UniSysCat - Colloquium

Dr. Johannes Broichhagen

FMP - Leibniz Forschungsinstitut für Molekulare Pharmakologie

Start Time: Wednesday, September 8, 2021 05:00 pm

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Online-Colloquium

ChemBioProbes to visualize and optically control biological function with high definition and spatiotemporal precision

Dr. Johannes Broichhagen

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Selective targeting of biomolecules for labeling, visualization and functional manipulation is at the forefront of Chemical Biology.[1,2] Key challenges in the field are currently the interrogation and analysis of biomolecules in a selective and quantitative manner. To tackle these issues, we employ approaches from photopharmacology and fluorophore design to enable biomolecule labeling and control in specific sites while bringing dye properties to the next level. For instance, we engineered azobenzene photoswitches that enable reversible on/off remote control of metabotropic glutamate receptor 2 (mGluR2), a class C G Protein Coupled Receptor (GPCR) involved in neurotransmission.[3,4] This control over intracellular catalytic activity has led to the latest generation of photoswitches showing increased sensitivity and fast kinetics while maintaining diametral parameters like bistability to probe working memory with light in vivo. [5]

More generally, the specific labeling of GPCRs in specific cellular compartments is important to differentiate functional receptor pools, another big challenge in Chemical Biology. For this reason, we equip labeling techniques with new properties to separate and interrogate different cellular protein pools, such as the membrane bound and the intracellular populations. We successfully highlight this by custom-tailored SNAP-tag substrates to determine different GPCR stoichiometries in different cellular compartments.[6]

In order to pave the way for better image quality, we think in and pursue unconventional ways

in the design and synthesis of fluorophores for super-resolution imaging in live cells. In our latest study, we endow fluorophores with deuterium to yield dyes with increased fluorescent lifetimes, higher photostability and higher brightness, thereby opening new applications in nanoscopy and single molecule tracking.[7] Taken together, we bring chemistry into biology and are on the lookout to put the spotlight on the invisible.

References

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Prof. Dr. Dorothea Fiedler

Organizer