Dr. Philippe Pierre Hujoel - Is there a relationship between personal oral hygiene & dental caries in the absence of fluoride?

Chiraz: As the most prevalent chronic disease in children and adults worldwide, dental caries occupies a large space in oral health research. The Causes and means of prevention of dental caries are major themes within this research area and the theories are numerous and sometimes conflicting. To cut through the noise, researchers perform systematic reviews that give a lay of the land of a particular topic; and in our case today, we have invited the corresponding author of a systematic review that looked at the impact of personal oral hygiene on dental caries. He co-authored a recent article titled: Personal Oral Hygiene and Dental Caries, A Systematic Review of Randomized Controlled Trials. Dr. Philippe Hujoel is Professor of Oral Health Sciences and Adjunct Professor of Epidemiology and Periodontics in the Dept of Epidemiology at the University of Washington in Seattle. Dr. Hujoel, thank you for speaking with me today and welcome to CDA Oasis.

Dr. Hujoel: Well, thank you for inviting me.

Chiraz: So, I usually start by asking what the review is about, why it is important, etc., but in this case, I'd like to start by giving the audience some context. What are the two major theories that you spell in your article related to dental caries?

Dr. Hujoel: So, there's two major causes of dental caries that everybody agrees on. The first one is you need bugs. You need microbes, you need the biofilm, you need dental plaque. And this dental plaque, the biofilm, is the material that's going to create the acid that dissolve the tooth, that cause dental caries. These bugs need carbohydrates, they need dietary carbohydrates, specifically sugar, and this combination leads to dental cavities. Everybody agrees on these particular two causes. So, but then there are two hypotheses as to how this process happens. The first one is that this biofilm is located within tiny cracks, crevices of the teeth, and within what they call dental defects. So, if it's in dental defects, you cannot remove it with your toothbrush. You cannot remove it with dental floss because it's trapped in there. So, if you brush it, you just polish the biofilm on top and the biofilm stays there and causes dental cavities.

Dr. Hujoel: So that's called: the people that believed or that postulated this hypothesis; they kind of had a motto, they said sound teeth do not decay. So, people with sound teeth, they can eat sugar, they won't get any dental cavities because their teeth are sound; they don't have the defects. Then you have another hypothesis and that hypothesis I think is kind of most prevalent in terms of common wisdom, which is that this biofilm is not in defect, it's on the surface of the tooth and therefore if you brush your teeth, if your floss your teeth, you can remove this dental plaque and you can prevent dental caries. So, the people that believe in that hypothesis, they have a motto also, they say clean teeth do not decay. So, those are kind of the two major hypotheses that I looked at in my systematic review.
Chiraz: And then what is the association between the hypotheses and the purpose of the review?

Dr. Hujoel: So, if the people that believe in the clean tooth hypothesis, if those people that say, you know, well, as long as you clean your teeth, you will prevent dental caries, that would mean that those studies where they specifically evaluated that hypothesis, so in those studies that specifically looked okay, what happens if we meticulously remove dental plaque on a daily basis from the teeth, are we able to reduce dental carries? And so we did a systematic review of those studies and those studies do not support that hypothesis. In other words, those children and young adolescents who daily at school, they had their dental plaque removed meticulously, they got exactly the same rate of cavities as kids that did not have that deplaquing, that careful removal of dental plaque.

Chiraz: And what are the findings of your review?

Dr. Hujoel: So, the findings of the systematic review is that very careful, meticulous dental plaque removal on a daily basis on school days did not reduce the incidents of dental cavities. So, those children in whom you know actually hygienists came and checked whether the plaque was removed completely, yes or no. And when the plaque was not removed, the hygienist would remove the dental plaque, the kids that had that particular deplaquing had just the same amount of dental cavities than the kids that did not have that careful deplaquing. In other words, what these findings suggest is that those people that support the clean tooth hypothesis currently have very little basis to support that hypothesis. Of course, you know, it's very important to stress that this deplaquing was without fluoride. So, the whole goal of the review was to focus on just what is the effect of very meticulous oral hygiene in the absence of the confounding effects of fluoride. So, by default, these findings suggest that the dental defect hypothesis, is more likely to be true. In other words, that dental plaque is indeed, the biofilm is indeed hiding in areas that we can't get access to with the floss and the toothbrush.

Chiraz: Now, what are the implications of your systematic review and findings on the whole conversation/debate about fluoride?

Dr. Hujoel: So, that's a conversation that every clinician probably has on a daily basis with patients that have dental caries. And as I said in the beginning, the most important thing that I always emphasize in any start of such a conversation is you need the fuel to get dental cavities and what is the fuel for the bacteria? It's dietary carbohydrates, it's sugar. So, if a person has really problems with dental cavities and he doesn't mind to go on a what they refer today as a Paleo Diet, a diet which is very low in carbohydrates and sugar particularly, the dental caries problem is largely solved. In other words, you cannot get dental cavities unless you eat dietary carbohydrates. If you decide to go on a high fat protein diet, you don't need fluoride, you don't need a tooth brush, you don't eat anything. The dental cavity problem is solved. It's obviously a very difficult solution.
Dr. Hujoel: Most patients may not want to go on such a restrictive diet and then it becomes important to discuss, okay, if that's not a good solution for you, then we need to start looking at other solutions to prevent dental cavities. So, one thing which I then kind of mention is, you know, it's important to have sound teeth. I mean a person that has cavities doesn't have sound teeth, in all likelihood, he has, he or she has defects and obviously you don't want to pass this on to the next generation, so people that adhere to the dental defect hypothesis, they will say, well, when a woman is pregnant, the first year of infancy, childhood, it's very important to have a good diet. What is a good diet? It's what they used to refer to as the mineralizing diet, which means you need to make sure you have enough minerals.

Dr. Hujoel: Milk typically is a very good source of minerals and you need to have certain vitamins, such as vitamin D. So, that's the second message that's important. Try to get sound teeth. You know, obviously when you're an adult and you have defects, there's not much you can do about it except you know maybe putting sealants on teeth. So, the next message is okay, if we're unlucky, we don't have sound teeth, we're prone to dental cavities, eliminating sugar or added sugar is not you know something that is within the realm of things that people typically would like to do. The next very important message is Fluoride. Fluoride is the only effective antidote to sugar, to carbohydrates, so those people that do eat dietary carbohydrate, that eat the starches, the bread, the pasta or that eat sugar, they have to have fluoride in their mouth and so it really doesn't matter whether that Fluoride is delivered with toothpaste, whether these people choose to have fluoride rinses, whether these people choose to fluoride varnish or fluoride gel at the dentist office.

Dr. Hujoel: The important thing is that you need to get access to this antidote of fluoride and tooth brushing and flossing is great if there is Fluoride in the mouth at the time you're doing that. So, for those people that select fluoride-free toothpastes, I think it's extremely important to tell them that you know what you're doing may have a very small beneficial effect, but if you are eating sugars, if you're eating the potatoes, the rice, you know the bread and all those things, you're more likely than not to, you know, being unable to prevent future cavities. Once again, the systematic review doesn't exclude the possibility that very careful plaque removal does lead to a small reduction in cavities. But, I think in the big picture, you need to make sure that you order the treatments that you suggest to patients in order of effectiveness. You should start with the most effective preventive method, that method that will avoid the largest fraction of dental cavities. Maybe even all, if you're really able to stick with a diet which is restricting of dietary carbohydrates, if that's not possible, then you go to the Fluoride. And that's about, you know, 25% effective, meaning for every 4 cavities that a person is going to get, you will be able to avoid one with the use of fluoride.

Chiraz: Well, thank you for bringing that point up and making that last comment because it relates exactly to my next question. So, every now and then we hear one of these statements, flossing does not work and is basically useless, personal or hygiene as this,
this is the case is not helpful and I know that those statements are just half the story because as we are showing in this interview there are other factors that come into play to reach any conclusions. So, how can we as health oral health promoters make sure that the right message gets through and how can we answer patients' questions when they come into the practice and start, you know, debating whether flossing is good or no, or whether plaque removal is good or not.

Dr. Hujoel: For me, the important message to give to patients is how effective is it? And so if patients will say, I mean sometimes people are surprised when you tell them, well, I can give you a method that's 100% effective. And they will say, Oh, what's that? You know, well, it's relatively simple. You really try to restrict sugar intake first and foremost. Then maybe starches too. Then you tell them, okay, you know, there's a second method which is you have a mineralizing diet and there the estimate is roughly 50%. In other words, you can prevent 50% of the cavities by making sure you have a mineralizing diet. Then you have fluoride, which is roughly a 25% effectiveness. In other words, you can prevent roughly 25% of the cavities. And so to come to your question then, if people say, well, I really like flossing and I really like brushing my teeth meticulously to prevent dental caries, you're not going to disagree with them. You say, well, it's possible there's a very small beneficial effects, but realize that if you do it without fluoride, you're missing a very effective antidote in trying to prevent dental caries.

Chiraz: To conclude there is another hypothesis that's out there or around dental carries, and that's the impact of the microbiome, the mouth microbiome. What are your thoughts about that? What is your opinion about that?

Dr. Hujoel: So, as I mentioned at the beginning, we need bugs. You need a biofilm to get dental cavities. So, it's been clear for now over 120 years that if you can get rid of those bugs, you don't get cavities. I mean everybody seems to know that, you know, every first grader, you tell them what causes cavities, oh it's bugs. So, this attraction to try to find a way to modify this biofilm has been around for over a century. So, the next big story, was penicillin toothpastes. So, they thought, okay, we have our first antibiotic, we know that bugs cause dental caries, we know these bugs are, you know, susceptible to penicillin if people brush with penicillin, they won't get any dental cavities. It failed. So, then we have the next big story, which is chlorhexidine, chlorhexidine, you know, in the 1990's in the Journal of Dental research is says this is the most potent chemotherapy you know it's next to fluoride.

Dr. Hujoel: It's the one big hope for dental caries prevention. Twenty years later, if anything, it increases dental caries. So, the hope has been there for over a century now that we can somehow, you know, modify this biofilm to prevent dental caries. But up to this day, despite huge investments in clinical trials that spent literally over a century, everything has ended up in failure. So, maybe tomorrow there will be a miracle discovery and you know, we'll find a way to change the biofilm. But once again with the dental defect hypothesis, it suggests this biofilm is in inaccessible areas. And it's exactly the same as
for the food processing industry. If you have a smooth surface and if you were to apply an antimicrobial to the surface, you can get rid of the bugs that’s on that surface, but if there’s cracks and crevices in the surfaces where you prepare food, you can brush all you want, you can put an antimicrobial on there, that biofilm in these cracks and crevices cannot be accessed, so it’s a big problem in the food industry and it may be the

same kind of problem in dentistry as far as the etiology of dental caries, it seems like this biofilm is located in areas where also antimicrobials are very unsuccessful because it's very small surface area on the top of the crack or the crevice that's accessible, but you have this very big film underneath there and that's the one that the moment you feed it, sugar starts causing the demineralization.

Chiraz: All right, great analogy, Dr. Hujoel, thank you very much for taking the time to speak with me. Good luck in your endeavors and I hope to host you again on Oasis.

Dr. Hujoel: Alright. Thank you so much for inviting me.