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# Concentration and Mobility of Activator and Repressor Morphogens in live early Drosophila Embryos

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Morphogens (often acting as transcription activators or repressors) govern pattern formation and cell differentiation during early embryogenesis. Abnormal distributions of morphogens can result in developmental defects or even death. Oftentimes, thresholds of concentrations of morphogens behave like an ON/OFF switch for the activation or repression of downstream genes. Thus accurate measurements of morphogen concentration and mobility in space and time can help tackle the puzzle of how exactly cascades of hundreds of morphogens coordinate their targets precisely and promptly amidst crowded and complicated cellular environments.

In principle, Fluorescence Correlation Spectroscopy (FCS) allow for accurate measurements of both protein dynamics and concentration. Here, we demonstrate how to use FCS and confocal imaging to achieve extremely low (˜ nM) concentration measurements in live Drosophila embryos expressing recombinant fluorescent morphogens, by carefully taking account background noise and photobleaching effects. The dynamics of both an activator and a repressor morphogens were further studied using FCS and Fluorescence Recovery After Photobleaching. We found that both type of morphogens are very mobile in nuclei, explaining how that are able to turn on or off gene expression in only a few minutes.

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