wells, as you know, they’re not under federal regulations, they’re not under state regulations. So it’s up to the people that they have their private wells to check their water level. And for example, I can tell you some of the houses that we have in Madison that might have radon also in their drinking water, or uranium, it’s naturally occurring things. So it is up to the individuals that they have the households they have the private wells checked. That at least makes me feel better in the sense that those who do get
NOTE Confidence: 0.955318601304348
00:22:44.280 --> 00:22:46.879 their drinking water from public sources,
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00:22:46.880 --> 00:22:49.106 what you’re telling me is essentially that
NOTE Confidence: 0.955318601304348
00:22:49.106 --> 00:22:52.040 if you get your water from a public source,
NOTE Confidence: 0.955318601304348
00:22:52.040 --> 00:22:54.637 you should be safe from these carcinogens.
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00:22:54.640 --> 00:22:57.184 And that really the word to the wise
NOTE Confidence: 0.955318601304348
00:22:57.184 --> 00:22:59.933 is for people who get their water
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00:22:59.933 --> 00:23:02.400 from private well water that they
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00:23:02.400 --> 00:23:04.885 need to take those extra steps to
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00:23:04.885 --> 00:23:07.288 make sure that they’re drinking clean
NOTE Confidence: 0.955318601304348
00:23:07.288 --> 00:23:09.398 and safe and healthy water.
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00:23:09.400 --> 00:23:10.000 Is that right?
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00:23:10.080 --> 00:23:12.120 Yes, it is. Yes. You said
NOTE Confidence: 0.909750938
00:23:12.120 --> 00:23:13.480 it right very correctly.
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00:23:13.720 --> 00:23:15.196 The other question that I have,
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00:23:15.200 --> 00:23:16.248 you mentioned that the
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states are all doing
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a very good job in terms of detecting
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these carcinogens and purifying.
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Yet you mentioned that not all
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states have invested in things like
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reverse osmosis like New York has.
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And I would think,
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and this is just a guess,
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that the efforts that individual states
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take in terms of the investment
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may take in terms of clean water may also be different,
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perhaps along political lines.
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So, you know,
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is drinking water in a red state like Texas,
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for example,
can we be assured that that water is just as safe as drinking water from a blue state like New York? I think what it comes down to it’s not opinion, it’s not blue or red state if there is a contamination. For example, in Florida, there was a factory which was the contaminating source, in the water in the lake and everything. So the federal regulation is if you contaminate, you’re responsible to clean the area.
company pay for getting all the chemicals secured out of the environment and protecting the people. So I think what the states are trying to do, especially the EPA, is trying to force all these rules and is doing a very good job in terms of that. Now you’re going to have cases that you have a little bit more contamination there that it’s up to the municipalities and everything to follow up. And I can assure you with my experience, especially with Florida and Ann Arbor,
there are people working both from the communities also with the EPA, the Environmental Protection Agency, and also the state regulators to have safe drinking water. Yeah. It would seem to me, however, that particularly with the ubiquity of these chemicals, right. They’re in shampoo, they’re in Teflon, they’re in detergents, they’re in carpet, they’re in clothing. It’s going to be very difficult to identify particular companies that you can say you’re responsible
for contaminating this water,

therefore you need to pay

It seems like it’s kind of a ubiquitous fed accompli.

Yes and no.

If you look at all the literature

3M and DuPont are paying big dollars to purify the waters from the PFAS all over the country and also in Florida,

for example,

once you find the company

that has caused the contamination,

then they’re responsible to clean it up.

So yes, it does occur.

Yeah, you would hope
that would be enough of a deterrent for companies to do their own self regulation and reduce the quantity of these chemicals that they’re producing. Although it seems like New York felt that a ban was actually needed as well. Yes, firefighters are exposed to several chemicals including 41
polycyclic aromatic hydrocarbons, benzene, formaldehyde, asbestos, chloroform, vinyl chloride.

But most importantly also they're using this what we call AFFF known as the IQUS in firefighting foams. This is the one that they use to try to put the fire down. And this is all PFAS. And the studies have shown so far that the firefighters have significantly elevated PFAS in their blood compared to the other populations. Now we all have PFAS in our blood because we're all exposed to the PFAS.
That doesn’t mean that we’re going to get sick, but the firefighters have a little bit higher levels and this is a concern. However, there is no epidemiological study yet, although we say it may increase the risk of cancer for these people, but there are not epidemiological studies to confirm that. So everything is on the risk idea. And for the firefighters, it’s very important to have this protective gear that they will breathe clean air and be protected from the exposure.
to these chemicals.

Dr. Vasilis Vasilou is department chair and Susan Dwight Bliss professor of epidemiology and environmental Health Sciences at the Yale School of Medicine.

If you have questions, the address is canceranswers@yale.edu and past editions of the program are available in audio and written form at yalecancercenter.org. We hope you’ll join us next time to learn more about the fight against cancer. Funding for Yale Cancer Answers is provided by Smilow Cancer Hospital.