Adventures in Expanded Porphyrin Chemistry

Jonathan L. Sessler[a,b]

[a]Department of Chemistry, 105 E. 24th Street A5300, The Univ. of Texas, Austin, TX 78712-1224 USA

E-mail: sessler@cm.utexas.edu

This lecture will present a personal story of a 3x cancer survivor and how with the assistance of great coworkers and collaborators an effort has been made to fight back against this disease by studying the chemistry and anti-cancer biology of expanded porphyrins. Expanded porphyrin is a term we introduced into the literature in 1988 to describe larger homologues of natural blood pigments, such as the dyes (called heme) that make blood red. Many expanded porphyrins are now known. They have seen application in areas as diverse as anion recognition (capturing species with negative charges) and extraction (removal of pollutants from waste streams), photodynamic therapy (where light is used to burn out a cancer), and aromaticity (a fundamental property of organic chemistry).

In this presentation, the focus will first be on a set of expanded porphyrins called texaphyrins. These compounds were named for the State of Texas due to their size. Two of the texaphyrin complexes, known as MGd and MLu, were the founding technology for Pharmacyclics, Inc., a company that later developed a best-selling leukemia drug and was acquired by AbbVie for $21B in 2015. New work involving the creation of a new drug lead, oxaliTEX-Pt(IV), targeting platinum-resistant ovarian cancer, will then be described. Efforts to control aromaticity will also be presented.

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Lead References

- Sessler, J. L.; Murai, T.; Lynch, V.; Cyr, M. *J. Am. Chem. Soc.* **1988**, *110*, 5586-5588.
- Ishida, M.; Kim, S.-J.; Preihs, C.; Ohkubo, K.; Lim, J. M.; Lee, B. S.; Park, J. S.; Lynch, V. M.; Roznyatovskiy, V. V.; Sarma, T.; Panda, P. K.; Lee, C. H.; Fukuzumi, S.; Kim, D.; Sessler, J. L. *Nature Chem.* **2013**, *5*, 15-20.
- Cha, W.-Y.; Kim, T.; Ghosh, A.; Zhang, Z.; Ke, X.-S.; Ali, R.; Lynch, V. M.; Jung, J.; Kim, W.; Lee, S.; Fukuzumi
  Baird- *Nature Chem.* 2017, *9*, 1243-1248.

Prof. Jonathan L. Sessler was born in Urbana, Illinois, USA on May 20, 1956. He received a B.S. degree (with Highest Honors) in chemistry in 1977 from the University of California, Berkeley. He obtained a Ph.D. in organic chemistry from Stanford University in 1982 (supervisor: Professor James P. Collman). He was a NSF-CNRS and NSF-NATO Postdoctoral Fellow with Professor Jean-Marie Lehn at L'Université Louis Pasteur de Strasbourg, France. He was then a JSPS Visiting Scientist in Professor Tabushi's group in Kyoto, Japan. In September, 1984 he accepted a position as Assistant Professor of Chemistry at the University of Texas at Austin, where he is currently the Doherty-Welch Chair. Dr. Sessler has authored or coauthored over 730 research publications, written two books (with Dr. Steven J. Weghorn and Drs. Philip A. Gale and Won-Seob Cho, respectively), edited two others (with Drs. Susan Doctrow, Tom McMurry, and Stephen J. Lippard, Placido Neri and Mei-Xiang Wang), and been an inventor of record on over 75 issued U.S. Patents.

on more than 50 journal or book covers. His current H-index is 101. Dr. Sessler is an Associate Editor for *ChemComm*. Dr. Sessler is a co-founder (with Dr. Richard A. Miller) of Pharmacyclics, Inc., which was acquired by AbbVie for $21B in 2015. He is currently launching Cible, Inc. with Dr. Jonathan F. Arambula and Ms. Karen Strnad. Dr. Sessler has served as the co-organizer of several international conferences in porphyrin, supramolecular, and macrocyclic chemistry and numerous ACS symposia. In addition to English, he speaks French, Spanish, German, and Hebrew reasonably well and can get by in Japanese. He struggles with Korean.

been recognized with several awards, including the ACS Cope Scholar Award, the RSC Centenary Prize, the Southwest Regional ACS Award, the Molecular Sensors-Molecular Logic Gates Award, the CASE award, and the Hans Fischer Award. He is a member of the U.S. National Academy of Inventors and was named Inventor of the Year at The Univ. of Texas at Austin in 2016. Dr. Sessler recently received the 2018 Thomas Dougherty Award in Photodynamic Therapy from the Society of Porphyrins and Phthalocyanines. In 2019, he will receive the C. David Gutsche Award in Calixarene Chemistry. Dr. Sessler was just elected to the European Academy of Sciences (class of 2019).