Modulation of gene expression with miRNA is a promising technique for improving control of wound healing and tissue repair processes. MiRNA’s utilized in autologous, adipose derived mesenchymal stem cells (ASC) are an attractive therapeutic modality for regenerative medicine. Directing the osteogenic differentiation of ASC is of particular interest in the design of therapies for critical size bone defects, spinal fusion and skeletal reconstruction. MiR-148b has been shown to induce de novo osteogenesis as indicated by increases in total alkaline phosphatase activity and early specific biomarker expression. Here we demonstrate light Activated miRNA Delivery (LAMD) system comprising plasmonic particles with light sensitive miRNA payload that can serve as a potential improvement over state-of-the-art regenerative medicine techniques by providing greater temporal and spatial control over the activation of differentiation and tissue repair.