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# Transforming lives of children with cerebral palsy

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The cerebral palsy prevalence rate has dropped by 25%<sup>1</sup> in Australia and Europe, but this life-long condition continues to remain the most common motor disability in childhood.

In Australia, one child is born with cerebral palsy every 20 hours, with the condition affecting at least 34,000 people in Australia and more than 17 million globally<sup>2</sup>. Spasticity, in people with cerebral palsy, is a condition in which muscles stiffen or tighten, preventing regular fluid movement, which causes muscles to contract and tighten, said reconstructive plastic surgeon [Dr Joe Dusseldorp](#) noting that the most popular treatment involves receiving painful, deep injections of botox every three to four months over a patient's life.



### Micro-implants to control spasticity, pain

"Knowing this, the Syncricity team and I asked the question, 'What if we could just inject something tiny, send signals to it to block spasticity and then turn it on and off like a dimmer switch?'. It was this moment that led us on a mission to transform the lives of people living with excessive rigidity in muscles," Dusseldorp said.

Dusseldorp, along with his team at Syncricity, aims to accomplish this mission by developing life-changing micro-implants set to control spasticity and pain. These micro-implants "do not require invasive surgery, will deliver real-time controllable relief from muscle spasticity and return functional muscle control to people with traumatic brain and spinal injuries — reducing pain, increasing limb mobility and independence, removing the need for repeated botox injections or permanent nerve severing surgery", Dusseldorp said.

The project recently bagged the National Bionics Innovation Prize (NBIP) in the [Bionics Challenge 2022](#), a competition designed to fast-track bionic healthcare solutions to market, to help change the lives of those impacted by road trauma, related disabilities and chronic disease.



## The Bionics Challenge

Hosted by [Bionics Queensland](#) and delivered in partnership with the [Motor Accident Insurance Commission](#), the Bionics Challenge awarded \$200,000 in major category prizes and a total of \$40,000 to a suite of promising, early-stage bionic innovation teams. In addition, a \$30,000 NBIP plus expert advice on funds attraction, awarded courtesy of Morgans Financial Limited.

Other winners include: a UQ Queensland Brain Institute-led project to fast-track closed-loop neuromodulation treatments for those impacted by traumatic brain injury; a Mater Research project delivering smart watch-enabled monitoring of stress-induced epilepsy; Griffith University designed smart garments for use in rehabilitation; neurobionic and e-stimulation treatments for stroke rehabilitation and spinal cord injury; and a Griffith University student's new-to-the-world design for a brain-computer-interfaced bionic jaw.

Dr Robyn Stokes, CEO, Bionics Queensland, and architect of the Bionics Challenge said, "Australia's reputation for bionic innovation has not dimmed since the groundbreaking work of Professor Graeme Clarke on the multi-channel cochlear implant. We've seen Control Bionics, Audeara and others achieve market success and Synchron, Bivacor, Bionic Vision Technologies and Brisbane-based bionic voice box inventor Laronix are now accelerating their global profile. Australia has the potential to become a 'go to' location for first in-human trials of bionic implants, devices and treatments, not just pharma and cell therapy trials.

"Our Bionics Challenge sees start-ups, R&D leaders and everyday innovators work 'head to head' with patients and end users of bionic devices to jump-start new discoveries and improve on existing solutions to transform lives."

## Overcoming challenges

Like most innovators, Dusseldorp's journey so far hasn't been without challenges. "In getting this far with the development of the implants — it's been tough. First of all, I had to learn about how medical devices are actually developed and make the right connections. I realised pretty quickly I couldn't do it all on my own.

"Developing products is expensive, especially medical ones, so I had to learn how to pitch the idea well to attract prize funding, as well as dig deep into my own pocket. Maintaining a full surgical schedule while investing time into this startup and spending time with my family has been a difficult juggling act. We've also had to overcome challenges in the design and testing of the technology," he said.

## Reaching the milestone

Dusseldorp didn't always know he wanted to be a surgeon but accidentally discovering his family history injected a strong sense of motivation in him.

"Discovering my family's deep-rooted history in medicine when I was 21 years old was the catalyst that launched me into the medical world. I immediately felt a strong connection to my ancestors, who all showed resilience and compassion in their community and hope to leave a legacy for future generations. It gave me even more of a reason to pursue my passion for medicine...

"While I was in medical school I happened upon an amazing surgery where plastic surgeons can sculpt an ear from cartilage for children born without one due to microtia. I was hooked and decided to track down the surgeon who conceived the surgery and train with her until I could bring the technique back to Australia. Since then, we've brought in 3D-printing techniques to build custom prosthetic implants to improve the outcomes even further.

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"In the early days I also saw how neuro-stimulation can open up whole new ways of treating conditions that were previously essentially untreatable. I resolved to keep applying the principles of innovation to medical practice and do what I could to push the boundaries of what's possible," he said.

The funding from Bionics Queensland through the Bionics Challenge and the mentoring from advisors on the commercialisation of bionic-medtech devices will help Syncricity take their device to market. It will also help the company fund further testing required to make design modifications and continue the development of our innovation to improve patient health outcomes.

"We want to optimise the parameters of the nerve block signal so that we can get to a sufficiently tiny wireless device that is easy to implant and will require a reasonable level of energy transfer to operate. Completion of short duration in-human experiments is a key upcoming milestone for us," Dusseldorp said.

## Future potential

The global bionic devices market is expected to grow by CAGR of 9.92% and reach US\$8.68 billion by 2027<sup>3</sup>, according to the latest report by [Reportlinker.com](https://www.reportlinker.com).

Rise in chronic conditions, growth in heart disease rates worldwide, an increase in prevalence of hearing loss and surge in healthcare costs are some of the key drivers for growth in the sector.

"However, the high cost of bionic implant devices and the unsure reimbursement framework in various parts of the globe are the factors that are expected to restrain the market," according to a statement by Reportlinker.com.

The possibilities are endless for the future of bionic devices and innovation, Dusseldorp said.

"As we've seen in the Bionics Challenge, aspiring innovators are able to push the boundaries when it comes to revolutionising bionic technology, and with the support from Bionics Queensland, we're able to propel these breakthrough healthcare products to market.

"My personal interests are in the areas of 3D bioprinting, gene therapy and obviously neuro-stimulation. I think they have some of the greatest immediate opportunities for successful developments and we'll see some of that come to fruition in the next five years. The common thread is dedicated people not just settling for the status quo. If we look instead to collaborations between clinicians, scientists and engineers to tackle problems in ways that may be unproven and currently only borderline feasible we have the potential for hugely positive impact for patients," Dusseldorp concluded.

1. <https://onlinelibrary.wiley.com/doi/10.1111/dmcn.15346>

2. <https://cerebralpalsy.org.au/our-research/about-cerebral-palsy/what-is-cerebral-palsy/facts-about-cerebral-palsy/>

3. Bionic Devices Market, Global Forecast 2023-2027, Industry Trends, Growth, Impact of Inflation, Opportunity Company Analysis - [https://www.reportlinker.com/p06381975/?utm\\_source=GNW](https://www.reportlinker.com/p06381975/?utm_source=GNW)

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