

A palm-sized, pain-free drug-delivery platform

With funding from the W.H. Coulter Translational Research Partnership in Biomedical Engineering, which encourages faculty-clinician research that leads to a commercial product, Professor **David Beebe** and colleagues have developed a palm-sized device that could deliver measured, timed doses of drugs ranging from aspirin to insulin.

Easy and inexpensive to make, the disposable device is slightly larger than a poker chip and contains no electronic parts. Inside are three layers: a stimulus-responsive material called a hydrogel, the stimulus, and the drug. “When you press the button, it connects the stimulus to the hydrogel,” says Beebe. “The stimulus makes the hydrogel swell, which is the pumping action, and it simultaneously connects the drug packet to the skin. So, there’s just one simple motion required to operate the device.”

Initially, Beebe, biomedical engineering alum Ben Moga and Pediatrics Associate Professor Carol Diamond developed this platform technology to deliver a vital blood-clotting factor to children with hemophilia. Since then, they have conducted animal studies using liquid aspirin and a vaccine.

The Wisconsin Alumni Research Foundation has patented the technology, which Beebe and Moga are continuing to research and develop. Currently, they are perfecting a microneedle array, which replaces the current single needle, for virtually pain-free drug delivery. In addition, Beebe and UW-Madison biomedical engineering and business alum Tony Escarcega formed Ratio, a spin-off company that is commercializing the device.

Among their closest competitors is a simple microneedle array coated with dry-formulated drugs. Beebe’s device bypasses the need for drug reformulation—making it an attractive technology for a pharmaceutical company to license. “In theory, ours has a lot of fundamental advantages in that we could take almost any drug off the shelf and deliver it immediately, which can provide a significant value-add proposition for pharmaceutical companies,” says Beebe.

Initially developed for young children with hemophilia, this palm-sized device could administer many drugs.

