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Editorial Open Access

# *M. tuberculosis* and Macrophages: Co-existence and Co-evolution

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## Editorial

Tuberculosis (TB) remains one of the world's major health problems. It is estimated that 8.6 million people developed TB, and 1.3 million died from the disease in 2012. Because of the increased drug-resistance of the causative bacterium *M. tuberculosis* (Mtb), about a half of the multidrug-resistant tuberculosis (MDR-TB) patients were not successfully treated globally in 2010 [1]. Thus, it is urgent to identify novel therapeutic targets for developing drugs that can treat drug-susceptible and drug-resistant TB. Since Mtb is an intracellular pathogen mainly residing in macrophages, thus elucidating the mechanisms underlying Mtb-macrophage interactions is crucial to the development of Mtb-host interfaces-targeted therapeutics.

Shaped by eons of co-evolution with its host, the most successful human intracellular pathogen Mtb can persist in macrophages for long periods in a dormant state by deploying numerous strategies to evade host immunity [2]. Several studies have revealed a variety of processes that are important for intracellular survival of Mtb. For example, the ability of Mtb to interfere with phagosome maturation is critical for its survival in macrophages [3]. In addition, Mtb can prevent apoptosis of infected macrophages, thus preventing bacterial killing and avoiding antigen presentation [4,5]. Furthermore, Mtb can inhibit activation of the inflammasome and induction of autophagy [6,7].

In addition, increasing studies have revealed that many kinds of post-translational protein modifications such as phosphorylation, glysylation and ubiquitin-like modifications can regulate key cellular signaling pathways during mycobacterial infection, which add a new layer of complexity to the molecular mechanisms underlying Mtb-host interactions. For example, the mycobacterial Ser/Thr Protein kinase (STPK) PknG was demonstrated to be involved in the interference of phagosome maturation in macrophages during Mtb infection [8]. Truncated Hemoglobin HbN is post-translationally modified by glycosylation in Mtb and modulates host-pathogen interactions during intracellular infection [9]. Pupylation, a ubiquitin-like protein modification identified in actinobacteria, was shown to be linked to intracellular survival strategy of Mtb [10].

In summary, we have gained some insights into the cellular processes that are critical for intracellular survival of Mtb, but our current knowledge on the molecular details underlying the pivotal Mtb–macrophage interactions is incomplete. In future studies, it is important to better define the specific Mtb-host interacting interfaces to provide potentially more specific and effective targets for the development of novel anti-TB therapeutics.

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