Temporal Control Over Self-Assembly Of Deoxyguanosine Derivatives For Intracellular Formation Of Therapeutic Agents

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Supramolecular self-assembly uses the spontaneous organization of molecules by non-covalent interactions to explore new mechanisms for drug development. Our research focuses in the synthesis of deoxyguanosine derivatives (dG) that self-assemble to form supramolecular G-quadruplexes (SGQs) which under certain conditions can further aggregate to form what we call Supramolecular Hacky Sacks (SHSs) (Figure 1). We have shown that both types of assemblies have important biomedical applications, for example by interacting with native cellular components such as GQ-DNA or as drug delivering agents.

Our current project focuses on temporal control over self-assembly. We use reversible reactions that temporarily increase the hydrophilicity of our derivatives to delay self-assembly for specific amounts of time (Figure 2). Because time is a crucial aspect of cellular processes and biochemical pathways, achieving temporal control over the self-assembly of our derivatives will allow us to coordinate the activity of our supramolecules to natural cellular processes. This may lead to supramolecular therapeutic agents that can couple to the dynamic nature of the intracellular environment.

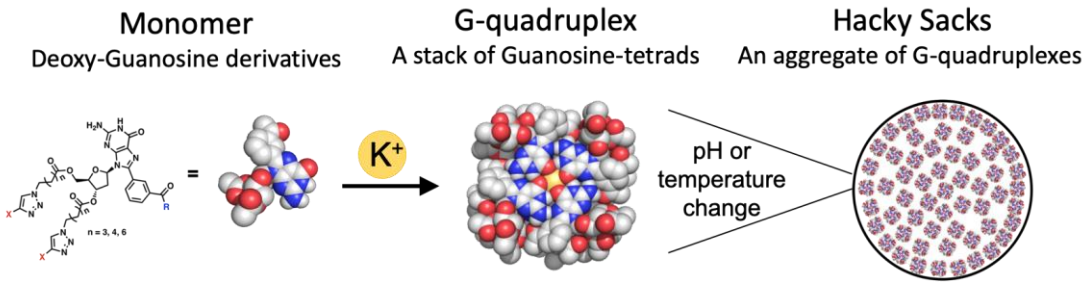

Figure 1: Self-assembly of G-Derivatives.

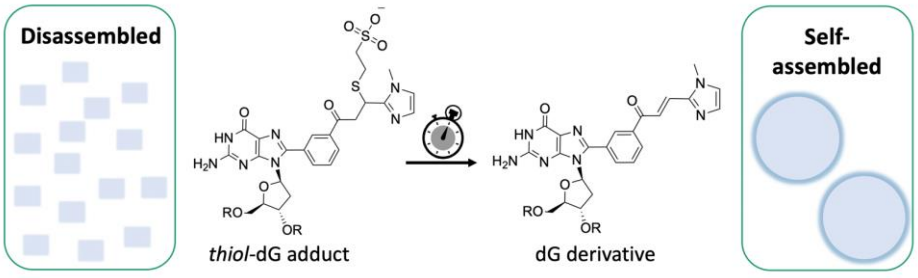

Figure 2: Representation of reversible reaction for temporal control over self-assembly.