We have developed nanoparticles carrying two secretory proteins of *Mycobacterium tuberculosis,* CFP-10 and CFP-21, and are evaluating their potential to invoke an immune response coupled with oxidative stress when encapsulated in nanoparticles. The interplay of immune response, ROS, and RNS created by our secretory proteins encapsulated in nanoparticles indicated interesting results that warrant detailed evaluation of the signaling pathways to ascertain the extent of interdependence. Furthermore, we have identified Foxo1, a forkhead family transcription factor, as predominantly required for the induction of IL-9 in Th9 and Th17 cells. We further identified AKT, an upstream kinase that regulates IL-9 induction in Th1, Th9, and Th17 cells via Foxo1. In addition, c-Jun N-terminal kinase (JNK), a MAPK (Mitogen Activated Protein Kinase), enhanced IL-9 induction in Th9 cells via Foxo1. Chromatin immunoprecipitation (Chip) identified a direct physical association of Foxo1 with IL-9 and IRF4 promoters. In addition, Foxo1 transactivates both IL-9 and IRF4 genes in Th9 and Tc9 cells and, together with IRF-4, synergistically enhances IL-9 induction. Furthermore, loss of Foxo1 suppressed IL-9 production in Th9 and Th17 cells. In fact, Foxo1 acts as a transcriptional switch, which exclusively suppresses IL-9 induction in Th17 cells while enhancing IL-17 and Th17 cell development.

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