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Weapons-grade nanomaterial repurposed for prosthetics

A group of American and Russian scientists are repurposing a nanomaterial developed for Cold War-era weapons technology for use today in medical prosthetics and dental implants.

Manhattan Scientifics Inc., Albuquerque, N.M., was awarded exclusive U.S. licensing rights by Los Alamos National Laboratory for nanotitanium, a new FDA-approved material that is stronger than conventional metal alloys, integrates more quickly with human bone and is expected to be more reliable, last longer and provide faster post-surgery healing.


MSI

Dental implants made from nanotitanium.

Nanotitanium is the product of a collaboration of U.S. scientists at the Los Alamos National Laboratory and Russian weapons technology scientists who joined together under direction of the U.S. Global Initiative for Proliferation Prevention at the U.S. Department of Energy.

The implants are manufactured and distributed by Basic Dental Implants Inc., Albuquerque, under a limited license from Manhattan Scientifics. MSI also issued a broader exclusive license to an unnamed metals manufacturing company to cover other medical and nonmedical applications for the new class of metals.

Microfluidic devices made from paper

Using liquid and paper tools, researchers at Harvard University's Whitesides Research Group have developed 3-D, microfluidic, paper-based analytical devices (3-D μPADs). The devices are intended for medical diagnostics and monitoring water in developing countries.

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"The devices are made from paper because it is cheap," said researcher George M. Whitesides. "The underlying notion is that we are building these devices for the developing world. And there, cost is everything."

The devices are comprised of stacked layers of patterned, cellulose paper and double-sided adhesive tape. The paper is treated with a hydrophobic polymer that directs the fluid along prescribed channels and seals unused channels.

"The devices are made out of pieces of paper that are patterned with fluid-impenetrable side barriers," Whitesides said. "The fluid can't make its way across those walls, but it can wick its way along channels—similar to how coffee wicks its way in a napkin. We just channel that fluid spreading, called 'capillary wicking,' by building lines into the paper across which the fluid can't go."

A version of an inkjet printer applies wax on the paper that makes the channels hydrophobic. When the layers of paper and tape are stacked to assemble the device, a small gap created by the finite thickness of the tape is formed between the paper layers. Fluid does not flow across the gap between channels in two adjacent layers of paper unless the gap is filled with cellulose powder or some other hydrophilic material.

While the devices are only used once, they are lightweight and resistant to breakage, making them highly portable. The devices can easily be disposed of via burning, a key consideration for medical