Signed details of the excellence in research work for which the Sun Pharma Research Award is claimed, including references and illustrations.

1. *Poushali Chakraborty, Sapna Bajeli, Deepak Kaushal, Bishan Dass Radotra and **Ashwani Kumar**. Biofilm formation in the lung contributes to virulence and drug tolerance of Mycobacterium tuberculosis. **Nature Communications**. 2021. March 11, DOI: 10.1038/s41467-021-21748-6. (Impact Factor 12.12).

Highlights: Tuberculosis displays several features of a biofilm-associated infection, but if it is a biofilm infection is not known. This study for the first time demonstrated the formation of *Mycobacterium tuberculosis* (Mtb) biofilms in vivo. Using cellulose as a biomarker to detect Mtb biofilms, we demonstrated the presence of Mtb biofilms in the lungs of experimentally infected mice and non-human primates, as well as in lung tissue sections obtained from patients with tuberculosis. Mtb strains defective in biofilm formation were utilize to establish that biofilms protect bacilli from the host immune system. Furthermore, the administration of nebulized cellulase enhanced the antimycobacterial activity of isoniazid and rifampicin in infected mice, supporting a role for biofilms in phenotypic drug tolerance. The essence of the manuscript is provided in Figure 1.
This article featured as the Editor's choice of the week in Science. Science 02 Apr 2021: Vol. 372, Issue 6537, pp. 44-45. DOI: 10.1126/science.372.6537.44-c. This article was also picked up by Nature Communication for the Editors' Highlights webpage of recent research called "Microbiology and infectious diseases".

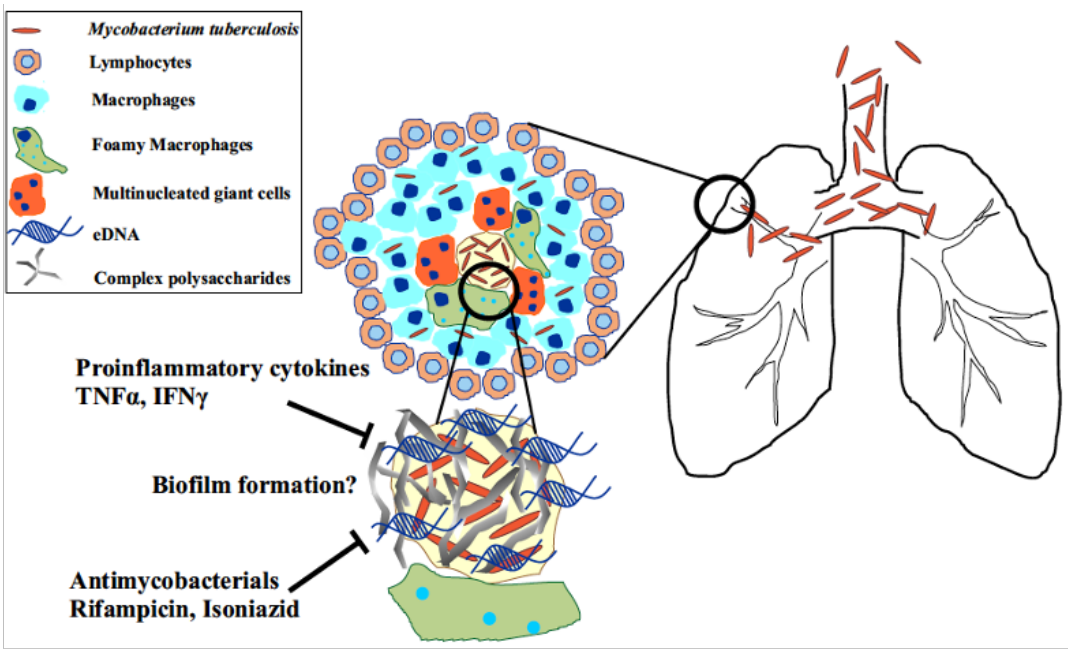

Figure 1. Cartoon depicting the hypothesis that mycobacterial cells could organize to for biofilms inside the lungs.

2. Abhishek Trivedi, Parminder Singh Mavi, Deepak Bhatt & **Ashwani Kumar**. Thiol reductive stress induces cellulose-anchored biofilm formation in Mycobacterium tuberculosis. **Nature communications** 2016 Apr 25;7:11392. doi: 10.1038/ncomms11392. (Impact factor: 12.38).

Highlights: This manuscript describes the discovery that cellulose is a structural component of the Mycobacterial Biofilms. In this manuscript I have demonstrated that intracellular thiol reductive stress induces mycobacterial biofilm formation. We have further demonstrated that cellulose is a major component of the extra polymeric substance of Mycobacterial biofilms and it degradation results in disruption Mycobacterial biofilms. Before this study, mycolic acids were believed to be the most important constituents of the mycobacterial biofilms. Since cellulose is not present in the human bodies, we have proposed that cellulose could be used as a biomarker for detection of the mycobacterial biofilms inside humans/animal models (Microbial Cell, 2019. 6(2) 105–122). The major findings of the manuscript is summarised in figure 2. Microbial cell has published a commentary on this manuscript.

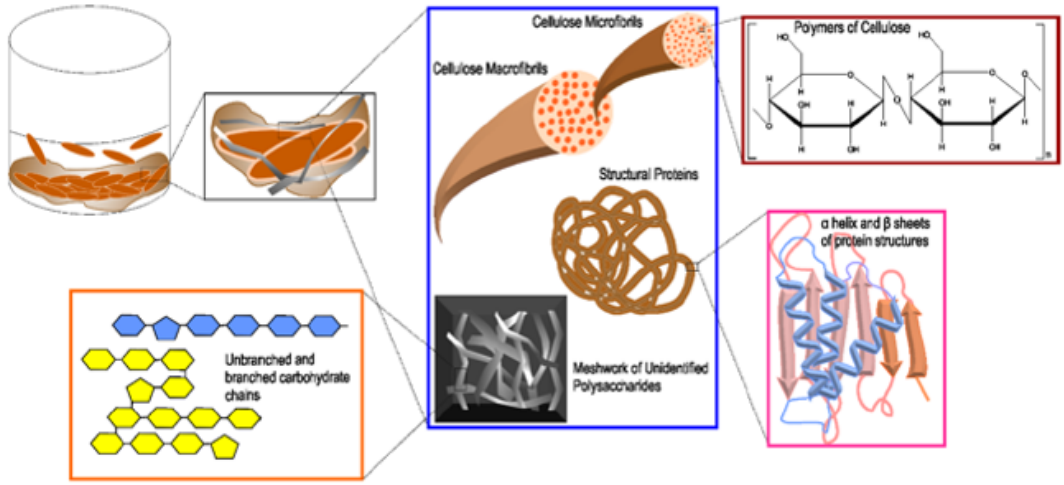

Figure 2. Cellulose is a key component extracellular matrix of Mycobacterial biofilms (Taken from Microbial Cell 2019, under creative commons license)