Eliminating the 'Twin'

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A University of Arkansas researcher has received a grant to study the dynamics of synthesizing molecules with the same "handedness."

Bob Gawley, professor of chemistry and biochemistry, has received $380,000 from the National Science Foundation to study the dynamics of stereoselective reactions, which are essential to drug synthesis.

When researchers create a drug, their product often has an almost identical molecular twin, known as an enantiomer. The enantiomer physically and chemically resembles the pharmaceutical product, except that it reacts differently to polarized light and may not function in the same way the drug does. The two enantiomers are related by reflection in a mirror, just as the right hand is the mirror image of the left.

For many years, researchers thought that these twin-like enantiomers were harmless filler, but some have proved to be the equivalent of "errant twins," potentially causing health problems. Since these findings, the Food and Drug Administration now requires pharmaceutical companies to create pure mixtures that only include the active enantiomer - a process that requires either throwing out half of the mixture, or creating one enantiomer through stereoselective reactions that select for the correct "twin."

At the microscopic level in the natural world, many molecules have the properties of enantiomers. For example, all amino acids are one enantiomer, and all sugars are the opposite enantiomer. Biological receptors also exhibit this property, Gawley said, making it imperative

that biomedicines be made from molecules of the same enantiomer.

Despite the fact that pure forms are often found in nature, synthesizing them has turned out to be more challenging, said Gawley, a professor in the J. William Fulbright College of Arts and Sciences.

"The molecules are tumbling around in solution and there are many forces that determine how atoms attach to a molecule," Gawley said.

Gawley will study the properties of stereoselective reactions to help find better ways to create pure forms of enantiomers and to better understand the dynamics of the synthesis of these compounds.

Source: University of Arkansas