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Selenium-containing "Turn-on" fluorophores: Molecular probe switching and leaving group chemistry

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Over the past 15 years, the Churchill laboratory has synthesized, characterized, and tested various fluorophores that contain Se centers in the hopes of being able to better engage aspects of neurodegenerative disease research. These molecules are proposed as molecular tools or building blocks for molecular tools. We use rigid chemical platforms which are fluorogenic and stem back to "turn-on" fluorescence findings by Detty, and our own "crowdoxidation" probes. The molecular skeletons have involved BODIPY, coumarin, phthalimide and others. We have also reviewed the literature in past years. The presence of one Se atom often imports a "red shift" to the molecular system. The discovered organoselenium systems can fall into two categories with regard to analyte reactivity: ones that become Se oxidized and retain C-Se bonding, and those that allow for C-Se bond cleavage and leaving group departure. We will discuss findings from recent publications that contain both of these types of molecular probe systems. Neuroscience, as with any scientific endeavor needs new modalities of probing and we hope that our finding with regard to ROS and selenium containing systems serve to create starting points for future neurodegenerative disease related research efforts.