**Photoswitches for gene expression**

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****Introduction.** All cells in an organism contain the same DNA sequence but vary greatly in gene expression. Epigenetics deals with these phenotype changes that retain the same DNA sequence. Importantly, misregulation of these epigenetic processes is implicated in the pathophysiology of numerous human diseases, including cancer, autoimmune disorders and neurodegenerative disease. Therefore, epigenetic regulation is at the core of both natural and pathological states. The current available methods do not have sufficient spatiotemporal resolution to deal with the challenges of targeting the dynamic epigenome. We and others envision that light could offer new possibilities and achieve molecular functionality. Reversible photoswitches, which have demonstrated their potential in diverse areas such as material science, have hardly been implemented as genome regulators.

**Aims**. Modulating the gene expression to tune transcription profiles and cellular phenotypes in a programmable manner.

**Methods**. For this purpose, we design and develop innovative optochemical tools based on the synthesis of photosensitive molecules. Our methodology is multidisciplinary, covering from synthesis to biological experiments.

**Results.** I will present our journey to achieving *in vivo* manipulation by targeting protein-protein interaction and splicing.