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## Molecular propeller could pump medicines

American researchers have developed a theoretical model of a nanotechnology propeller that could be used to target medicines or control the flow of liquids into and out of cells.

However, an actual nanotech propeller is probably several years away because of the problems of constructing such a small device, Petr Kral, assistant chemistry professor at the University of Illinois at Chicago, said in a release Monday.

The team's study of a molecular propeller pumping liquids — water and oils — was a first, the university said. Previous work had looked at propellers in gases. The blades on the propeller are the size of molecules.

"In principle, we could even attach some biological molecules to the blades and form a propeller that would work only if other molecules biocompatible with the blades are in the pumped solution," Kral said.

Kral and his associates set out to study what happened when the propeller's blades are as small as possible.

They found that the efficiency of a nano pump varies with the size and shape of the blades, as does any regular propeller.

But they also learned that the chemical and biological composition of the blades is very important, determining whether the propeller pumps efficiently or just spins.

Hydrophobic blades repel water and are very efficient; hydrophilic blades that attract water become clogged with water molecules and pump poorly.

"Pumping rates and efficiencies in the hydrophilic and hydrophobic forms can differ by an order of magnitude, which was not expected," Kral said.

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