

Wrinkled membranes create novel drug-delivery system

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A University of Illinois scientist studying how membranes wrinkle has discovered a novel system for on-demand drug delivery.

Sahraoui Chaieb, a professor of mechanical and industrial engineering, has created temperature-sensitive capsules that can release drugs on demand. The capsules, which can range in size from 10 to 100 microns, can be tuned to deliver drugs at different rates. Chaieb reports his findings in the Feb. 17 issue of the journal *Physical Review Letters*.

To make the capsules, Chaieb begins by confining a drug inside lipid bilayer membranes. Some of the lipids are then "sewn together" through a polymerization process. Cooling the capsules by 10 degrees Celsius causes the capsules to crumple and collapse like deflated beach balls, releasing the drug.

"The release rate can be controlled by the amount of wrinkling that occurs," said Chaieb, who also is a professor of bioengineering and a researcher at the Beckman Institute for Advanced Science and Technology. "And the amount of wrinkling is dependent upon the degree of membrane polymerization that took place."

One problem that remains is how to cool the capsules without harming the surrounding tissue. The solution, Chaieb said, might lie in newly discovered nanoparticles that can be chilled through magnetic cooling.

Chaieb and colleagues at Illinois are exploring ways to coat the capsules

with the nanoparticles. When exposed to a magnetic field, the nanoparticles would cool down and remove heat from the capsules. The capsules would then wrinkle and release the drug.

Source: University of Illinois

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