Safety of Turf Fields

Hosted by: Anees Chagpar, MD

Guest: Vasilis Vasiliou, PhD, Department Chair and Susan Dwight Bliss Professor of Epidemiology (Environmental Health Sciences) and of Ophthalmology and Visual Science, Yale School of Medicine

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Welcome to Yale Cancer Answers with doctors Anees Chagpar and Steven Gore. 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 is a conversation about environmental causes of cancer with Dr. Vasilis Vasiliou. Dr. Vasiliou is Professor and Chair of the Department of Environmental Health Sciences at the Yale School of Public Health and Dr. Chagpar is a Professor of Surgery at the Yale School of Medicine.

We talk a lot on this show about cancer and different risk factors for cancer. We talk about genetic causes, but tell us a little bit more about environmental causes of cancer.

This is a great point. There are a lot of environmental factors, which can affect the risk for cancer and that could be also at the genetic level, but also it could be affecting differently, people that have some genetic predispositions. In other words, you have populations that might be vulnerable to the environmental exposures and they may have higher risk of developing cancer than others. For example, it is just like cigarette smoking. You have people that are very sensitive; you have people that might smoke and they might never get cancer, but you also have the second-hand smokers that they get exposed to much less levels of cigarette smoke and they do get cancer. Also, the genetics play a role, what kind of genetic makeup the individual has.

Right. And so, certainly your genetics determines how vulnerable or not vulnerable you are going to be to environmental exposures and I think that your comment about cigarette smoking is a good one, it is certainly a very obvious environmental exposure that we all know is linked to lung cancer. And so, regardless of your genetics, my recommendation is always do not smoke.
Quite a few you know. Air pollution. Air pollution is a major concern and it has a lot of what we call volatile organic carcinogens that are present, and it is the same thing like the contents in cigarette smoke, that is what I was telling about. And it is not only you know the air pollution, it is also water pollution. So, our water which has less attention than the air pollution, water contamination could be an important factor for cancer causing due to the heavy metals and sometimes the polycyclic aromatic hydrocarbons that might be there, but essentially the metals which can cause, our pesticides you know that is an important thing. Pesticides in the drinking water.

So, let's talk a little bit about water pollution because I think it is a good thing to bring up. Certainly, air pollution, there is not a whole lot that we can do about air pollution aside from lobbying our government officials to try to ensure that we reduce air pollution, you know, and simply want to try to reduce our risk of developing lung cancer as it relates to air pollution. But in terms of water, tell us more about that. Is drinking water that we get from the tap generally safe in terms of you know all of these hydrocarbons that you are talking about or should we be drinking filtered water or purified water, like how does that work?

That's a very good point. In most of the cases, public water is pretty safe and because there are certain criteria that public water has to meet in order to be available; however, we have to be aware of some emerging contaminants that we do not have regulatory limits yet, and those are like the perfluorinated compounds, which is very recent right now. The EPA right now is having more and more studies to do that, but remember another factor is that about 40% of the population in the United States drinks water from wells and wells are not under Federal regulations. I just can give you a very small example, arsenic can occur naturally, so arsenic could be there, and it can go to the water and
people do not measure for it. Those are some of the areas of drinking water that can be a problem. So, I think we need better regulation for drinking water in every aspect. Or as I said, some of the other chemicals that we do not really know; for example, in Connecticut, we have in general, Northern New England, we have 1 compound which is called 1.4-dioxane, which is a known hepatocarcinogen at least in mice. It is a probable carcinogen for humans based on the risk assessment, and this is simply yet not regulated, has been recognized as one of the emerging contaminants, but people, you know, we do not have yet the appropriate facilities to regulate and there is no regulation at the federal level on that.

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<vChagpar>Hmm. So Northern New England does not have regulations on this?

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<vVasiliou>It is the entire United States. It is a probable hepatocarcinogen. It is not regulated yet. So, every state at the federal level, every state puts some limits of how much would be acceptable to have it in the drinking water, but in some of the areas, as I said, the well waters, are not monitored.

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<vChagpar>I guess my first question is, why is it that a known carcinogen is not regulated and how do we change that?

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<vVasiliou>Well, that is what we are trying to do. Actually, right now, the environmental protection agency has announced a big research for this particular compound. We know that also the perfluorinated compounds are under very big research. You have to have some data in order to make the legislation, at least at the federal level.

07:02.200 --> 07:08.700
<vChagpar>Yeah, but if something is a known carcinogen, one would think that that the research would already be there.

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Well, you know, when it comes to risk assessment, we can see it from different points of view. There might be some people that say, we do not have enough data on population studies that shows that it is a carcinogen, it might be a possible carcinogen in humans and hepatocarcinogenic in mice, but they want to have some more evidence, research-based evidence. So, that is why, and again that is why we call them emerging water contaminants.

Certainly, for people who are drinking from well water, which as you say is about 40% of the population, there are no regulations and so, for those people, your recommendation is to drink bottled water, purified water?

Well, what I would recommend is for people to check their waters for contaminants, and they have to do it. And what is really kind of scary is, some of the people do not want to do that because if they find out that their well water is contaminated, you know, perhaps the house will lose the value, so people are afraid. Yes, it is safer to use plastic bottled water if you are not sure, but I would argue that everybody should check their water, they should check it on an yearly basis.

And for people who are drinking from publicly available water, that is generally safe, but even there, there are carcinogens that are not regulated and measured.

Yes, in some cases. In Long Island, public water comes from well water right. So, in some of these wells, for the public water, they are very close to landfills where you have several chemicals being disposed there and essentially they are going to leak down to the drinking water.

But those are not purified when it comes out of the tap in a publicly available water?
Well, they are purified, and they are checked, and as I said, in general, public waters are very good, but in some of these public waters, for example, the chemicals that are not regulated, 1,4-dioxane, it has a very great variability in Long Island, in some of the cases it is very high, even to what has been recommended by the state. It is like 20 or 34 times more than it has been suggested and recommended.

And so, should people, because all of this is a little bit scary to me and making me think, Geez, you know, if there are chemicals in my water that are not regulated, that are potentially a carcinogen, should I be drinking bottled water and we can get into whether the plastic bottles have carcinogens or potential carcinogens in them as well and how free of carcinogens and how regulated bottled water is, or should we be filtering water and if we filter water, is that just as good?

Well, first of all, I do not want to create a panic to people including you. So, there are some chemicals in there that we need to study further and get really good results in terms of risk assessment, but yes, there are some chemicals that we should be concerned. Usually, the states monitor their public waters and they are fully aware of this. Now, if something is not regulated, you know, of course some people will say oh! it is safe, some people will say no, it is not safe. And I guess it is the risk assessment that supports that. But in general, as I said, all the public waters are in a very good position. Public waters, as I said, they are pretty safe and filtering is not a bad idea at all.

So, just use a standard filter that you can put on your tap or you can have a jug that filter as opposed to buying bottled water?

Well, you could. Bottled water is very well maintained, I mean checked as well.

You know, some people have concerns about bottled water in terms of the plastic bottle and leaching of chemicals from the plastic bottle into the water. Is there any truth to that?
<vVasiliou> Well, in general, plastics if they have what we call the compounds which can cause endocrine disruptions, that used to be in the old days. Now, the plastics that they have are much safer and the water is much cleaner. So, we try to avoid this leaching out.

<vChagpar> Yeah. Because I know that on the internet, there is circulating rumors about if you have bottled water and you leave it in your car that chemicals will leach out of the plastics and cause all kinds of cancers.

<vVasiliou> To a certain extent there is some of that, you know, usually people recommend not to use your bottle twice and do not refill, especially those chipped ones that we get. If you leave it in your car, maybe the temperature will increase and you have some higher probabilities of agents leaching out your water. But I do not think it is to the point that you should be concerned.

<vChagpar> Okay. So, use a filter for your water or drink bottled water and if you are living near a well, you should certainly have your water checked.

<vVasiliou> Checked. That's the only thing, you know, check your water.
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This is a medical minute about melanoma. While melanoma accounts for only about 4% of skin cancer cases, it causes the most skin cancer deaths. When detected early, however, melanoma is easily treated and highly curable. Clinical trials are currently underway to test innovative new treatments for melanoma. The goal of the specialized programs of research excellence in skin cancer or SPORE grant is to better understand the biology of skin cancer with a focus on discovering targets that will lead to improved diagnosis and treatment. More information is available at YaleCancerCenter.org. You are listening to Connecticut Public Radio.

Welcome back to Yale Cancer Answers. This is Dr. Anees Chagpar, and I am joined tonight by my guest Dr. Vasilis Vasiliiou. We are talking about environmental causes of cancer. Now, right before the break, we were talking about all kinds of environmental causes of cancer. So, we talked certainly about cigarette smoking and all kinds of smoking as a matter of fact, all of which increases your risk of lung cancer including by second-hand smoke. That we had pretty much known a little bit about, we talked a little bit about air pollution and then about water pollution. So, I thought we would talk a little bit about other potential environmental causes of cancer and one of them that we frequently think about and certainly talk about is alcohol. Do you want to talk a little bit about alcohol as a cause of cancer?

Right. You know, a lot of people give a lot of emphasis to the epidemics we have with opioids. However, we have a constant problem with alcohol, you know, in addition to all the addiction and alcohol, what is really depressing is the increase of hepatocellular carcinoma in the United States at young ages. So, young people, because the binge drinking has been increased quite a bit, so we have higher incidence of, you know, fibrosis and cirrhosis and hepatocellular carcinoma within the area of the United States. And it is well known that alcohol can cause at least 8 or 9 different types of cancers. Now, in some cases, there is significant evidence that it might act protective against certain types of
cancer, but my point here is we need to bring awareness in the people that alcohol is a cancer-causing environmental insult.

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<vChagpar> Right. So, if you are going to drink, drink responsibly and in moderation because certainly, I mean it increases the risks of hepatocellular cancer and pancreatic cancer.

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<vVasiliou> Colon cancer, pancreatic, and breast cancer as well.

16:59.500 --> 17:25.200
<vChagpar> All kinds of cancer. So, really it does deserve to be in the category of carcinogen, and along those same lines, you know the other co-carcinogen that people need to think about is obesity, and fat because that is now people are saying that the new cancer, the new form of smoking is sitting.

17:25.200 --> 17:50.300
<vVasiliou> Yes. Well, it is absolutely true. And I will tell you what the deadly combination is; is alcohol, smoking and obesity. So, because the obesity, it has an altered metabolism and this can affect a lot, and you know when you get to add the alcohol angle, it is additive.

17:50.300 --> 18:09.200
<vChagpar> Yeah. So, certainly things to think about. Now, along those same lines, you know people are trying to get their kids active and healthy and I know that you have an interest in the turf fields that kids play on, like where they play soccer. Since when is that a carcinogen?

18:09.200 --> 20:48.500
<vVasiliou> Well, let me tell you something. First of all, it is the artificial turf and it is the in-filling, you know the stuff that we put in to the artificial turf, which is recycled tire. Now, the tire if you an old tire, you cannot burn it, you cannot bury it and you cannot throw it into the water simply because of the chemicals that are there and these are polycyclic aromatic hydrocarbons that can be found in your
cigarette smoke, in your air pollution, combustion and everything, so they are present there. And then we are allowed to ground up these tires and put it on a field that those kids will be playing on and will be exposed to, and it is not only the stadiums, they have it on the playgrounds of kindergartens. You know, this is the stuff that are volatile compounds that will go into the atmosphere and you will breathe, but also another factor that people do not appreciate is that the artificial turf fields, they can reach temperatures at least between 20 or 30 Celsius higher than the normal grass. So, in other words, you just have plastic and you burn it. So, all these chemicals you will breathe when you are exercising heavily. So, you inhale all these compounds and there is a lot of anti-risk assessment from the manufacturers, which you know they recruit some people and essentially they are doing literature review and they try to convince us that this is safe for the people to use. No, it is not safe until you prove that. So, there are not really good epidemiological data to say that it is safe. This is an event that has started very lately, so we need to collect more data. In my laboratory, we have and in collaboration with the National Toxicology Program, we analyzed using predictive toxicology and deep learning, we analyzed 300 chemicals that have been reported to be constituents of the rubber and 196 of them meet all the criteria for being carcinogenic or genotoxic. In other words, either can cause cancer or they can cause mutation to others.

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<vChagpar>I mean so I get the whole concept, you are taking a tire, you are grinding it up, it can get hot and they can leach these carcinogens or potential carcinogens into the air and into the water, but if kids are playing on it, you know presumably we are worried about them leaching into the air because there usually is no water in these playgrounds unless there happens to be a well nearby or something like that, but if it leaches into the air, you know and these are open air fields, then that toxin could potentially get diluted and so how much of an impact does that have on these kids and does it really cause cancer or is it just a potential risk because it is a known carcinogen?

21:42.300 --> 23:35.900

<vVasiliou>Well, you pose a very good question. Let me address that from the fact that in most of the cases, the indoor facilities are what have artificial turf. And one thing that I want to tell about the indoor facilities is, they do not have the proper ventilation. So, there is a constant accumulation there. You know, if you can go there is heat, there is humidity, there is everything. So, it is highly likely that you can achieve really high concentration. Second one, the point that you are making, yes you are absolutely right, it is in the air, but remember goal keepers are always down, they are very close, like 20 or 30 cms from these. So, they are getting the high emission right there. It is not that you are, you know standing up all the time. Goal keepers actually according to what they found is, are the more sensitive population. And the other thing is, the temperatures, just imagine if a field goes up to 80 degrees and it is not only the air, most of these players are getting injured and they scratch their bodies right, and some of those, you can go to the internet and you can see people that they have those
scratches and the blood comes in direct contact with those grounds of the artificial turf and the question is very simple, why do we have to stick with artificial turf, why do not we use an organic in-fill, why don’t we use the second-generation of the plastics that they do not emit all these chemicals, why do we have to use artificial turf, that is my point. Yes, it is a risk of exposure.

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<vChagpar>Do we know that people who play soccer for example on an artificial turf with all of the things that you have said right, it gets hot, they could be exposed if they get a scratch, the goal keepers are closer to the turf, do we know that those people, just on basic epidemiologic studies, do we know that those people end up getting more cancers than people who play on turfs that are organic or play outside or play on other fields, do we have that data?

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<vVasiliou>We do not have the data and that is why we need the data. I was interviewed by CNN last year I think and also by the Canadian TV, and what I said is we need more data. This is a recent event, it has not been accumulated, there is no systematic really good epidemiologic review and what we are doing now from my department is, we want to monitor the personal exposure of the athlete. So, in other words, we have the variable monitors that my colleague has developed that we can monitor to what extent the athlete has been exposed and then we can look at his blood and his urine and we can find out those chemicals in there. That is what I called, you know a more comprehensive study that we need to do, nobody is doing that. EPA at the beginning said everything was fine until a couple of years ago when they said, you know what maybe it is not that safe. So, as we speak, there are 3 major studies including our study. There is one at California, Environmental Protection Agency. This is a huge study that they are doing. There is also a study that we know at the National Toxicology Program. We have worked with the National Toxicology Program but we are doing our own research also. We will try to monitor the exposures that occur into those athletes, into those kids, and see if we can find it in their biofluids and we will be in a better position to address those comments.

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<vChagpar>What about, you know people similarly who live near a landfill, you were talking about how this artificial turf is made up of tires that are ground up, what about the people who are living near garbage dumps or landfills or near shipyards or whatever, I mean are they at increased exposure as well?
26:06.900 --> 26:51.100

<vVasiliou> Yes they are. Without a doubt, and you know the landfills, there are a lot of reports that there will be stuff letting out to the water, again one more time, there is going to be stuff going into the air, but essentially my concern would be whatever comes into the ground comes in contact with the ground water. Now, remember, in addition to the ground water, there is also contaminating soils, where eventually you are growing stuff, you know vegetables and things like that, there will be some of those metals and things that they will be transmitted into the plants and you eventually are going to be consuming it. So, this is where we are talking about environmental justice and people have to be fully aware of all these landfills and we have to get better protection.

26:51.100 --> 27:21.300

<vChagpar> I mean, when you speak of it that way, then we start wondering where does our food come from right? You go to the local market and you buy strawberries which came out of the ground, you have no idea whether that strawberry patch was near a landfill, not near a landfill, what kind of chemicals were in the soil that was grown; I mean, how far do we take this in terms of protecting ourselves against these carcinogens?

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<vVasiliou> I do not think we take it that seriously and actually there was a major study that was published, actually in my mother country, in Greece a couple of months ago that they were finding that the vegetables from a particular area where they were taking the water from a river, that river was contaminated by the industrial sites and landfills and all the vegetables had metal levels at about 100 times higher compared to the other areas. So, how close do we monitor that? I do not know, you know and how we should do it? I think we should do a better job monitoring this. Everybody assumes that everything is clean and nice, but you know there might be some contamination. It is very well known that some of the, for example rice, might contain some arsenic and arsenic again, it is a pollutant but also it is naturally occurring stuff, so we need to pay more attention to that, and as a matter of fact, next month, in April, I am working with water, we are trying to set up how to use the technologies to advanced monitoring of the contaminated food from all these pollutants.

28:44.500 -->

Dr. Vasilis Vasiliou is Professor and Chair of the Department of Environmental Health Sciences at the Yale School of Public Health. 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 will join us next week to learn more about the fight against cancer here on Connecticut Public Radio.