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- Sports
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- Opinion
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Soviet roots, American growth

Delaware biologist Vidadi Yusibov's research into coaxing plants to produce human vaccines lands him on Esquire Top 10 list

BY VICTOR GRETO
THE NEWS JOURNAL
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idadi Yusibov first became a farmer when he was 5 years old.

In the Caucasus Mountains, by a small town in Azerbaijan near the Caspian Sea, his mother and father showed him how to make a hole in the soil with his finger so he could help plant the tobacco seedlings they had grown during the winter in their greenhouse.

He had to get it just right. It was the family's livelihood, after all, and the determined boy, on his knees at times, crouched at others, grew up observing everything around him growing as quickly as himself.

It was there in the field that Yusibov, now the 44-year-old executive director of the Fraunhofer USA Center for Molecular Biotechnology in Newark, first sowed the roots of his future as a biologist.

The center specializes in developing plant-based vaccines, a relatively new field that has taken on added importance after 9/11 and the more recent fears of an avian flu epidemic.

Fraunhofer USA is a subsidiary of a German company, which does scientific research at more than 40 locations throughout Germany.

This week, Yusibov, whose 15,000-square-foot, four-lab center sits in the middle of the Delaware Biotechnology Park, was recognized by Esquire magazine as one of the 10 "best and brightest" minds in science nationwide.



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Vidadi Yusibov, 44, is executive director of the Fraunhofer USA Center for Molecular Biotechnology in Newark.



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Fraunhofer research assistant Carolyn Cricuolo works with DNA.

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"They call me a 'vaccine farmer,' " he said of the magazine, noting the irony.

Why all the attention for a self-described "low-key" biologist with "mixed feelings" about being in the Top 10 of anything, and let alone in a national magazine?

"He's an interesting character," said Robin McFee, medical director and president of Emergistics US Inc., a bio-terrorism-preparedness company that consults with

Using a variety of plants to develop vaccines

Vidadi Yusibov develops vaccines, therapeutic proteins and antibodies from multiple plants, including tobacco, petunias and varieties of soy bean and lettuce. Although no plant-based vaccines are available for people, some have been tested in humans, and vaccines for anthrax and the flu are in the clinical stage with animals, he said. While at Thomas Jefferson University, in Philadelphia, he helped develop new technology that uses genetically modified plant viruses to create antibodies.

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government and law enforcement and is based in Washington, D.C.

"The jury's still out on what he's doing," she said. "But it offers a lot of hope."

That hope includes vaccines for the avian flu, anthrax, diabetes and prostate and cervical cancer.

Traditional vaccines have consisted of a killed, weakened or derivative form of an infectious germ.

When the body receives the vaccine, it triggers an immune response by causing it to believe it's being invaded by a specific organism.

"Your body builds an antibody against it," McFee said, "so when your body sees the real virus, it can defend you from it."

If you create a vaccine through plants, however, there will be no need for needles and injections in the arm or shoulder. You would take it orally, usually by eating, or by sniffing it, or by swallowing pills.

No more contaminated stockpiles of vaccines that put populations at risk, because plants hold the promise of having a much smaller risk of contamination by human and animal pathogens or microorganisms.

And the manufacturing of a plant-based vaccine theoretically could be done by the acre.

"We're able to get the attention of the farmer, because now we're not just growing soybeans to feed chickens," said Mike Bowman, president and CEO of Delaware Technology Park. "We're creating a new platform for chemistry for the world."

Soviet education sparked interest in science

"It's like I'm climbing a mountain and I've reached a peak," Yusibov said in a mild but rich Eastern European accent about the honor. "Once you reach it, you see another one higher, and have added responsibility."

Although most assume he is Russian, Yusibov is actually Lezgian, an ethnic group of Dagestani people, several hundred thousand of whom live in Azerbaijan.

Born and reared under the umbrella of the Soviet Union, he did not learn to speak Russian until he went to school. When he calls home to his parents, who live and farm in Amiviran -- that same small village in which he grew up -- he speaks Lezgani because they don't know how to speak Russian.

In school, Yusibov excelled in science and biology after becoming inspired by an eighth-grade biology teacher, he said.

"He stirred something inside me," Yusibov said. He became insatiably curious about nature, why cicadas made their incessant noises, for example -- but especially how plants grow.

"I was happy to finish high school," he said, because he was able to leave his village. "I no longer had to touch tobacco."

Not exactly.

Attending Leningrad State University, he became fascinated with plant physiology and biochemistry, "how they can do things we can't do," such as creating their own energy from sunlight through photosynthesis.

At the Academy of Sciences in Moscow he received his doctorate in plant molecular biology, mostly by studying corn at first. But then he moved on to tobacco, which is easy to manipulate genetically.

It also was in Moscow where he met his wife, Galena, and married her the year before he graduated in 1989.

Their first daughter, Rena, was born the year he graduated. They have since had twins, Katerina and Victoria, now 7.

It was his work modifying tobacco genes that interested Purdue University in Indiana, which had gotten his résumé through a friend, and hired him as a researcher. He stayed there until 1995, when he transferred to Thomas Jefferson University in Philadelphia.

It was in Philadelphia where Yusibov was "put in the middle of medically trained immunologists and vaccine development."

Before the heady 1990s, he said, "There was a wall between plant biologists and vaccine development."

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Beginning at Purdue, and furthering his research at Thomas Jefferson, he and his colleagues worked to turn plant viruses into potentially useful products.

It's a deceptively simple process.

With the new technology, a genetically modified plant virus is injected into a plant. The virus triggers the plant to make new proteins called antigens. When the plant is ingested, the body reacts to the proteins as if infected and creates antibodies.

Unlike current vaccines, the potential vaccine doesn't need to be refrigerated because it does not hold a live virus.

Terrorism threat boosts research

If there was one event that pushed alternative technologies toward vaccine development, it was 9/11, McFee said.

"Post-9/11 has been a huge cash grab for many companies and nonprofits," she said. "There's been a tremendous influx of vaccines and countermeasures. It has done more for research and innovation out of the box."

Plants are an arm of research that needs more development, she said. "But there's no free ride in medicine. The more we learn about it the more we find more unintended consequences."

Although no plant-based vaccines are available for people, some have been tested in humans and several Yusibov has developed with his 32-member crew are in the clinical stage with animals, he said.

The lure that drew him away from the Thomas Jefferson Medical Center toward the Fraunhofer center for molecular biology was its newness: "This was a clean piece of paper," Yusibov said. "I could work my vision and was able to bring some brilliant scientists and fill the gap between basic research and industrial needs."

The idea of the center and other Fraunhofer nonprofits, said Bill Hartman, vice president of the company's U.S. division, is to "push technological and scientific development into society by creating company spinoffs and licensing technology."

In fact, Barry Marrs, who was executive director of the center when Yusibov came on as science director at the end of 2001, has since gone to start a spinoff company called Athena Bio. This opened the door for Yusibov's current job as executive director, which he's held since January.

"As science director, he developed the entire research program," Marrs said of Yusibov. "He has a lot of worldwide connections, and is respected in many different venues, which helps him build good alliances."

Although Yusibov says he gets the itch to only do the research that he loves, he said he likes the role he's playing now.

"It's about getting the technologies to market as quickly as possible," he said of the idea of spinoff companies that would license the technological processes the center develops to create potential vaccines.

"It's not just about me and the research," he said. "It's about what we're doing and how it eventually will benefit others."

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