One step closer to needle-free injections

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A team of UCSB researchers, in collaboration with colleagues from UC Berkeley and StrataGent Life Sciences, of Los Gatos, California, has designed a novel pulsed microjet system engineered to deliver protein drugs into the skin without the pain or bruising that deeper penetration injection systems cause. The research was published online today in the *Proceedings of the National Academy of Sciences*.

The effort to create needle-free drug delivery systems is driven by a combination of factors, including needle phobia, pain and discomfort, infections, and accidental needle sticks to healthcare providers. Currently, about 12 billion needle injections are performed every year for the delivery of vaccines and protein therapeutics such as insulin, growth hormone and erythropoietin, a red blood cell booster. Needle-free delivery of vaccines has recently been identified as one of the significant emerging challenges in global health.

The researchers felt that the pain and bruising caused by previously-developed jet injectors was caused by the deep penetration of jets into the skin, creating negative reactions of nerves and capillaries. The pulsed mircrojets engineered by the researchers combine high velocity (more than 100 meters per second) with very small jet diameters (between 50 and 100 micrometers), delivering only 2 to 15 nanoliters of liquid drug at a time. The research showed that the pulsed microjet system could be used to effectively deliver drugs for local and systemic applications without using needles.

"The microjet system delivers precise doses into superficial skin layers, thereby mitigating pain," says Samir Mitragotri, a professor of chemical engineering at UCSB and a lead author of the paper. The system was designed as an alternative to the macro-scale systems that had been causing pain and bruising. "We realized that we had to find a way to stop the jets from going deep into the skin," says Mitragotri. "Speeding the delivery, combined with using extremely small jet diameters and less liquid per pulsation, was shown to be more effective."

Source: University of California - Santa Barbara