

Genica I. Chow^{1,2}, Nitesh K. Kunda², Dominique N. Price², Laura Stephens^{2,3}, Pavan Muttli²,

Chemical and Materials Engineering, University of Nevada, Reno, NV¹, College of Pharmacy, University of New Mexico, Albuquerque, NM², Oregon State University, Corvallis, OR³

Problem

Annually, two million people die from active tuberculosis (TB). A fraction of the deaths is from the reactivation of a dormant form of tuberculosis called latent tuberculosis (LTB). In LTB, *Mycobacterium tuberculosis* (*Mtb*) is encapsulated by structures called granulomas which are impenetrable to anti-TB drugs. There is an urgent need to design and develop novel therapeutics to effectively treat LTB infections.

Goal

Formulate a spray dried powder (SDP) that incorporates a live bacterial immunotherapeutic agent, bacillus Calmette–Guérin (BCG), with an anti-TB drug, isoniazid, loaded in nanoparticles (INH NP). We hypothesize that when the SDP is delivered by the pulmonary route it will disrupt the lung granulomas leading to the elimination of *Mtb* from the LTB patient.

Results

Nanoparticles Characterization

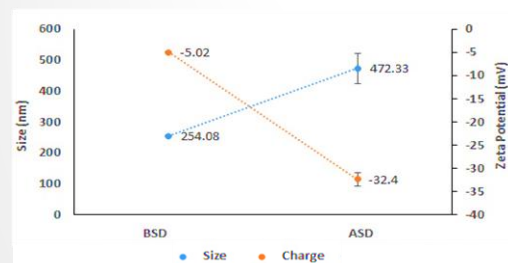


Figure 1: The size and charge of the NPs before spray drying (BSD) and after spray drying (ASD) (n=6, Mean ± SD)

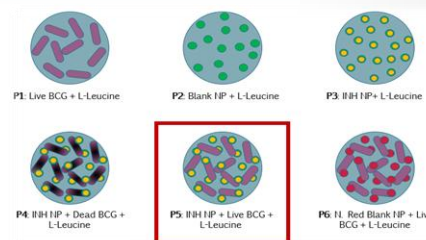
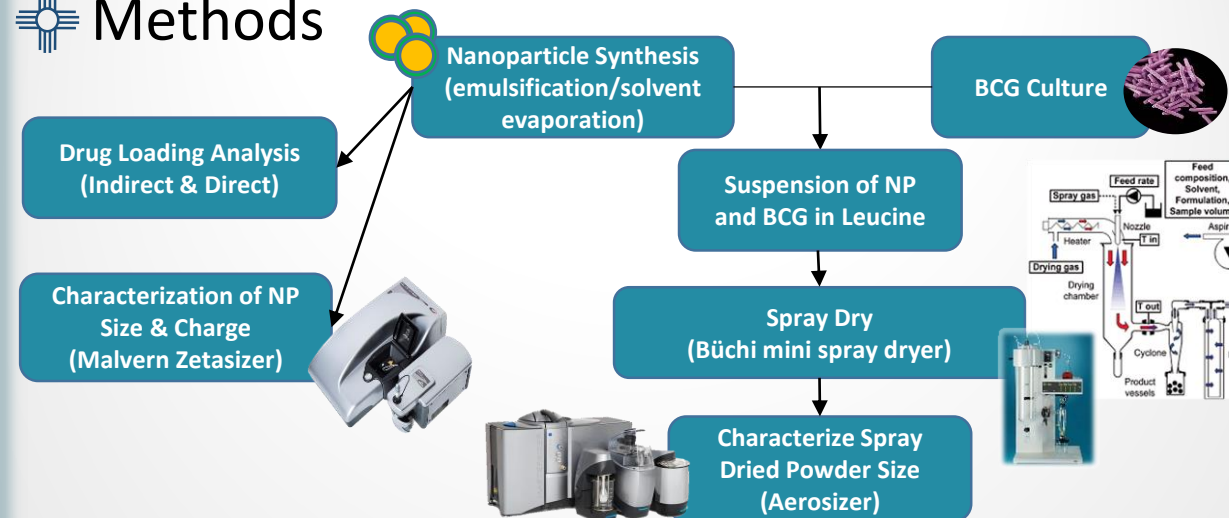


Figure 2: Different combinations of spray dried powders

Spray Dried Powder (SDP) Characterization

SDP Yield (% w/w)	36.90
Avg. SDP Size (µm)	2.47 ± 0.05
Drug Loading (% wt INH/wt NP)	38.60 ± 2.70

Methods



Conclusion

- ✓ Our data shows that the BCG and INH loaded NPs, i.e. the combination of immuno- and chemotherapy, can successfully be incorporated in an inhalable dry powder and used as a potential delivery system in LTB patients
- ✓ This inhalable dry powder may serve as the next step in controlling and eradicating LTB infections caused by one of the most virulent bacterial pathogens
- ✓ Further studies are needed to evaluate the immunogenicity of BCG and the toxicity of INH NPs in animal models

Future Studies

- Characterize Spray Dried Powder Aerodynamic Diameter
- Characterize using Scanning Electron Microscopy
- Characterize using Confocal Microscopy