Biosensors and biolistic methods in retinal circuitry imaging in mouse models

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We are using a self-engineered intensity-based glutamate-sensing fluorescent reporter (iGluSnFR), for *in vivo* mouse retinal explant imaging. iGluSnFR also responds robustly and specifically to glutamate *in situ*, and the responses correlate with voltage changes. In mouse retina, iGluSnFR-expressing neurons showed intact light-evoked excitatory currents, and the sensor revealed glutamate signaling in response to light stimuli. iGluSnFR is expressed on amacrine cell dendrites and throughout the inner plexiform layer and able to detect single field stimulus-evoked glutamate release. Here we are optimizing the use of gene gun on retinal explants of ChAT-Cre transgenic mice (ChAT-Cre is specific to amacrine cells) with Cre-lox machinery, using DNA (with iGluSnFR)-coated gold particles with 3 defined goals: We first demonstrate selectivity by successfully labeling starburst amacrine cells with green fluorescent protein. We then demonstrate selective and sparse expression of two different fluorescent biosensors, iGluSnFR and GCaMP6, again in starburst amacrine cells. Finally, we aim to demonstrate the feasibility of measuring light-evoked responses from biolistically transfected starburst amacrine cells using two-photon fluorescence microscopy.