Binding Molecules to Release their Full Potential

Lyle Isaacs
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CURRENT RESEARCH

Synthesizing molecular containers that can change and improve the properties of multiple biomedical drugs

In everyday life, containers serve many important purposes. For example, containers are used to preserve foods and beverages, to ship items to various locations around the globe, and to protect their contents from the outside elements. Molecules also need containers for many reasons; Dr. Lyle Isaacs of the University of Maryland, is working to synthesize some of the world's newest molecular containers with the power to change the chemical properties of the compounds they encapsulate and increase their utility in multiple applications. Pharmaceutical research is often crippled by the discovery of crucial drugs that cannot be delivered due to their insolubility in water, but when placed in the right container, these molecules become soluble and can then be distributed to the necessary places within the body. Cyclodexrins are a common type of molecular container facilitating the production of $5 billion of these insoluble drugs per year. Dr. Isaacs and his team have found that cucurbit[n]uril containers (also called CB[n]) possess properties that would allow them to improve upon a number of applications that cyclodextrin, as well as other molecules, fail to fully service, such as the formulation of new, advanced drugs. Another application involves neuromuscular blocking agents (NMBAs), which are administered by anesthesiologists during surgery, but which pose multiple threats to patients after surgery. Muscle weakness and difficulty breathing are only two of the side effects that increase healthcare costs and patient mortality. The Isaacs group is developing CB[n]-type receptors as *reversal agents* to significantly reduce the undesirable consequences of residual effects of NMBAs. This work promises to...

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AFFILIATION

University of Maryland College Park Campus

EDUCATION

- B.S., Department of Chemistry, 1991 , University of Chicago
- M.S., Department of Chemistry and Biochemistry, 1992 , University of California, Los Angeles
- Ph.D., Laboratorium fur Organische Chemie, 1995 , Swiss Federal Institute of Technology, Zurich, Switzerland
- Postdoc, Department of Chemistry and Chemical Biology, 1998 , Harvard University

AWARDS

- 2013 Elected Fellow of the American Association for the Advancement of Science (AAAS)
- 2011 Invention of the Year (University of Maryland, Life Sciences Category)
- 2009 Special Creativity Extension, National Science Foundation
- 2005 Visiting Professor, Central China Normal University, Wuhan, China
- 2003 Visiting Professor, Universität Duisburg-Essen, Essen, Germany

RESEARCH AREAS

Technology, Chemistry

FUNDING REQUEST

Your contributions will support the continued research and mentorship of Dr. Isaacs' diverse group of student researchers. The cost to provide a fully enriching educational experience for an undergraduate researcher is about $10,000/year. The stipend needs and supply costs for each graduate researcher is about $50,000/year; for postdoctoral fellows it is $65,000. Sponsoring the research of one or more students in Dr. Isaacs' laboratory would allow us to bring anti-cancer drugs and many other medicinal agents closer to real world application.