

8th Annual Congress on Analytical and Bioanalytical Techniques & 14th International Conference and Exhibition on Pharmaceutical Formulations

August 28-30, 2017 Brussels, Belgium

Synthetic steps towards reversible chalcogen-based sensing of essential neurodegenerative disease factors

David G Churchill^{1,2}, Sandip V Mulay^{1,2}, Youngsam Kim^{1,2} and Tesla Yudhistira^{1,3}

¹Korea Advanced Institute of Science and Technology, South Korea

²Institute for Basic Science, Republic of Korea

³Indonesia Endowment Fund for Education, Indonesia

The chemical etiology of neurodegenerative diseases, is multifactorial and relates to proteins, biomolecules, as well as small soluble analytes including metal ions and ROS. The over-abundance of ROS/RNS could be an indication of Alzheimer's and/or Parkinson's disease (PD). Recent articles by us and other researchers have begun connecting the dots of this small molecule chemistry. There is an incredible interest in preparing next-generation (e.g. ROS) probes that are reversible, sensitive, and also robust. Hypotheses involve also discrepancies in metal ion concentrations in various regions the brain; some metals are redox active. Concentrations and the innate chemistry of selenium for example may connect to proposed/tentative etiology of dementia. For all of these reasons and more, we feel that the pursuit of studying, e.g. organoselenium chemistry in this context will be fruitful for years to come. In this oral presentation and discussion, selenium, a key element in the redox chemistry of life and for its ability to engage in catalysis, is presented and debated in terms of diagnosis (probing), as well as potentially in therapy. To-date, the role of fluorescence and fluorescent molecules in diagnosis, treatment, as well as in biomedical research, has great current medicinal significance; this is the focus of concentrated effort across the scientific research spectrum. In particular, organoselenium and/or organosulfur molecules show great promise in the detection of reactive oxygen/nitrogen species (ROS/RNS) - key factors in ageing/neurodegenerative disease in living systems. The boron dipyrromethene (BODIPY) system is a versatile class of fluorescent dye; it is commonly used in labelling, chemosensing, light-harvesting, and solar cell applications due to the many compelling characteristics, including an intense absorption profile, a sharp fluorescence emission spectrum, and high fluorescence quantum yield. As part of our ongoing effort to study chalcogenide systems, dithiomaleimide- and phenylselenide probes (among many others) have been designed, synthesized and characterized. Commonly, fluorescence is quenched by photoinduced electron transfer (PeT) mechanism. These probes show a "turn-on" fluorescence response upon reaction with ONOO- (BDP-NGM) and HOCl (Mes-BOD-SePh) with significant increase in emission intensity with fast response to ROS/RNS. Related studies with superoxide have also been published. Live cell imaging showed that the current probes can be used for the selective detection of ROS and RNS in living systems.

Biography

David G. Churchill obtained a BS degree in Chemistry at the University at Buffalo (NY) while performing X-ray crystallographic studies. He then studied under professor Gerard (Ged) Parkin at Columbia University (NY). After his PhD, he served as a postdoctoral fellow for professor Kenneth N. Raymond in the Department of Chemistry at UC Berkeley (CA). He started his academic career in South Korea since 2004 and then became full professor at Korea Advanced Institute of Science and Technology (KAIST) in 2017.

dchurchill@kaist.ac.kr

Notes: