Nano bubble gum for enhancing drug delivery in gut

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Of the many characteristic traits a drug can have, one of the most desirable is the ability for a drug to be swallowed and absorbed into the bloodstream through the gut. Some drugs, like over-the-counter aspirin, lend themselves to this mode of delivery and are trivial to take. They can be pressed into a pill and swallowed. Other drugs cannot be swallowed and must be administered instead through more complicated routes. Insulin, for instance, must be injected.

The reason why insulin and many other drugs cannot be swallowed is that they cannot survive the trip through the digestive tract -- wherein they are first plunged into the acid bath of the stomach and then passed into the intestines, which are filled with enzymes designed to break down molecules like insulin. Aspirin does fine in the gut because its active ingredient is a small chemical that doesn't get broken down. But insulin is quickly degraded.

Tejal A. Desai (University of California, San Francisco) is looking at ways to enhance the "oral availability" of drugs by designing new delivery devices that will help their absorption in the gut, which she will present on November 12 at a meeting of the scientific society AVS in San Jose. Working with a Bay-area biotechnology company, she is making devices that are sort of like spiny beads filled with drugs. The spines on these beads are silicon nanowires designed to form an adhesive interface with the tiny, hair-like cilia that cover the cells lining the gut. They are designed to stick like burrs to the cells lining the gut and slowly release their drugs there. Localized in one spot, the drugs have a better

chance of diffusing into the bloodstream.

Desai is currently fine-tuning the geometry of the nanowires in order to optimize their adhesion. Her laboratory has done a number of toxicity studies with the beads, and their plan next is to look at how effectively they can deliver proteins, peptides, and other macromolecules that are not usually taken orally.

One of the advantages of this approach, Desai says, is that it may be applicable for delivering drugs to other part of the body as well, such as mucosal tissues like the insides of the nose, lungs, or vagina, where the surface cells are also coated with such cilia.

Source: American Institute of Physics