COVID Information Commons (CIC) Research Lightning Talk

Transcript of a Presentation by Ponisseril Somasundaran (Columbia University), September 22, 2021

Title: Novel Foam formulations for decontamination of surfaces with minimum wastewater generation

Ponisseril Somasundaran CIC Database Profile

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Transcript

Ponisseril Somasundaran:

Slide 1

Thank you. So the idea of this project is to have methods by which you can mitigate the spreading of this virus or the future ones. And one of the problems using the current method, if you use bleach solution and is spread over the HAZMAT it just drips - it doesn't stay there long enough. So we're looking at ways to generate, you know I like beer and a lot of, we like beer, I'm sure, so we thought: you know, how about if you use foam" which should stick to almost any surface, depending upon the structure of the foam. So our idea is to generate nanostructured foams so that you stick to the surface for whatever time you want. In the case of Ebola, because this project started at the time of Ebola, for half an hour. So depending upon the time you want you can control the formulations.
And we tested this foam structure - on the screen, if you can see that - in front of the Columbia grads, at 7:00 AM by graduate students - I'm not a morning person, I wasn't there - but that's where it was tested.

Slide 2

Ok, so the main idea is to then, to eliminate the use of bleach which has other problems that are shown here. They irritate the skin, the bleach fumes cause lungs to burn when inhaled too much, and if you use vinegar for various purposes it creates deadly gas. Remove these…ok.

Slide 3

Also exposure to quats on skin quality - I don't worry about it at this age, but a lot of people should worry about it, skin quality - and the widespread use also produces superbugs. That I do have to worry about because it avoids, it makes it difficult to use antibiotics as you know, and the potent chemicals can contaminate the surface they come in contact with. And more serious problem is that the toxic effluent is a major problem. So the idea is how to avoid the use of the bleach foam.

Slide 4

So this is the wet form, which still has a lot of liquid - we want to also avoid the toxic effluent such as that is generated during washing of any kind of surfaces, so that won't avoid, so if you have the wet foam drain - this is the photo generated by my mentor, previous Dr. Karol J. Mysels - most of his protégés went on to Nobel Prizes, anyway he's in the heavens now. And then you get the dry foam. Dry foam has very little liquid between the lamellae, between the bubbles, and so not much is generated - that's one of the main advantages. And you can have the formulation in such a way that it will kill the virus.

Slide 5

Another advantage is that we could incorporate penetrate super spreaders like the silicone shown here. My first graduate student makes some of these modified silicones - he's a genius - he also made, by the way, the first flat plate display system we are looking at. And they can penetrate because they can penetrate into cracks, and they can also penetrate under the rug, which is usually where viruses can hide, and this is very very important.

Slide 6

So that is what - and another purpose was some of the surfactant soaps that you use are toxic. Like sodium sulfate we wash your hands very often then you will see, if you look at your hands, the hands become dry. Our idea was to use benign microbial biosurfactants which are, some of them were shown here, but more important one was the surfactin that is generated actually by the microbe. Surfactin is very effective, it also has other effects such as to stop the cancer and things like that, so this was another project.

Slide 7

So with all that, we generated this formulation, the idea by which the foam life is controlled is shown here: this lamellae between two bubbles, and these two surfaces come towards each other - all the water will go and the bubbles escape. But if you have the right kind of surfactant layers which repel each other, then some of the water will be retained, and that is how you control the structure - by controlling this surfactant layers, you can control the amount of water that is drained - that is how you can control it, the formulation. And so what are the advantages? First of all, you can use minimum bleach - just that is necessary, or no bleach at all in some cases. The other advantage: you can get nanostructured foam

which will stick to surfaces. Then sufficient deposition and uniform coverage, which you can test, you can get uniform coverage so there are no spots left, and also as I said, you can reach not only roofs, which has - if I have a roof like what I have here, to absorb sound, there will be also a virus that'll solve here, and you can-- ordinary sprayers and no splashback, splashback is always a problem. And you can use some of these sprayers, or bigger ones if you want to use rooftop or even top of air- airplanes, you can use such things. So there are various ways to use it.

Slide 8

So, this is the last slide, I think, so results: we have developed optimum robust formulations, and the formability, it was studied, which I didn't cover at all using infrared technique and other techniques - I didn't cover that here - and degree of home deposition on different target surfaces was looked at, foam delivery options also was looked at using various, very very simple - like the one that used for car wash. And finally our product that is licensed to a company called Universal Formulations is on the market - that is there - but they don't have any funding, we don't have any funding to market it, to have a T.V. advertisement and everything on everything. So it's, this trademark printing, so we need funding for marketing or some kind of venture capitalist, so we are hopeful. This– and you know, unfortunately, as you know, this virus is not going to go away for a long time - or there will be other viruses - and this kind of strategy is very very important for future pandemics also. So this was supported by one of the NSF RAPIDs, and we're very very grateful for that. Without that we couldn't have done it. So thank you, and I hope I used just my time.