Justin 0:07
All right, well, I see we still have people joining through the zoom. But it's about four after the hour now, so we're gonna go ahead and get started. Hello, everyone. Good morning. Good afternoon, wherever you may be joining us from today. My name is Justin Weinberg. And I'm one of the founders and CEO of Chem 101. Welcome to our second chemical misconceptions webinar. Which today is going to be hosted by Dr. Hans-Dieter Barke. And as a chemical engineer and as a former chemical educator. I am just so excited and grateful to have Dr. Barke sharing his expertise and insight with us today. You know, it's long been our mission as a company to support chemical educators in the work that you all do to help your students understand and appreciate and just be engaged in chemistry. And before I begin, before we begin, I do want to tell you a little bit about our speaker, as well as this webinar series. As I mentioned a few seconds ago. This is the second in a three part webinar series that focuses on student misconceptions and chemistry. Hopefully, some of you who are attending today also caught our first webinar last week with Dr. Vincent Talanquer from the University of Arizona. I do also want to thank again Dr. Boryesenko, who is a faculty member from Milwaukee Area Community Technical College, who in our limited spare time helped us develop this series and these educational events. Now as chemistry instructors and educators, you probably noticed certain common pain points and misconceptions that students tend to experience when going through any one of the chemistry courses that you teach. I know this is one of the main reasons that originally drove me to create Chem 101 back in 2016. And over the years, my team and I have developed tools and ways to help students master skills and topics like dimensional analysis, Lewis structures, nomenclature, chemical patients and much more. But we all know that there's always ways for us to improve how we teach and help students learn. And sometimes in our attempts to simplify or explain complex concepts and chemistry topics, we plant seeds of understanding that grow in unexpected and incorrect directions. And to help us better understand how teachers at all level all levels in our students education can inadvertently set our students on the wrong course thinking we're going to turn to Dr. Hans-Dieter Barke today, so introduce Dr. Barke, Dr. Barke is a professor emeritus at the University of Muenster Institute for didactics of chemistry in Germany. He is an author of several books focused on supporting chemistry educators, and he first came to our attention when the team here at Chem 101 read his book, titled misconceptions in chemistry, addressing perceptions in chemical education. I just want to quote one part of a review of the book. This well documented reference volume is organized around broad basic chemistry concepts. It gets various examples of students' preconceptions and misconceptions to help students help teachers prepare lesson plans to develop laboratory experiments. This welcome addition to science and chemistry education will be valuable for both practicing and potential educators summing up highly recommended Dr. Barke is a recipient of the prestigious Johanne Friedrich Gmelin award of the division of education within the German Chemical Society. He has over 200 publications and total publications and has presented at numerous chemistry conferences and quite regularly with the chemistry educators around the world. So I'm going to hand it over to Dr. Barke to give us his presentation, misconceptions that instructors inadvertently create through their teaching. Dr. Barke, over to you.

Dr. Barke 4:04
Thank you. Thank you very much, Justin and I will say welcome to the many participants. Thank you for being so interested in this title, you see my title and misconceptions. And I will point out first, I will bring you misconceptions in the first part of my lecture. The school made misconceptions, misconceptions which occurred in grade 10, 11, 12 of Oregon nauseum. My doctorates and Master's students made the thesis about several topics and could cover many wrong ideas or misunderstandings, which I will summarize in my slides very shortly. In the second part, I just greet my doctorate as he visited Avati from Indonesia, but because she did her pupil receivers research with students at universities, she asked her about 100 students in her and other universities and can bring misconceptions that our university made PureBond but let's start first with some slides about my town. Oh, I cannot move the moment my slides. How to move the slides now? You can hear me?

Unknown 5:47
Yes, we can hear you.

Dr. Barke 5:51
Oh, okay. I could press my other button then it worked. So here you see our Deutschland over Germany. And on the left side of the western part, you see Muenster by University Town near the Netherland border. And you'll also see a nice big Cathedral in the middle of our old town. Here was in 790, somewhere, the first monk who settled a little chaplain and then over the hundreds of years it's gotten bigger and bigger and bigger. And now we have this mega church and 19 other churches in our town. The town is well known because in this major hole in our heart home, the Peace of Westphalia was done in 1648. My town was the only town undestroyed in this time 50% of the people in Europe are killed. And here they find an end of the 30 years of war and Netherlands was born because of the Spain have to give up the country which they occupied. And therefore we have many visitors from Netherland to visiting our principal market and our Christmas market and so on. But let's come to our title. In this book, Essentials of Chemical Education, first, I got the main topics for my students so that they could read what I'm teaching in my lectures in my didactic lecture, lecture lecturer of the director of chemistry, and you see learners ideas and misconception is a big part related to experiments, structural and mental models. I will come up to this, and formula equations, terminology in chemistry. These four chapters are the main part which I will try to transfer to you. One of my researches was this three level concept.

Dr. Barke 8:21
Sorry, I could not, or have not published in these days in English language. And therefore, yeah, only the German knows this idea that many empirical research to show when you go direct from the phenomena to the chemical symbols, the students try to memorize those symbols. And after seeing that they have no idea which structures the metals, which structure the solids have and the salt, salt solutions have. I introduced structural models of substances first, of the formulas or the models of substance before and after the reaction to come to the chemical equation. One example when I take some carbon pieces in a plant, which is filled with oxygen, and heat them until they burn, it's a nice phenomena to see the burning pieces, which are away after burning

and asking the students they will say, carbon is the weight and the mass is less, but we have the mass first here and at the end and see the mass is the same and they can prove after discussion that carbon dioxide is done. And when we discuss the phenomenon, we come to the structure of models, the C atoms in graphite, the O atoms in O2 molecules and C and O atoms in co2 molecule so that they have the idea “what is the difference between atom and molecule?”. There are many more examples but we will go on with the same idea because Mr. Johnstone came up and helped me very much in English language published now, that triangular concept. He also mentioned from the macro going direct to the representational level means the equations are memorized. And he is asking every chemistry instructor to go to the submicro level to clear first which atoms or ions or molecules are involved, which chemical structures are there. One example because I often saw that students have no idea about solutions when you only tell something about brutalization or dissociation of the thought. They don't know what it's meant and when you make such a beaker model of hydrochloric acid and sodium hydroxide solution and ask which particles are reacting, then they see of course, when the H+ and OH- ions are reacting to actual O molecule, then the ions remain. I saw in my state in San Diego State University in the academic year 1986 to 87. I saw that nice work spectator ions. They are looking for the process but not taking part. And that is sometimes against the image that a salt production must go with every neutralization that is, yeah, a misconception. And all those questions were in 2004, 2005 in my brain, and I summarized these in German language, and then by meeting Mr. Al Hazari, professor in the US in I think Denton was in BCCE which I met and which I've visited and he looked to the English language and edit some things and another doctorate from Ethiopia Mister, Mister Sileshi came up with his doctor father, Doctor Timeshin to show that we can have concept cartoons to make analysis to analyze the misconceptions. I will come with one example a little later.

Dr. Barke 13:07
And the most important thing I could see, the most idea is that there are two kinds of misconceptions. There are preconcepts which no children, no child can do something against. The children are looking to the everyday life and they come with combustion, something is going away, transmutation of substances (copper changes from red to green). They don't know about carbonate iron from gray to black. They don't know that black iron is iron oxide. You have to do this in our lectures. We have to come to a conceptual change from the pre concept to scientific concept. That is a bit tough, but about pre concept. Mr. Talanquer, I think was presenting last Friday. I will do more about school made misconceptions. Yeah, one thing in appropriate, appropriate teaching by the instructor, but also by the difficulties of, of some chemical equilibrium. It's not easy when you ask students, not just right after this topic, but later they they see oh there something equal the reactants and products show same concentration, or same amount of substance that are many answers after asking them about equilibrium, or we get today of the pH of 3, every strong acid can be diluted to three, but they have in mind “You cannot reach the O pH values.” Redox reactions... That's the ox to the image that oxygen must always be involved. And all those questions are moving to the idea that something has happened in school, which is not really scientifically. Let's go to the examples. Here's an example that the student grade 10 I think 16 years old boy. He get question out with the print letters and I wrote this with my pencil. The result of one of those students and they have 95%

know MG+O you get MgO or even 2Mg+O2 gives 2MGO. But then I asked about what happens with small particles of magnesium during combust, and the answer? Magnesium contains two kind of particles. Whatever place by combustion, the other one remains at magnesium oxide. I know the name magnesium oxide but has no connection that there must be magnesium and oxygen particles. Even he wrote two kinds of articles into the model of magnesium because he wants like his pre concept, his everyday life concept, something is going away and efforts remain. So the teacher has not reached the moment that the student can scientifically interpret the combustion. Have the new equation in his mind, but his thinking in the old way is thinking like every day people are thinking. The teacher has to do more than only to write the equation. He has to interpret the equation by articles and show that in magnesium oxide, there are two kinds of particles. Mr. Sopandi was here my doctorate from Indonesia and because we have a nice “bonaqua” (sparkling water) where on the label only the names of salt are written down here in German language. I will translate for you as water their carbon dioxide, their Sodium hydrogen carbonate, calcium chloride, magnesium chloride and sodium chloride. And our question was, which particles are in mineral water?

Dr. Barke 17:55
And here is one answer which is totally correct. Na+, Cl- the separated ions are there. So 25% of 300 students answer in a good manner, in this manner. But 75% have given us the formula CrCl2 or even wrote every co2 molecule. Although they have made the cross you'll see this cross mineral water contains ions of many solids. They know the ion idea, otherwise we have not asked them.

Dr. Barke 18:40
Oh but they think on molecules. And now a big idea. We got a visitor from Russia Mr. Dr. Davidoff. He saw this and told us “cannot be in Russian.” From the eighth grade, we have the atomic model, nucleus and shell and outer electrons and even sometimes orbitals and they know all the ions. They took this questionnaire, you see the Russian written letters, and ask the students that you see. CaCl2 either bondings you see the bondings covalent bonding maybe? Or they make a circle around CaCo2 or NaCl even though NaHCl3. Fine, but no ions. Here one student did both. He wrote the right ions and the covenant bonded particles. For him, I think it's only something of writing, question of writing right? And they are also not scientifically using the ion idea. So that's the atomic structure when you give them first atomic. It’s not helping much when you don't have the structural model about sodium chloride lattice or about beaker model sodium chloride solution where the separated ions are moving. Another little study... I gave the students the idea, you see on the left side, that that sodium chloride solution is done by separated ions which are moving with water molecules in the solution. I told them, I don't have written the water molecules, you must imagine them. And then I asked what happens during heating, during evaporating some water? The second block and the third block, what happens when all water is gone by heating? And you see they’re right. You're very intelligent first some NaCl molecules and some ions. But at the end only NaCl Yeah, what I don't know, molecules, I think because the molecule idea is very, very early in instruction and they even said that is the translation sodium ions and chloride ions are equalizing. They are equalizing they’re,, the charge pluses away minuses away. And they're electrically neutral now. That is sometimes the

idea when you don't give them models. So I even given the left model the idea of the solution. Or Taber at the same time in London, make his researches about the same. And he got many times that when you ask about ionic bonding, the students are taking an electron from the outer shell to the other atom and make the electron transfer as the reason for ionic bonding. We all know it comes from the reaction sodium plus chloride is sodium chloride. Nice idea but when they see this and the electron transfer is very easy to understand, they think ions all the time are born by going over of electrons. We have the salt millions of years under the earth. They are ions and you must somewhere tell them that ionic bonding had nothing to do with electron. There are already ions and therefore the ions were first and, later, 1806 Davey I think, make the melt electrolysis and get sodium and chloride.

Dr. Barke 23:37
All misconceptions done by lecturers and hear my doctorate Hilbing summarized all those ideas when the teacher asked “what holds the ions together?” and has the, like, the this model in his mind. Students are answering electron transfer, the same electron is extracting the other particles, ion pair binding because they want to become noble or stalled particles are answers which students are giving and really a very low number of students have the right idea of an ionic lattice and the attraction of charged ions. The same incident basis when you are in the area of acids. We asked here with two beaker models. What is What are the particles in pure sulfuric acid and in diluted sulfuric acid? And this boy or girl, grade 10 or 11, he's doing many H2SO4 molecules in the left beaker which okay and in the right beaker, he is only less molecules and has not no idea about ions or he lost the idea the teacher I think has tried to give them the idea that there are two H+ ions and one sulfate ions. The ratio of ions is two to one. But they forgot this and have the molecule h2 as a force such a formula which you can memorize very or hear the other student has not even known what this meant was which particles are there. Or when you come to strong and weak acids. One is the first on the left side. This pair of beaker models is showing the right way. Only ions in hydrochloric acid but mixture of ions and molecules in the second guess. The others on the bottom you have only the ions overall. And on the left side, on the bottom, you have only molecules. So the students are not really sure what happens and why the name weak acids is there. They have heard the word equilibrium of ions and molecules but they have forgotten it when you ask later. And this was where all questions in the both last years of school grade 11 and grade 12. And with this knowledge the students are coming to university and when they studied chemistry, they must really learn the weak acids and the difference to strong acid from the professor at university. Okay in here I found a teacher who gave me when I taught in the teacher training seminar one week in Moshi, Tanzania, about acid base basis and redox reactions. He gave this picture from the textbook and sorry Dina, you asked about the author or the name of the book. I have no idea. This you see is from the book and this shows HCL are what molecules and OH molecules. The author means here the substances NaOH AQ means sodium hydroxide illusion. This reacts to water not a water molecule but water and here are the right ions. Okay, why here? Ions are there and not ions in hydrochloric acid sodium hydroxide solution. There are things that even teach us in Tanzania are very unsure. I can talk about the long story that teacher was happy to hear from me. Please look to the ions and tell them H+ and OH- ions are reacting and NA plus and CL minus ions remain they are spectator ions.

Dr. Barke 28:41
With this knowledge, with this text books, the students get misconceptions that are text book made misconceptions. Now what I would do when I would be a teacher or I was a teacher and have done it of course in the modern way. In my textbook in Germany, Chemie Heute, "Chemistry Today" for grade seven in our country, North Rhine Westphalia. I must really convict the data when we have the atoms and molecules first, atoms and molecules in element element copper and sulfur and molecules in compounds. Please introduce also the third group of particles, the ions. There are sodium Na plus and Cl minus ions in the ratio of one to one and where there is the cation is two plus charged Ca 2+. Then you have to get Cl minus ions in the ratio of one to two and make a good model to visualize this without any atomic model, without structure of the atom, can have even the name ion and can show their special other particles which we will meet later. And when you reach later the moment you can take a periodic table you will see this and all new versions in as you can read www.educhem.edu. You can open this and can download your periodic table in this way where we took atoms and ions. Because I know from many discussions, they know the ionic bonding but they are unsure if they are really ions, they're atoms with ionic bonding and so on and so on. So I will make the end of thinking in the wrong ways. We give them the ions and they can combine salts from ions from the left side with ions from the right side. Then they have potassium bromide, or calcium sulfate or aluminum oxide and so on. They can combine it by the charge and they get the formula let's say aluminium oxide because it's three plus we have to take two to three plus and combine it with three O2- ions. And that's the formula I'll have three plus brackets 2, 02 Minus brackets three. When you take the ions to show the formulas, then they have more the idea of octon salts. And you only write a two or three. I have so often seen the covenant bondings that I'm sure and I convinced my entire for the school book, please let us write the first ions in the formula, calcium two plus brackets one Cl minus bracket two so that they see it's an ionic compound and the ionic ions are in the lattice. Therefore I have here I have my combinations. You can see our two metal atoms left and left in this system. For example, many silver atoms are going to have a metal structure a closest sphere packing nonmetals atom right and right in the PSE, one C atom four H atoms make 1 CH4 molecule, which is tetrahedral ions left and right in the PSE and go to the ionic lattice and to the ionic bonding without knowing many about atomic structure can come later and then you can make the sodium chloride reaction and so on. You can make salts synthetically. But please point out that the salts mostly come out from the earth from the ground they are resting millions of years.

Dr. Barke 33:34
And for having not only the name, metal SS lattice or ionic lattice, please make from spheres. We have in Germany, three centimeter silver spheres and 1.4 centimeter spheres and build those models for every course so that everyone can take one of these cubes to home can make such a cube I either from 14 spheres in this manner. One plus six plus six plus one must staple them or you take what is more better to see five, four and five. And sometimes the books have ball and stick models instead of sphere packings. Also, introduce those ball and stick model but point out the bonding line makes no chemical bonding. It's only for visualizing the model. And you can even in this model, you can make this cube and have it in this form in the cubic cubic

sphere packing and can take it out and show it in this manner. You can also take the system away and unit cell if you want. But more important is take two kinds of spheres. Three centimeters and 1.4 centimeters. Make it sphere packing like with the metals with the close packing and get the same cube to show how sodium and chloride ions are founded. In ionic less, the chloride ions are the bigger ones and the sodium ions are the small ones.

Dr. Barke 35:49
For other lattices it's better to take the ball stick model model again here for lithium oxide, the ratio one to two or six sulfide in the ratio one to one. Here the tetrahedral interstices are occupied and it's hard to do something with tetrahedral holes. In the sodium chloride model, the octahedron hole occupied. When you build this or the students even build those models by themselves they can really grab on the model and the concrete model will go in the brain and will be a mental model. So that whenever you ask about sodium chloride, they have this model in mind and can have a scientific view on those compounds. I asked you about the or I get information to you about concept cartoons which we both Ethiopian scientists bring to Minster. Here's one example. The first line is I cannot see the first line. What are the particles in sodium hydroxide in hydrochloric acid? Are the HCl molecules and h2o molecules? Are this HCL aq articles? Are this h plus cl minus ion groups or particles? Or H plants and pure minus ions and more h2o molecules? The students in class can discuss to see how many preferring this and this model and at the end to point out, in this case, the left boy here is the right one with ions in hydrochloric acid. These concept cartoons are down for 20 topics. And you can look to the name Commission and the left sheet and we'll find the publication. In my book, I cited those. Now the end, some slides to show that even university students are not always thinking the right way. And as Asih Wisudawati published in the African Journal of Chemistry Education 2019. You can get this electronic paper just clicking AJCE and you will get it and can go to 2019 and find her application. Explain the following reaction in four ways. We are giving students I think eight equations we looked at redox and asked number eight, “Which atoms ions or molecules are involved in reaction?”. You will see the example at the end when I give them the example set Zn(s) + H2SO4(aq) gives set in ZnSO4(aq) + H2(g). They should find zn atom H+ ion plus iron sulfate ions set in two plus ion and H2 molecules. Then, Asih asked to be write down the equation of those atoms, ions or molecules, which really react and you see the really reacting particles are a set of n atom plus two plus ions gives set in two plus ions and h2o molecule. And her idea was even to ask which atoms ions or molecules are not reacting. Of course the sulfate ions do not change. They are spectator ions. And the last and most difficult question redox or acid base reaction explained transfer of electrons or protons and must show that zinc atoms are giving electrons, two electrons and two h plus ions or accepting two electrons to do the h2 molecule.

Dr. Barke 40:45
Not easy and you must believe there are 50% of right answer sometimes, sometimes only 20% and all the other answers the wrong. Why? Here we have the magnesium hydrochloric acid reaction. They have HCl molecules in mind. They don't know what Mg co2 means. They write mostly the formula and only the h2 molecule that I think was okay. And here we have also the redox reaction. Or what is a little more tricky. Magnesium oxide and hydrochloric acid reacts to

magnesium chloride solution h2o water molecules and when they should look to appeal to real react, then that is the O2 minus ion. You all know this and write this equation. And the first thing is magnesium oxide contains ions Mg two plus an O2 minus ions. And mostly students have written mg double bonding O or only Mg O and I think they mean molecules and HCl, sometimes molecules sometimes also ions and could not answer the question. If it's redox or acid base. When they are an acid is also in the redox reaction before they mostly say acid base because there's an acid. In this case it's okay. The donors are the H3O+ ions and the acceptance of equal to minus ions. That is not easy and therefore, we took a more easy question. Hydroxide. Yes of course not solid and the solid metal hydroxide they don't mention the ion or many students don't mention the ions in magnesium hydroxide. They know hydrochloric acid better and could maybe also find the second equation. And yeah, when we gave them the word proton transfer, I don't know if they ever heard this. Because I remember an Indonesian student after a conference, I asked, you don't... you know the branch of theory of that's the bases. Of course, I know. There's a proton transfer as a proton donor and the proton acceptor. Oh, yes, then please tell me an example. And the answer was, I don't know any example. They learn the definitions and cannot transfer to proton transfer or electron transfers and that was a little irritating. But therefore Asih Wisudawati, took interviews and in one of her next presentation she can she can tell you the results of the interviews for getting more behind those symbols when they only write mg co2, what they are thinking of. We have not only two big other questions with the alternative is the most difficult for you. And the most difficult answer is explain transfer of electrons or protons. Proton or electron transfer confuses me because I need basic concepts of chemistry. Because we need to understand A to C because we have understood the function of particles. And the ends question if they like to go deep into the submicro level. They both big majority say oh yes we want to differentiate to redox and acid base reductions better? It can help to understand chemistry better. Yes- because I can support to be a better teacher. Yes- because I can improve my understanding of chemistry.

Dr. Barke 45:38
That I think says all to avoid misconceptions, give them the idea of the atoms, ions or molecules which react and then they understand the chemistry. Or when I make a big summary don't go from the macro direct to the symbols. Please involve every time the submicro level asked about atoms, ions, molecule and chemical structure. So when we do this with every experiment with every phenomenon, we could understand chemistry and will not memorize so much. Okay? Thank you very much. Waiting for your questions. Oh, I see that 62 I don't know if I can answer all those questions.

Dvora 46:36
Oh, no, no. If anyone has a question, then I will unmute you and you can ask, raise your hand or I'll look in the chat.

Unknown 46:47
Dr. Barke- I wanted to ask. So I was very intrigued by this three level concept that you are presenting here. The triangle concept. Is this the as a practical takeaway is this better to scaffold question the assessment where you you present a phenomena, or you do a demo, or something

and then you ask students to draw a models or pictures and only after that to write chemical equations? Yeah, you know, am I understanding correctly and you teach that way, but you assess that way as well.

Dr. Barke 47:35
For the first phenomena, I do view those pictures myself or I take good pictures out of textbooks and show them and ask them what will show this picture about carbon and oxygen to carbon dioxide. So the first two, three or four examples, I explained the reaction by atoms, ions or molecules, and later students will do this themselves independent from me. And in such tests they are used to answer those questions. And are sure that they know what happened in the reaction and can easily make a formula or the chemical equation.

Unknown 48:34
Thank you.

Dvora 48:40
David, do you wish to ask your question?

David 48:44
All right, sure. I was just wondering, would you recommend that educators abandon you know the so called molecular formulas like say NaCl aqueous, in favor of just always using a fully ionic representation?

Dr. Barke 49:01
I like to do both. Okay, I have NaCl AQ as the symbol for the substance. But the second what I do is the second line and a plus AQ, plus Cl minus AQ. And I know a big discussion about one of my doctorates when he wrote AQ they are not used to this. Mr. Delphi, I think, said to them, yeah, AQ means the C ions are surrounded by water molecules. In solid sodium chloride, you know, water, there are the good eyes and a plus and Cl minus so that they understand why AQ and why they are separated. So take NACL AQ okay, but just the second line was separated ions for showing the particles which are present.

David 50:06
Thank you.

Dvora 50:17
I see a question about sending the name of the book about this topic. I believe it's the misconceptions book, is that right? That's the one that we're referring to. Dr. Barke, is that your that's I believe that's the one there was several books but the misconceptions about...

Dr. Barke 50:38
I have several topics, about equilibrium, about acid based, about redox in this book, and when you are teaching you can show what I propose for every topic. When you will look to the misconceptions which if there are some or if you must know the misconception for having a

good lecture for avoiding those mistakes. When you don't know the misconceptions, you can go, do the same as in the history. You say ionic lattice. And the students don't know what you mean. So when you have the model with Ionic lattices, and a plus Cl minus and a plus Cl minus, the student can have something concrete in his mind, and will remind better what an ionic lattice or a metal lattice is. The molecules are more easy because only three, four or five atoms are linked. But lattices are a big, big gap. Our schedules in chemistry, so therefore, another time, try have your models ready to show them or even build the models with your students.

Dvora 52:10
I cannot thank you enough Dr. Barke for today. Everyone, thank you so much for attending. I'm Dvora and I'm with Chem 101 also. And I will be emailing you all a link to recording of this as well as a copy of the slides. I know people have been asking for that. We'll have that available to you as well. If anyone does need a certificate of attendance, please email me learning@101edu.co. I put that in the chat. I'll put it again. And I do hope that you also take a moment to put your answers to two questions in the survey, I put that link in the chat. Not only feedback for today, but we're looking ahead to 2022 and we want to make sure that we're putting together presentations that are of use to you. So like your thoughts on other topics. Thank you. Thank you, Dina. Thank you Dr. Barke. We're so glad you took the time to meet with us. Thank you, everybody. Have a good rest of your day. Take care.

Dr. Barke 53:09
Okay. Thank you all the time for your invitation. It was a nice experience to have the virtual discussion about, to our presentation. I mostly I have only two or three virtual things behind me and I'm not comfortable with this. I like more be better on the screen on the...

Dvora 53:35
In person we hope. Maybe, maybe we could bring you to the states in person. That would be wonderful.

Dr. Barke 53:43
To Milwaulkie. Excellent.

Dvora 53:48
Thank you everyone. Bye.