

Making a Better Bike Helmet

When Ryan Mathieu crashed going 28 miles per hour, he landed on his head and shoulder, snapping his collar bone into three. But his head and—more importantly—his brain, were unharmed.

Not all cyclists are so lucky. [About 800 Americans die each year](#) from bicycle related accidents. [A 2013 study estimated](#) 494,000 people in the U.S. were hospitalized from cycling accidents, half of whom sustained traumatic brain injuries. But helmet technology aimed at preventing head injury hasn't changed much in 30 years.



The founders of [Wavecel](#) didn't start out to revolutionize the helmet industry. But while conducting research at the Legacy Biomechanics Laboratory in Portland, Oregon using a 2007 Phase I Small Business Technology Transfer (STTR) grant to investigate the shortcomings of current helmet technology, they realized they had the know-how to keep cyclists safer.

They've illustrated the problem on their website with a simple [egg video](#). To mimic a brain inside the skull, two cracked eggs with intact yolks are suspended in water inside a clear dome. When the dome collides with anything directly, or "head-on," the yolks are fine. And the assumption that this is how heads collide with pavement is why standard helmet tech often fails.

From previous data and Wavecel's own research, scientists have found that most crashes happen at an angle, which causes head spinning after impact. The egg simulation video illustrates how brain damage can occur. Upon impact, the egg-filled dome spins and the yolks disperse. To protect the eggs, and prevent traumatic brain injuries, the company used Phase II STTR funding (2014) to develop their 3D technology.

The Wavecel material is a honeycomb-shaped network that crumples during an impact, then causes a domino effect of crumpling across the network, dispersing the force. Then the whole honeycomb network slides, helping to counter any spinning caused by impact.

WaveCel received the highest rating from Virginia Tech University's helmet testing facility. And the company calculates the helmet—sold exclusively to bicycle company Trek—[reduces the risk of concussion by 98%](#), compared to a standard foam helmet.

Wavecel co-founder Michael Bottlang says the [NIH Commercialization Readiness Pilot \(CRP\) Program](#) (funded by the National Institute of Neurological Disorders and Stroke) was critical to Wavecel's success. "Without that CRP, I can confidently state we would have had little to no chance of making this available for consumers," says Bottlang.

As much as Bottlang is excited about the future, he's most proud of seeing comments like the one Ryan Mathieu posted after his Ironman crash, thanking the Wavecel technology. Bottlang says, "That is the best feedback."



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