Along the Silk Road: Improving Vaccine Storage

Who would guess that silkworm cocoons – the raw material for silk thread – could replace vaccine refrigeration transit? This innovative application of a “natural” product is an emerging reality, thanks to Vaxess Technologies, a Cambridge-based biotech company founded by four Harvard students and launched in 2011 with seed grants from the Harvard Global Health Institute (HGHI) and the Harvard University President’s Challenge for social entrepreneurship. Vaxess is cofounded by Michael Schrader, MBA ’12, Kennedy School student Livio Valenti, MPP ’13, Kathryn Kosuda, a former Harvard postdoctoral fellow in chemistry, and Patrick Ho, JD ’12. The Vaxess team, which has received mentoring and support from various Harvard faculty as well as Tufts University Professors Fiorenzo Omenetto and David Kaplan, hopes to leverage the silk-based technology to change the way vaccines are stored and distributed around the world.

Vaccines and antibiotics are generally stored and transported cold, and lose their efficacy if not properly refrigerated at the right temperature at all points along the “cold chain,” from production to use. But refrigeration and electricity are scarce and expensive in many countries, and the World Health Organization estimates that unregulated temperatures at gaps in the chain account for the loss of half of all vaccines produced in the world, costing vaccine programs approximately $200–300 million a year. In resource-poor settings, where infectious diseases make up more than half of all deaths, those who most desperately need effective vaccines and antibiotics may not get them. Shifting transport to small pouches of self-standing silk protein biomaterial can keep cold-sensitive drugs stable and eliminate the need for cold storage.

“We have made a conscious decision to focus on leveraging the intellectual breadth and collective expertise of Harvard faculty and students, like the Vaxess team, by providing a unique platform to provide the intellectual space and scaffolding to tackle the most intractable global health challenges by promoting collaborative innovation, intellectual risk-taking, and the testing of both new ideas and long-held assumptions,” said HGHI Faculty Director Sue Goldie. “We hope to inspire and invest in the next generation of global health leaders, interdisciplinary thinkers with the practical ability to work across sectors, and the moral will to challenge health inequities wherever their career paths lead them,” Goldie noted. If successful, efforts such as this one by Vaxess Technologies could make the difference between saving
billions of dollars worth of viable vaccines and antibiotics and making needed medicines available to people in resource poor countries.

The vaccine-stabilization technology, which also won the Harvard Business School Business Plan Contest, was recently published in the *Proceedings of the National Academy of Science* and has also been featured in *The Economist* and *Forbes.com*.

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