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Ga-Ga over ^{68}Ga: Novel chelates for PET heart imaging

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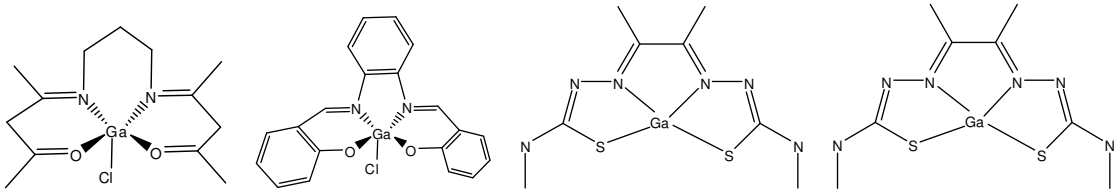
Heart disease remains one of the leading causes of death in the United States. Improved, function-specific imaging agents promise to augment current diagnostic techniques, leading to better treatment and fewer deaths. Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET) provide physiological rather than anatomical imaging systems. As such, they non-invasively probe tissue function with greater accuracy than other imaging techniques. Since functional abnormalities occur well before anatomical changes, these scans can lead to earlier diagnosis. In PET imaging, a directing agent binds to a positron-emitting material and carries the radioisotope to a specific tissue (in our project, the heart) where the isotope decays, emitting a positron. Current PET imaging agents, such as ^{18}F, have short half-lives and must be administered at or near the production facility (cyclotron). However, one promising positron emitting radiometal, ^{68}Ga ($t_{1/2}$ = 68 minutes), comes from a Ge/Ga parent/daughter generator system. In such a generator system, a "parent isotope" (^{68}Ge, $t_{1/2}$ = 271 days) with a long half-life decays into a useful "daughter isotope" with a short half-life. Periodic elution provides the daughter isotope in high specific activity. In our case, ^{68}Ge can be transported anywhere in the world, where it generates a viable PET agent without the constraint of an on-site cyclotron. Our work focused on Schiff base and aminothiolate ligand systems. Specifically, we bound, characterized, and analyzed the Sal_2Phen, $Acac_2Pn$, ATSM, and PTSM ligands with non-radioactive gallium on the milligram level. In future research, complexes will be created analogously on the radioactive level (nanogram or picogram quantities) and compared to their thoroughly characterized milligram-scale equivalent. The compounds will be tested for stability in a biological model before progressing to animal studies and, potentially, human drug testing.



$GaAcac_2Pn$ $GaSal_2Phen$ GaATSM GaPTSM