

# Developing Tuberculosis Vaccines

**Rachit Agarwal**

**Centre for BioSystems Science and Engineering**

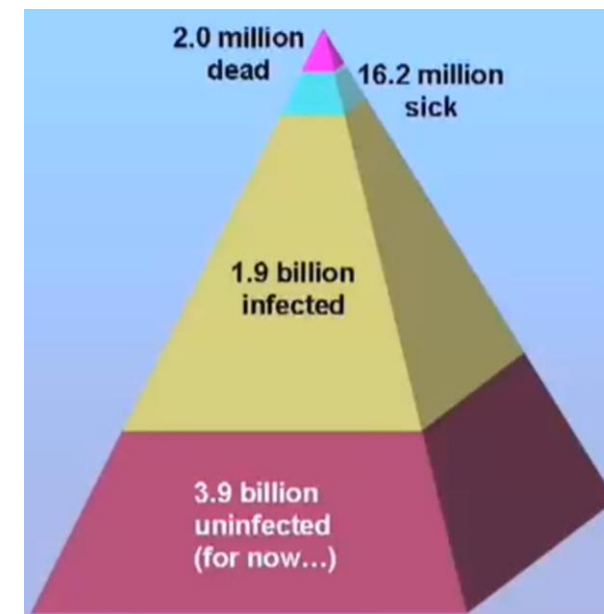
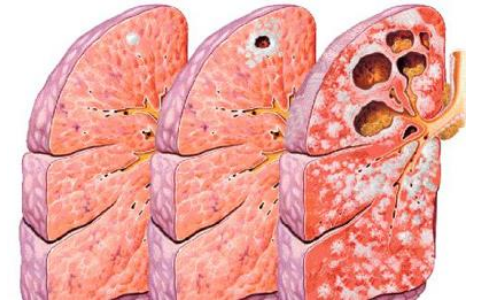
**Indian Institute of Science**

[rachit@iisc.ac.in](mailto:rachit@iisc.ac.in)

<http://www.be.iisc.ac.in/~rachit/>

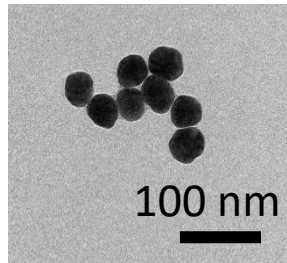
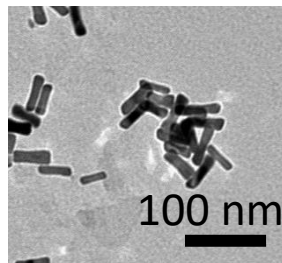
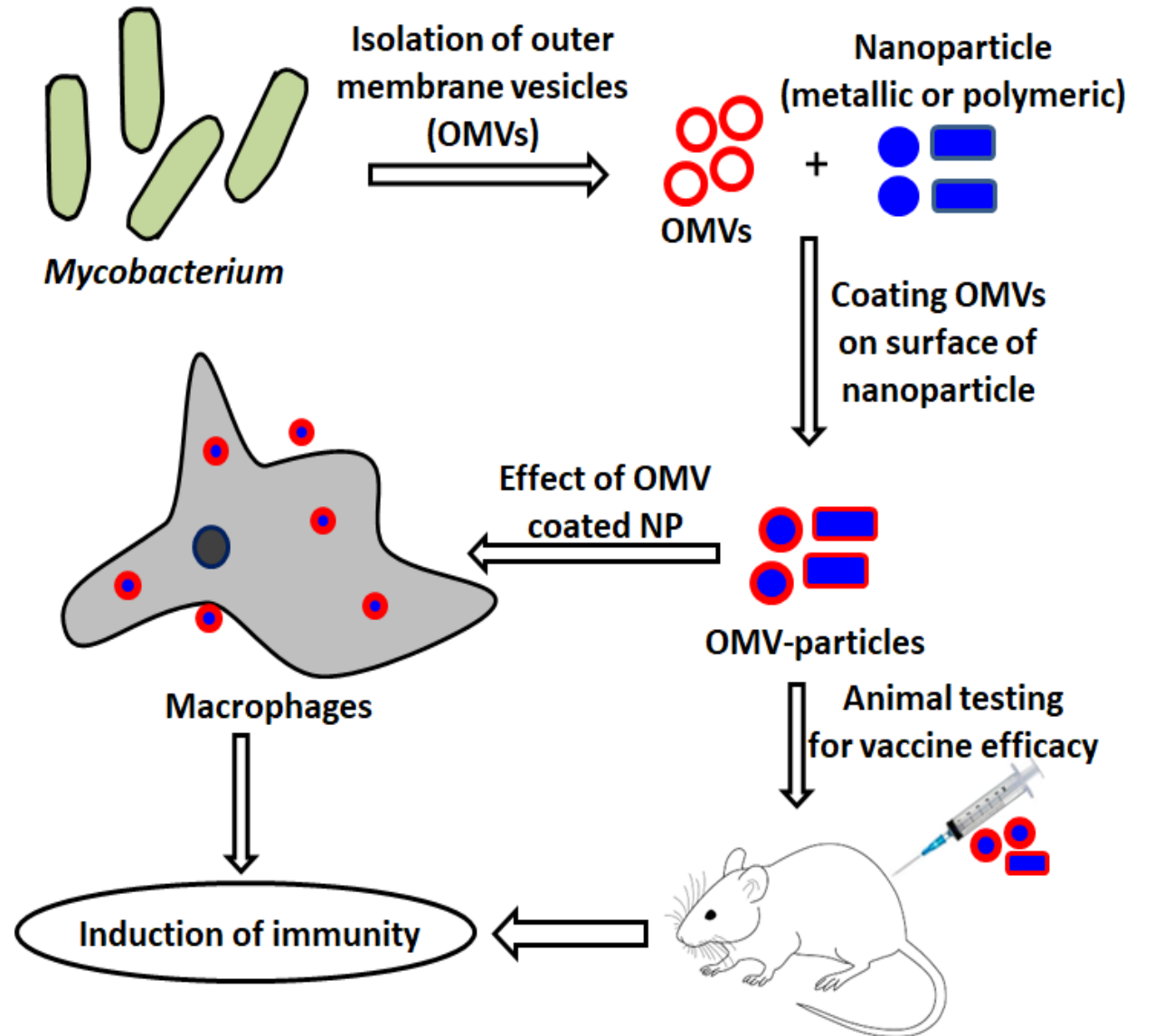
# Tuberculosis Lung infections

- Mycobacterium Tuberculosis (MTB) infects nearly a third of human population
- 10 million new TB cases each year
- 5% had Multi-Drug Resistant (MDR) TB
  - India has highest MDR cases in world
- Total Drug Resistance (TDR) also reported in India
  - Resistant against all clinically used antibiotics
- Long treatment: 6-12 months
- BCG vaccine is not effective in adults



# Overall system

- Isolation of bacterial outer membrane vesicles
- Synthesizing metal and polymeric particles of different size, shape and charge
- Coating bacterial membranes over to present antigens to immune system
- Testing in mice to determine efficacy of vaccines and compare it to BCG vaccine



Gold Nanospheres and rods

# Major Techniques

- Mammalian and bacterial cell culture
- Engineering nano- and micro-carriers
- Characterization of charge, size and shape (DLS, TEM etc.)
- Rodent and clinical samples handling
- Working in BioSafety Level-3 facilities

## Further reading

- Gao et al., Modulating antibacterial immunity via bacterial membrane-coated nanoparticles. *Nano Letters* 2015, 15 (2), 1403-9.
- Hu et al., Erythrocyte membrane-camouflaged polymeric nanoparticles as a biomimetic delivery platform. *Proceedings of the National Academy of Sciences* 2011, 108 (27), 10980-10985