Nanotech could give us safer, greener diapers and sanitary products

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A new material made of tiny nanofibers could replace potentially harmful materials found in diapers and sanitary products, according to new research published in *Applied Materials Today*.

The authors of the new paper, from the Indian Institute of Technology, say their new material would have less of an environmental impact and be safer for humans than existing materials.

For the last few decades, disposable diapers, sanitary napkins and other sanitary products have been made absorbent using superabsorbent polymers (SAPs). These materials are capable of absorbing many times their own weight in liquid; the average diaper can absorb 30 times its own weight in bodily fluids. But the material is not biodegradable: in ideal conditions, it can take as long as 500 years for a diaper to degrade. And SAPs have been linked to health problems like Toxic Shock Syndrome, leading to their ban in tampons in the 1980s.

According to researchers, a new material – made of electrospun cellulose acetate nanofibers – does not have these drawbacks. In their study the team analyzed the material, and they suggest it could replace the use of SAPs in female hygiene products.

"Prolonged use of commercially available products could lead to toxic shock syndrome and other conditions, so it's vital to develop a safe alternative to SAPs," explained Dr. Chandra Sharma, corresponding author of the study. "We propose to eliminate the use of harmful, non-

biodegradable superabsorbent polymers from commercially available sanitary napkins without compromising the performance, and even enhancing absorbency and comfort."

The nanofibers are long and very thin fibers made using a technique called elecrospinning – spinning using electricity. Because of their large surface area compared to their volume, the researchers thought they would be more absorbent than existing materials. They compared the performance of the material to commercially available sanitary napkins and found it to be even more absorbent.

The material used in commercially available sanitary napkins is made up of flat, ribbon-like fibers that are about 30 micrometers thick. In contrast, the nanofibers are about 150 nanometers thick – about 200 times thinner. The material is more comfortable than those used in existing products and leaves behind less residue after use.

The nanofiber material is also more porous (over 90 percent) than the traditional material used (80 percent), making it more absorbent. This was confirmed: in tests using saline and synthetic urine, the electrospun fiber material was much more absorbent than commercially available products. They also tested two alternative versions of the nanofiber material with SAPs added and found they were not as absorbent as the nanofibers alone.

"Our results show that electrospun nanofibers outperform commercially available sanitary products in terms of absorbency and comfort, and we think this makes it a good candidate to replace the potentially harmful materials currently used," said Dr. Sharma. "By making sanitary products safer to use and dispose, we hope to have a global impact on health and the environment."

More information: Shital Yadav et al. High absorbency cellulose

acetate electrospun nanofibers for feminine hygiene application, *Applied Materials Today* (2016). DOI: 10.1016/j.apmt.2016.07.002

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