BC CHEMISTS’ CATALYST DISCOVERY PROMISES FASTER, LESS EXPENSIVE DRUG PRODUCTION

CHESTNUT HILL, Mass., Sept. 6 2006 – Boston College chemists have discovered a substance that will make it possible for scientists to produce scores of pharmaceuticals and other chemicals in a faster, less expensive way.

In a letter published in the Sept. 7 issue of the journal Nature, a team led by Patricia and Joseph T. Vanderslice Professor of Chemistry Amir Hoveyda and Professor Marc Snapper of the Boston College Chemistry Department said they had found a first-of-its-kind catalyst that will eliminate several costly and wasteful steps from the process of synthesizing certain molecules.

“Our new catalyst will significantly improve the efficiency with which biologically and medicinally active molecules can be prepared,” said Prof. Hoveyda, who is also chair of the department. “Such a catalyst, by shortening synthesis routes, will significantly lower cost and reduce the waste generated in laboratory syntheses.”

The discovery is based on the concept of chirality, which refers to the two-handed nature of certain molecules. Many important chemical compounds that exist in nature or are created by laboratory scientists come in two, mirror-image forms – a “left” and a “right” hand. Some drugs comprise chiral molecules, which can pose a problem: often, one hand, or enantiomer, of the drug molecule can be beneficial to a patient’s health, while the other may be harmful.

Because of this, it is important for anyone who wants to prepare drugs, especially in large quantities, to be able to synthesize single-handed compounds with high selectivity; ideally, none of the opposite hand should be around. This way, the unfavorable properties of one enantiomer are eliminated without diluting the desired enantiomer’s benefits.

What the Hoveyda-Snapper team discovered can be referred to as a “silylation catalyst” – a molecule that attaches, with extremely high selectivity, a silicon atom to an alcohol group so that only one enantiomer is formed. Other molecules are known to promote this important reaction, but the new catalyst is the first to control the handedness of the process at the same time.

“What makes this discovery enormously significant is that silylation is already one of the most useful ways – if not the most effective way – to protect an alcohol from undesired reactions while a molecule is being modified somewhere else,” Prof. Snapper said.
Because of the new catalyst, what used to take four to five steps to accomplish – each step adding significantly to the final cost – can now be achieved in a single transformation. The substance also contains no metals and is therefore more environmentally friendly than many other catalysts.

“The new catalyst is easy to prepare, requires little or no solvent and therefore minimizes waste, and can be used in air and can be recycled several times,” Prof. Snapper added. “Together, these properties make our discovery an important one both from the theoretical as well as the practical point of view.”

The research was made possible in part by a grant from the National Institutes of Health, which has funded the Hoveyda-Snapper collaboration since 1997.

“This is an elegant solution to a very important, practical problem, with the potential to result in more efficient, more environmentally friendly, and less expensive processes for manufacturing drugs. It’s a great example of how NIH support for fundamental chemical research can benefit the American health care consumer,” said John M. Schwab, a chemist at the National Institute of General Medical Science, which supported the work.

The Hoveyda-Snapper team includes Boston College Chemistry graduate students Jason Rodrigo and Yu Zhao, who also co-authored the Nature letter.

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