

Interview with Mikko Herrala

Laura Dyster: Welcome to the Biocolours2024 conference podcast, where you get a glimpse of the upcoming conference next June. My name is Laura Dyster, and I am part of the conference organizing team. Our next speaker here with me is Dr. Mikko Herrala, who will be one of the session keynote speakers at the conference. Welcome, Mikko.

Mikko Herrala: Thank you.

LD: I'm so happy that you accepted our invitation to be one of the speakers at the conference. And we're looking forward to hearing you in more depth at the conference. But maybe this podcast will give a brief introduction to your career and also on the toxicity of dyes. So at the beginning, can you just give us a brief overview of your background and research focus, and particularly your work on environmental health and toxicity testing, including natural and synthetic dyes?

MH: Yes, so my background is in environmental science and I have been studying toxicity and possible health effects of many kind of environmental agents or exposures. When I did my PhD, my topic was the health effects of electromagnetic fields, and after that I have been researching toxicity of microplastics and in recent years the dyes, especially focusing on the biocolourants. And for my research, I have been mostly doing in vitro methods, so using different human and animal cells.

LD: Why is the safety of biocolourants an important area of study and does it differ from the safety considerations of synthetic dyes?

MH: Well actually it's not very different than in the case of synthetic dyes because not depending of synthetic or natural origin the safety of the dyes needs to be explored before the larger scale use. And in case of biocolorants, sometimes people think that, okay, this is biocolorant. It's natural. Okay, it's safe because it comes from the nature. But it's not necessarily true because there are many poisons in nature. So definitely the toxicity of biocolorants needs to be studied.

LD: Yes, and I understood that it's also the dosage of how much dye there is, how much maybe a consumer digests. So a small amount is okay, but if it's a larger amount, then it has its adverse effects.

MH: Yes, that's the key thing in toxicology. So the dose makes the poison. Even water is poisonous if you drink many liters of that too fast.

LD: Yes. So everything around us is poisonous.

MH: Basically, yes.

LD: In your postdoctoral research, you have studied the toxicity of biocolorants. What methodologies and approaches are employed in assessing the safety of these colorants?

MH: Well, in my studies and in our studies at the University of Eastern Finland, we have used different human cell lines to test quite basic toxicological endpoints, such as cytotoxicity, cell viability and different oxidative stress parameters. And then we have also used the in vitro skin sensitization assay to assess biocolorants' potential to cause allergic reactions. And we have also done some metabolism studies of biocolorants. And currently in my research project, I'm focusing in genotoxicity of biocolorants.

LD: So why is this genotoxicity an important aspect to consider and what are the potential implications?

MH: Well, genotoxicity is of course a very important aspect to study, because any damage to genetic material, like in the DNA, may have severe consequences. And in the worst case, DNA damage and genotoxic can lead to carcinogenesis and cancer. So that's the reason why it needs to be studied. To make a proper risk assessment, for example for biocolorants, we need to also understand the possible toxicity mechanisms so that we can assess the risks of biocolorants.

LD: Your focus has been on natural anthraquinone dyes. Where can you find these in biocolorants?

MH: In this project we have natural anthraquinones which are extracted from the bloodred webcap fungi. And this I have gotten from the University of Helsinki from the BioColour project. But there are lots of different sources for natural anthraquinones in the environment. Many plants and some animals also produce anthraquinones.

LD: So what are the challenges that you have faced when studying the safety of biocolorants?

MH: Well, I would name two big challenges what we have faced. The first one is that some of these biocolorants are not very soluble, even normally used solvents like DMSO. And that makes the toxicity testing with the cell cultures difficult because those should be soluble in the cell culture medium. The other thing, some biocolorants are mixtures, not purified substances, and it also makes the evaluation of the results a little bit difficult. Like if we see that some mixture is causing effects, it raises the question that what part of the mixture is causing that? Is it just single substance in this mixture or is it some kind of effect of all of these compounds in the mixture?

LD: Thank you Mikko. My last question is that when you think about the Biocolours2024 conference and you close your eyes, what color do you see?

MH: I would say orange, yellow and red.

LD: Orange, yellow and red. Okay.

MH: Yeah. Those are the colors of the natural anthraquinones that I'm currently researching.

LD: Yeah. Well, that's very, very understandable color that comes to your mind. Thank you so much for this interview, Mikko. And we're all looking forward to seeing you and hearing more about your research next June. Thank you.

MH: Thank you. And looking forward to see everyone in the Biocolours2024 in next June.