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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’s a conversation about E cigarettes, vaping and cancer risk with Doctor Suchitra Krishnan-Sarin. Doctor Suchitra Krishnan-Sarin is a professor of psychiatry at the Yale School of Medicine.

Dr Gore is a professor of internal Medicine in hematology at Yale and director of hematologic malignancies at Yale Cancer Center. Well, this is really a timely topic with all that’s going on with the recent tough crisis with vaping that came out of the blue it seems. Yeah, vaping has evolved or E cigarette users evolved over the years, and it’s unfortunate that we had all these crises and especially young people who experienced a lot of lung damage and inflammatory conditions, it’s rather unfortunate. But you know, there are multiple devices on the market and they were generated with a good cause in mind. And unfortunately they have taken on a life of their own. Do you think that the original motivation was to be able to wean people off cigarettes?
Absolutely, I think the original devices which were developed by a Chinese pharmacist were actually created to offer smokers a cleaner form of nicotine to help with their cigarette addiction. As most people who are in the cancer field know very well, tobacco, combustible cigarette smoke is one of the worst well known causes of cancer and a variety of other inflammatory conditions.

So there has always been the hope that we would be able to get smokers to quit using their cigarettes. That has not always played out the way that we like it to. A lot of smokers still smoke despite having multiple health problems, despite knowing the health risks of smoking.

So the idea here was that perhaps if you have a cleaner form of nicotine available to them, the underlying thought being that nicotine is the addictive substance in cigarettes and if you can replace that addiction with something else then perhaps smokers will be able to quit this combustible product, which is of course fraught with so many problems.

And as you know, as everybody’s heard, it has 4000 chemicals and causes combustion and has a variety of respiratory issues so I think the concept behind it was a positive one and the idea of potentially helping smokers quit with the cleaner form of nicotine, also called harm reduction, is not an idea that we should throw out.

And yet, the success with either nicotine patches or nicotine gum, which are those that come to mind has not been terrific, or not that many people are successful using patches or gum.

Some people are. Yeah, absolutely.
So there are a couple of problems with patches and gum. The main problem is that they do not deliver nicotine the same way that a cigarette does. One of the things that is most reinforcing about somebody smoking a cigarette is that initial peak in blood nicotine levels you get when you combust the product and you get an elevation in blood nicotine levels in your body. You don’t get the same kind of delivery with the nicotine Patch or nicotine gum and most people who use these products don’t like them because it’s not satisfying their craving and their withdrawal symptoms. There are there have been studies which have shown that if you combine the two, for example, if you combine nicotine Patch and gum together, you have better outcomes because essentially what you’re doing is you’re boosting up that nicotine level. So there are ways of manipulating the existing products to make them work, but people are always on the lookout for something new that could be even more helpful now.

Is there a difference between an E cigarette and Vaping? Are they just the same? It’s a very good question. No, they are essentially the same. E cigarette is the device, vaping is the behavior that said people are vaping, you can vape whatever you put in the E cigarette device so they were originally created for nicotine. You can get them with nicotine. You can get them without nicotine. You can get them with a variety of flavors or without flavors.
And nowadays you also get products which are easily manipulated and are being used to administer things like marijuana and a variety of other things,

which in a sense I feel is what the CDC is saying has led to the current crisis that we have right now.

This so called black market or manipulative values of these devices now.

The E cigarettes that one can purchase in some drug stores,

for example. Can those be refilled with stuff from Vaping stores,

or is it a separate device?

There are a variety of devices on the market and each one of them can be manipulated.

We started out with a device which was very rudimentary,

which really did not even deliver nicotine that well.

It was called a cigalike when it initially came out, the nicotine solution.

And the device was not formulated very well,

so people didn’t really get enough nicotine from these devices.

Overtime these formulations have become a lot better,

so you have these closed systems which look almost like a cigarette and are called Cigalikes.

Then they evolved into a variety of other systems.

You have things called tanks which are refillable clear tanks that you can fill

with any liquid that’s on the market,

you have things called mods,

which are basically if you’ve seen people use them,

these don’t even look like cigarettes.

It’s a rectangular box like jewel thing.
It’s called box mods and you can put a variety of attachments onto them to make the vapor better, you know you can produce more vapor. You can change the resistance of the devices. You can change the temperature of the devices so you can make your vape experience a lot better and a lot of people who use these kinds of devices use them for shows. You know there are competitions that you can participate in, vape competitions for creating the smoke rings and smell.

You’re going back to school pranks, but you know they can do a lot fancier things with these devices. And now the newer generation device is the one that you probably heard the most about, which are the pod like devices. These are the jewel device, the jewel devices, the way they vary from the other devices is in multiple aspects.

First they are very small and they are discrete so they can be easily hidden. The jewel is a closed system which means you cannot technically manipulate it. It comes with nicotine and it comes, with a variety of flavors, but now those have been taken off the market. The jewel also differs from the earlier devices because they use a nicotine salt in the device. It’s called benzoic acid salt and this causes faster absorption and a faster peak blood.

Nicotine level as opposed to freebase nicotine which is what is in all the other nicotine liquids that exist in the market now. Freebase, nicotine and salt differ.

As I said most cigarettes contain freebase,
nicotine which increase blood levels a lot faster. They are also supposed to be more palatable. Now this is what is said. I have not seen evidence of this, but it said that Liquid’s that contain nicotine salts can be used a lot more easily because they do not produce that harsh undertone that most freebase nicotine has. It stings right, it stings in the back of your throat or makes you cough. Or you know just tastes better. Just to follow up and answer the question you asked earlier. As I said, the market has evolved to now where there are jewel knock off pods where you can actually buy slower open pods and fill them with whatever you want and use them with the jewel device and then this has evolved into even other products which like the dualan come in multiple flavors. So I think the problem with this market is in the quest to come up with the product that works for smokers, with the idea being that it needs to produce the maximum nicotine level it needs to be palatable. It needs to satisfy the smokers we have created. This market that is producing all these devices, which unfortunately are also very attractive to youth, which is what has led to the huge youth epidemic that we have with the current CDC number. Saying that almost 27.5% of high school youth are using these devices regularly in the past month. Those are the numbers. So there are all these kids who have used these devices in the past month and I’m sure that not all 27.5%
have used them every day in the past month, but a significant number did. And how does that compare to what cigarette users used to be like in that population say 20 years ago? So it’s probably I would say coming up to equivalent standards and it’s a little hard to make an apples to apples comparison with these two products. The reason being that a cigarette is a combustible product. You light it and then you have to use it up before it burns out. With these devices you have the option of charging it, taking a puff and then putting it back in your pocket and then using it whenever you want, so it’s not like it runs out at the same rate that a cigarette does, which is one of the big problems that we have in this field because we don’t know how to quantify use of these devices and equate them to cigarettes. At this point, the only thing I can really think of is looking at things like nicotine and cotinine levels which exist in both, so it’s a different beast. I would say that cigarettes are. But I would say the users are about the same and the scary thing about these products is how much they appeal to youth number one. And my area of research is really an understanding of youth substance. Youth risk behaviors and developing interventions for it. So I have worked with a lot of substances in the past, but I’ve never seen anything grow so exponentially as I have these products and it’s pretty amazing how the appeal of these products has just grown exponentially over the past few years. So what is the appeal?
Is it that they seem cool?

I mean, I understand the flavors, but you know, kids can get flavors from chewing gum and all sorts of candy and other garbage.

So we've been looking into this quite a bit in our work.

And we still need to understand the full picture, but here's what I think is going on.

First of all, you get multiple kinds of devices, right? So it's very innovative.

You can do smoke tricks with these devices, or vape tricks with these devices.

That's another innovative aspect of things.

Kids who are that in that age range, teenagers are really looking for things that they can make their own and yet give them this innovative aspect of it.

Here is something that they can manipulate to kind of make their own.

They can choose from anywhere between 7 and 15,000 flavors.

There's an amazing range of flavors out there.

They can choose to use it with or without nicotine.

They can choose to put marijuana in it if they want, or they can choose to add things or use it with other things.

So I think the innovative aspect of these devices is really what draws kids to these products.

The flavors are a huge appealing aspect of it. We have asked many about this over the years.
We conduct longitudinal surveys in schools in Indiana and the New Haven County and flavors are one of the top reasons why kids like these devices, like using them. They taste good. The other aspect, which they really like, is the fact that they’re very discreet. One of the things we hear a lot from, teachers in schools, and we do a lot of work in schools too, is that they’re easily hidden. Believe it or not, there are actually sweat shirts you can buy with holes where you can hide a jewel and so in class you can take a quick puff from it if you need to.

And they don’t produce as much smoke as cigarettes. So again, they’re very discreet. All these together make it a perfect storm for youth. Wow, this is a very fascinating and important topic, but right now we’ve got to take a short break for a medical minute. Support for Yale Cancer Answers comes from AstraZeneca, committed to pioneering the next generation of innovative lung cancer treatments. Learn more at astrazeneca-us.com.

This is a medical minute about genetic testing which can be useful for people with certain types of cancer that seem to run in their families. Patients that are considered at risk receive genetic counseling and testing so informed medical decisions can be based on their own personal risk assessment.

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physicians, and nurses who work together to provide risk assessment and steps to prevent the development of cancer.

More information is available at yalecancercenter.org.

You’re listening to Connecticut public radio.

Welcome back to Yale Cancer Answers.

This is doctor Steven Gore.

I’m joined tonight by my guest doctor Krishnan-Sarin.

We’ve been discussing vaping, particularly among adolescents and youth,

so it was really fascinating.

But before the break,

when you were telling me that how much flavor really is drawing the youth and this whole idea of discretion,

I can certainly imagine the idea that you’re getting away with something, and in the place where I get my haircut

I think most of the stylists vape and they mostly use jewel and

the person who cuts my hair is trying to get off of it

but sometimes it is kind of hard to know whether he just took a drag or not.

He isn’t hiding it, but I mean it’s so discreet.

No, it’s very true. I think one of the problems with these products is that it is discrete and also unlike cigarettes which give you the cues where

there’s smoke, it’s irritating in the back of your throat.

Things like that you don’t have those cues here which are telling you OK stop.

You know, maybe you shouldn’t be doing this,

and I say kudos to all the smokers who have quit cigarettes and who have quit using these products.

If they have quit and this product has been helpful to help them quit,

that’s wonderful and I think that’s a great tool,
but I would also add that this should not be an addiction that they should maintain for the rest of their life.

We have studied for many years cigarette addiction.

We have never really studied nicotine addiction and this is now opening up a whole bunch of problems and concerns that have been raised with the idea that somebody might be dependent on nicotine for the rest of their life.

And you know, I think we all know that nicotine is an essential receptor on the human body and is involved in almost every bodily function the nicotinic acetylcholine receptors are everywhere.

And if you are using nicotine,

you’re basically altering any systems that are related to the presence of this receptor.

Is there anything known about the long-term health risk even if it didn’t have nicotine or anything else?

I mean, does that harm the lungs?

Do we know?

I mentioned earlier that there was exponential rise.

and the science has not kept up with the marketing and the rise in the use of these products.

So we’re learning every day about what these products can do or what harm they can do or not.

I will tell you that the products contain substances like propylene glycol and glycerin,

which are used as solvents in the product.

Some of them contain ethanol.

You know these are all solvents that are used to dissolve the nicotine and or the various flavor chemicals that are put in there.

The problem with glycol and glycerin,

we’re learning that they can have inflammatory reactions of their own,
but they also, it appears create additional compounds when they’re just sitting in there in the E liquid called acetals, and these acetals are also known to have inflammatory potential. I see now in addition to that, the flavor chemicals themselves are not benign, they’re chemicals. They are things like benzaldehyde. You know all these things you find in your chemistry lab. Yeah exactly, and for those who don’t know about diacetyl.

Diacetyl is also what was in buttered popcorn flavor and it was found many years ago to be associated with bronchiolitis obliterans, which is a inflammatory condition, and so these flavor chemicals are not benign as of themselves. You know, they can have potentially inflammatory effects on the human body and the vape also contains metal particles which are generated from the battery or the heating element. That you’re also inhaling. So there is a plethora of things you’re being exposed to now.

Do we have clear cut evidence that all these are leading to cancer? No, we don’t have it as yet. There is a lot of emerging evidence that suggests that exposure in cellular models or in preclinical models leads to DNA damage which could potentially cause bladder cancer, or lung cancer in animal models, But we have not. I would say unfortunately, had the time frame of exposure in human to really see this emerge, it may take 10 or 20 years before we see that like it did with cigarettes, it took a long time with cigarettes for us to start linking cigarette use to lung cancer rates.
But there is a very clear evidence that lung cancer rates parallel cigarette use rates and lagged by about 10 or 12 years. So there’s a natural experiment going on here which is concerning and it’s also concerning that a majority of the use of these product seems to be by youth.

What interventions have you found, if any? Are you working to either help stop using or even preferably not start using? I would say unfortunately the interventional area has lagged even further behind than the other science because developing interventions takes time.

Developing interventions takes understanding of the behavior so you can develop appropriate interventions to know whether you have to treat withdrawal symptoms of the medication, or behavioral intervention will suffice.

You know things like that. That said, the FDA has had a lot of prevention programs in place where they’re really trying to educate people through ads. Enter prevention programs about these products. We here in Connecticut are doing a lot of work with local schools.

I think my group has probably visited 40 to 50 local schools just in the past year. Talking to students and teachers and explaining to them and making them understand that this is not just water vapor, which is what most kids think.

They think this is just water vapor. It’s not going to harm me. It’s not producing any combustion products or smoke, so why should it be of harm to me?
So I think education is the first step, we need to make parents and children and everybody understand that you don’t just start using these products because they are there.

The second thing we really need to do is regulate the product’s well.

The product’s have not unfortunately been regulated.

I would be all for a marketplace where products like these are made available to smokers who might want to use them to quit smoking but are sold in such a way that they are not available to youth who may want to initiate use of these products from an actual interventional perspective via just starting down that path.

where we are. There has been some huge initiatives that have come out from a variety of organizations, and the NIH is also starting to organize conferences on this issue to try to identify the holes and where money needs to be put.

We’re just starting down that path of developing interventions for E cigarettes, but I think most of these would probably draw some principles or ideas from what has been done for smoking cessation and things that work for smoking cessation as there’s a wide variety of things that have worked.

Behavioral interventions like calling to behavioral therapy,

motivational interventions. The nicotine Patch and gum and of course things like Chantix and zyban have also worked in adults.

Unfortunately most of these interventions I talked about have worked primarily for adults and they have not worked very well for kids,

so we still have this huge hole where we need to do a lot more work to develop interventions for you then we are.

My group is starting down that path but we’re not there yet.

It seems like. I’m certainly not deep in this field at all,
but it seems like at some point in the last 20 years smoking became not cool.

Yes, it became kind of gross.

It was excluded from bars and restaurants and there were all these ads about what smokers look like and it was disgusting and I have to imagine the kids

don’t want to look like that person,

Yeah that ad they used with this guy, he was really decrepit. And awful right?

But right now what you’re saying is these devices are seen as cool and that’s

the big problem I would think.

Yeah, there’s an essential problem here in that we don’t have the signs that tell us what these devices actually do to you.

One of the things that I have learned over many years of working with kids,

is you do not just go in and tell them this device is going to cause cancer because especially in this day and age of social media,

they’ll open up an app and they’ll tell you it does not.

There’s no evidence it does this,

so I think we have to be very careful how we approach this.

I’m glad you brought up the issue about cigarette.

And how it kind of became a non cigarette culture.

Overtime this was because of all the regulatory work that we did.

All the education we did over a number of years which basically made people realize that they did not want to be a smoker.

And you know, there was a whole change in culture in terms of whether you want to be a smoker or not,

and being a smoker was not considered cool anymore and with these devices

we need to go down that path.

I’m hoping it doesn’t take us 10 years to get there.
Because at this point I cannot take that man,
with a hole in their throat or the woman
with a heart problem and say,
hey, if you use this device,
this is what’s going to happen to you because I don’t
have the signs supporting that message.
So we have to base it on evidence that we know from
preclinical models,
especially for nicotine. And there is so much evidence
of the damage that nicotine can do,
after long term exposure from a lot of animal models.
Nicotine, especially in the adolescent brain,
the brain is not only known to be highly sensitive to
the effects of nicotine,
which means you get addicted more easily
but nicotine is also a neurotoxin in adolescence,
so it can cause cognitive changes it can.
It has been shown to cause epigenetic changes,
especially in genes that are involved in things like
asthma and anxiety and depression.
So there is a lot of evidence that we have from animal
data that we need to find a way
of transforming that into public messages and conveying
that to youth and parents,
it’s very difficult to motivate kids to quit using any-
thing.
And we have a very tough battle on our hands here.
Yeah, I just think about,
the long history of marijuana use,
and certainly nobody ever thought that was good
for adolescent brains.
But that probably isn’t enough to know,
especially convince your peers. Saying,
it’s no big deal, blah blah blah.
Who are going to believe right?

And on that note, I will say that a lot of people are also using these devices for administering marijuana.

In fact, if you’ve heard about it recently, the lung inflammatory conditions that were being observed and the deaths that we’ve had, very unfortunate deaths we’ve had in the US over the past year have been related to black market use of these devices is what the CDC is telling us now.

black market use of these devices is what the CDC is telling us now, and potentially could be related to the use of things like marijuana and other compounds that might be in the solution like vitamin E acetate.

I don’t quite understand how vitamin E acetate and I’ve had conversations about this with a lot of my chemistry friends and trying to understand why it would cause the kind of damage that they are observing.

but that seems to be the culprit that has been found in many E liquids that are associated with these lung inflammatory conditions.

So I think the other message to really get out there is tell people don’t change these devices, use them if you’re using them, as they are available on the market.

Because at least there is some control over what goes into them, even though they’re not technically regulated as yet.

The companies have a certain degree of responsibility to try to make sure that they have good products that go in there, but don’t use black market products.

And does the black market include those vape shops you see everywhere, or is that safer?

The vape shops are not black market.

The vape shops actually have licenses,
their local businesses that have licenses to sell these products,
You can walk into a vape shop if you’re 21 and older.
You can try out different vaping,
liquid’s it’s almost like I say it
walking into an Apple store where you can walk in and you can try out what liquids you like and what you might want.
You might like to use so they’re not technically illegal.
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 week to learn more about the fight against cancer here on Connecticut public radio.