

TerraVerdae takes a bead on microbeads

BY ETHAN FORMAN STAFF WRITER | Posted: Sunday, January 10, 2016 8:05 pm

BEVERLY — A small biotechnology startup called TerraVerdae BioWorks is finding itself at the center of a debate about a new federal law banning tiny, plastic microbeads in rinse-off cosmetic cleansers and exfoliants.

The company says it has developed a biological process to create tiny microspheres out of PHAs, a material that is commonly used in sutures in the body, and that are biodegradable in a marine environment.

Microbeads made out of petroleum-based plastics are an environmental concern, because they can pass through water filtration plants and wind up polluting lakes, ponds and streams. The plastic beads also can attract pollution and then be eaten by fish, birds and other wildlife.

To stop this from happening, Congress recently passed the Microbeads-Free Waters Act of 2015, which President Barack Obama signed into law earlier this month, phasing out use of the microbeads over the next few years. And that's causing some uncertainty for TerraVerdae.

The Beverly company says its microbeads are safe for the environment and their production is environmentally sustainable, but is concerned that the new law has filtered out its "green" microbeads for use in cosmetics.

That's because the broad language of the Microbead-Free Waters Act bans "intentionally-added plastic microbeads."

TerraVerdae President and CEO William Bardosh said there's a question as to whether the ban extends to microbeads that will eventually break down in the environment.

"The text said, 'plastic,'" Bardosh said. It's a nuanced argument, and Bardosh says there is debate as to whether bioplastics fall under the definition of plastic.



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KEN YUSZKUS/Staff photo William Bardosh, CEO of TerraVerdae BioWorks of Beverly, explains the biodegradable microbeads that his company is producing in a lab at Cummings Center.

“Some people in the industry said it’s not plastic, it’s polymer,” Bardosh said.

More on microbeads

TerraVerdae’s bioplastic breaks down into carbon dioxide and water in a marine environment. It’s a material that is already used in sutures and surgical mesh that breaks down naturally in the body.

These PHAs (short for polyhydroxyalkanoates) are actually a byproduct of a single-cell organism that consumes methanol, or wood alcohol.

Bardosh said he is not overly concerned about the ban on plastic microbeads in exfoliants, because that is not the only application for the material. PHAs can also be used in cleaners to remove grease from hands, he said, and in high-performance 3-D printing done by commercial designers. There are also possible uses in film and coating applications, Bardosh said, and even in drug delivery.

There is also a market for biodegradable microbeads in cosmetics in Europe and Asia, Bardosh said.

“As a small company, we are going to take the fastest path to revenue, and I think we have huge markets outside of the U.S. that I think are not going to go down this route,” Bardosh said of the ban on plastic microbeads. “I think with time, legislation in time will adapt.”

‘World’s smallest multinational’

Bardosh conceived of the company in 2009, and it has been in operation for three years. It has 16 employees, and has both private and government funding. The company has developed its process to the point of a commercial demonstration scale, and the next step is a full commercial run. “We are raising the funds to do that,” Bardosh said.

While the company is headquartered in Beverly, where Bardosh lives, its development facility is in Edmonton, Canada, where it has received government funding and where there is a large waste-to-methanol production facility. The company also has operations in the United Kingdom, at the Centre of Process Innovation in Wilton, England.

“I sort of joke we are the world’s smallest multinational, but my view has been quite global,” Bardosh said. “I’ve worked in Europe and all over North America. I don’t have a problem linking different opportunities together that are geographically separate.”

The company is based out of North Shore InnoVentures, a life sciences and clean tech small business incubator located at 100 Cummings Center.

Bardosh said North Shore InnoVentures has been vital to the company’s startup and success. It has allowed Bardosh to share know-how and resources with other life sciences companies at the Cummings Center. TerraVerdae also has access to the incubator’s lab space and equipment. The company was one of the early firms to join North Shore InnoVentures.

“You have people who are like-minded, who think similarly, who are sort of facing similar trajectories, similar challenges,” Bardosh said.

TerraVerdae's roots

Bardosh formerly worked for Applied Biosystems, a company that developed equipment for biotechnology companies, and later went to work for IBM.

He became familiar with PHAs when he got a call from the National Research Council, which had a technology to make biodegradable plastic out of methanol, which is also known as wood alcohol or wood naphtha.

The PHAs are produced when single-cell organisms consume methanol. Sources for methanol are forestry byproducts or municipal waste streams, and Bardosh likes that the process closes the loop in the waste stream.

“I just thought it was cool,” he said.

In developing the technology to produce the material, TerraVerdae has filed 12 patent applications and licenses.

The challenge is not in the science, Bardosh said, but in how to scale up the manufacturing to produce the material as economically and efficiently as possible.

“It’s almost more of an engineering challenge,” he said, “than it is a scientific, chemistry challenge.”

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