# Light-activated 'lock' can control blood clotting, drug delivery

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Scientists have shed new light -- literally -- on a possible way to starve cancer tumors or prevent side effects from a wide range of drugs.

A lock-like molecule designed by University of Florida chemistry researchers clasps or unclasps based on exposure to light. In laboratory tests, the chemists put the lock on an enzyme involved in blood clotting. They then exposed the enzyme to visible and ultraviolet light. The clasp opened and closed, clotting the blood or letting it flow.

The results suggest that the biological hardware could one day be used to prevent the formation of tiny blood vessels that feed tumors. The little lock could also be placed in drugs, giving doctors the ability to release them only on diseased cells, tissues or organs -- maximizing their efficacy while preventing side effects from damage to healthy tissue.

Endoscopic lights inserted into the patient could unlock the drugs when desired -- or, the drugs could be activated by simply exposing the skin nearest the targets to near-infrared light, which penetrates the skin.

"The major idea is to use photons to manipulate a molecule's function," said Weihong Tan, the V.T. and Lois Jackson chaired professor of chemistry and a member of the UF Shands Cancer Center. "The next step would be to deliver therapeutic re-agents at the site, for example, of a cancer tumor."

A paper about the research is set to appear next week in the online

edition of the Proceedings of the National Academy of Sciences.

Youngmi Kim, who earned her doctorate in chemistry from UF in December and is the paper's first author, said the lock has two interconnected parts: a molecule that responds to light, and a short, single strand of active DNA known to scientists as an aptamer. In its natural state, the aptamer binds with an enzyme called thrombin, which regulates blood clotting. The aptamer inactivates the enzyme, which allows the blood to flow freely.

Kim's locking version, however, folds itself into a curved, closed shape when exposed to visible light. That prevents it from binding, or clasping, which means the enzyme remains active and the blood clots. But with ultraviolet light, the curving shape dissolves, freeing the aptamer to clasp, inactivating the enzyme, and allowing the blood to flow freely.

Tan said further research could point to ways to use the lock in combination with thrombin or other substances, natural or artificial, to inhibit the growth of blood vessels around tumors or the delivery of nutrients through those vessels.

The locking molecule could also be affixed to a wide range of other drugs to remain inactive until they reached their targets and light is applied, he said.

Not only that, but Tan said he has made progress on related research using similar mechanisms to make "hydrogels" that liquefy or gel around a target in response to light.

Source: University of Florida (news : web)