



The Syqe inhaler includes 80% 3D printed parts.

## Swift Relief

Creating an Advanced  
Drug Delivery System at  
Breathtaking Speed

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Our motto at Syqe is ‘Don’t think, print.’ 3D printing throughout the product design phase accelerates your thinking process and gets you to the end result faster.”

Perry Davidson  
**Syqe Medical**



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Creating innovative medical devices that solve unmet clinical challenges is always a formidable task. Add extreme time constraints plus the need to invent an entirely new drug delivery approach and you'll match the pressure the young entrepreneurs at med-tech startup Syqe Medical faced.

Their first project was the creation of a drug delivery system that would enable patients suffering from extreme neuropathic pain to use, for the first time, precisely controlled doses of cannabis for relief, while avoiding unnecessary physical reactions.

"This pain is very resistant to many available treatments. Cannabis works to reduce this type of pain," said Professor Elon Eisenberg M.D., Director of Pain Research, RAMBAM Medical Center, Haifa, Israel. "The problem is that up till now there was no quantifiable and predictable way to prescribe medical cannabis."

"There were tremendous challenges in controlling the dosages of a drug that has therapeutic properties but also has psychoactive properties. We needed to control it in a very precise manner. So we set out to develop a quantified metered dose delivery system for cannabis as a start and for other botanicals that have therapeutic value," explained Perry Davidson, Syqe Medical Founder & CEO.

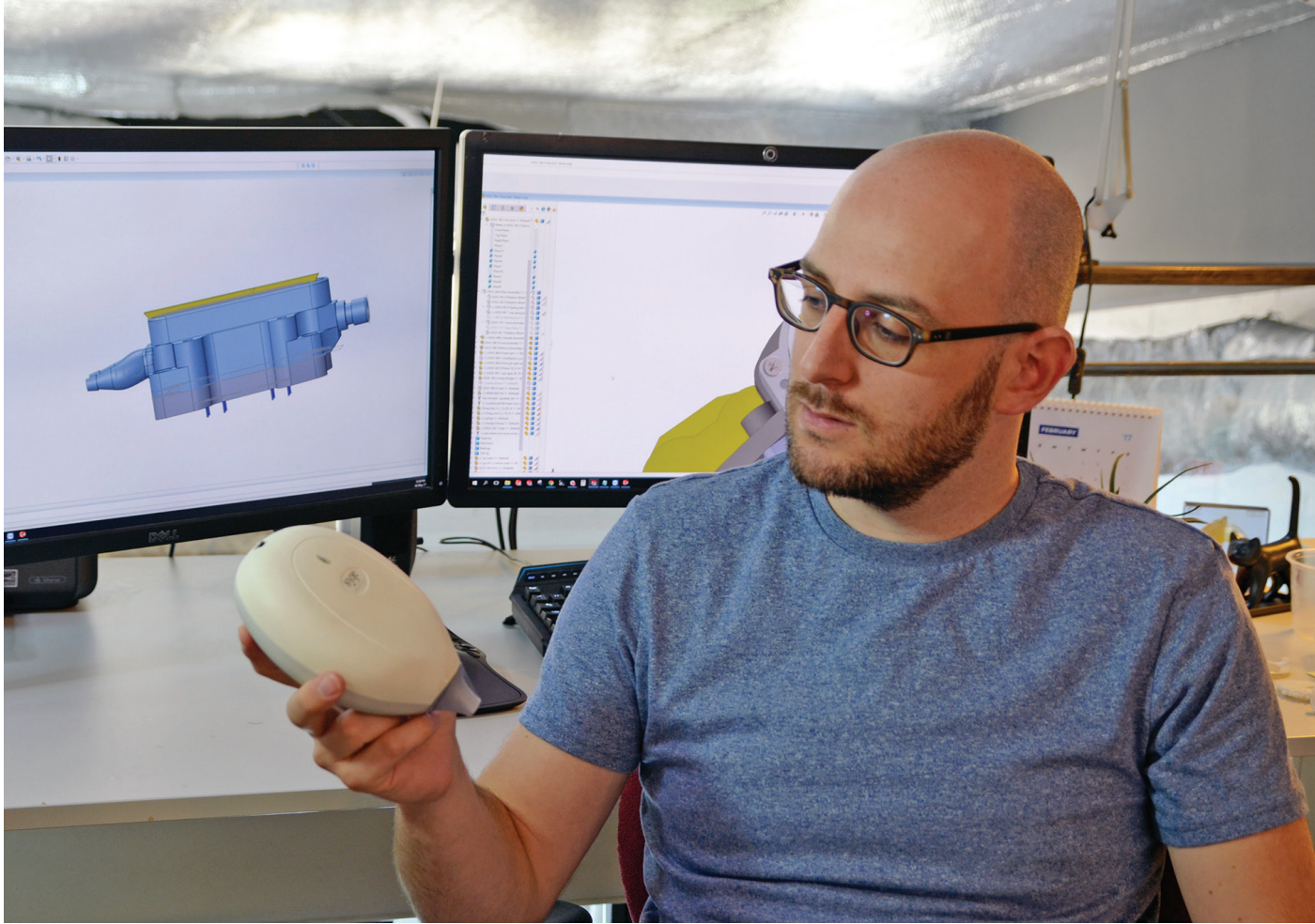
## Just Six Weeks to Win Over Investors

Syqe's vision is to bring the most efficacious medication to the largest number of patients in the fastest time possible. But conveying complex, technical solutions for previously unsolved medical challenges to investors is a complex task. Perry felt that just creating another "excruciating" slide presentation was not going to be enough to communicate the real innovation of the Syqe inhaler concept. So with just six weeks to create a model from scratch, Itay Kurgan, Syqe Medical's head of design, turned to Stratasys 3D printing.

"With just two weeks ahead of us, we turned our Stratasys Objet 350™ 3D Printer into our R&D hub. I designed the inhaler prototype and we 3D printed the parts," recalled Itay. "We wanted to show how



One of the cartridge designs used in the inhaler for dispensing the medication.



Itay Kurgan, Syqe Medical head of design, holds the inhaler design used in the clinical trial.

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small the device would be, how it would function, how the electronics would work, and how the airflow would work. This was all achieved with our 3D printed model. This changed the whole conversation with the investor.”

Funding was obtained as a result of this presentation and it was on to the next phase - clinical trials.

### The Race to Clinical Trials

With just two months to develop a working product, the Syqe staff now turned to the make-or-break clinical trial stage.

To create the devices for clinical trials, Syqe first tried using traditional CNC machining, but this was very slow and expensive, especially for a new company with limited resources. So again they turned to their Stratasys 3D printer, which made all the difference. They completely redesigned the entire device so that a working model could be wholly 3D printed, with the exception of the electronics and the metal parts.

The ability to iterate part designs quickly and easily was absolutely critical to the design phase, evidenced by the special demands of the airflow system.

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“One of the biggest design challenges was the inhalation system. Different patients inhale in different ways, different age groups have different lung volumes. So we needed to create an airflow system that is completely patient-agnostic. And we had to achieve this in an affordable and rapid time frame,” explained Perry. “In a single month we iterated 10 completely different flow mechanisms that we printed in house, culminating in a unique mechanism which solved the problem. This design, using a geometry only possible with 3D printing, reached the level of performance that solved the inhalation issue and ensured consistent precise doses.”

As a result of its optimized design, the Syqe inhaler -- 80% of which was 3D printed -- had a very successful clinical trial and was ready for commercial production.

The final product contains many 3D printed parts. For example, the parts that come into contact with the human body, including the inhalation mechanism, are 3D printed using Stratasys MED610™ biocompatible material.

“When we were designing the inhaler, we would design a part on Monday morning and by Tuesday morning it would have already been changed five or six times. By the end of one week we accomplished what it would take four weeks with conventional manufacturing methods,” concluded Itay. “I would recommend using 3D printing from the very beginning for any med-tech company, from concept to prototyping to clinical trials.”

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