



Centre for BioSystems Science and Engineering

THESIS COLLOQUIUM

at 11:00 AM on August 17, 2017
CES Seminar Hall

Mechanistic Insights into the Effect and Application of Shockwaves in Prokaryotic and Eukaryotic Organisms

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Shock waves are non-linear waves propagating at speeds greater than the speed of sound, with a unique characteristic of instantaneously increasing the pressure, temperature and density of the medium through which they propagate. For over a few decades, the phenomenon of shock waves has been associated with aerospace research. The emerging paradigms of present day shock wave research have opened up new horizons for interdisciplinary applications. Shock waves have been extensively used for various medical procedures like extracorporeal lithotripsy, treatment of avascular necrosis, etc. However, very little is known about the actual bio-physical behaviour of bio-systems subjected to shock wave loading. The current study is one such attempt to understand the fundamental effects of shock waves on prokaryotic and eukaryotic organisms and develop novel bio-medical applications.

In this work, we describe the development of a novel solar power oxyhydrogen driven miniature shock tube for biological applications like bacterial transformation. Using this device, we have been able to successfully transform Mycobacterial species which is one of the most difficult-to-transform bacterial strains with the known techniques. Extending the applications of our shockwave device, we have also been able to achieve an efficient and needle-less vaccine delivery where Salmonella and BCG vaccine strains were successfully administered in a mouse model. Moving a step further, we also examined the effects of shockwaves on the immune system of mice. For this, the whole body of the mouse was subjected to controlled, low intensity shockwaves generated using a novel diaphragm less shock tube. The final part of the work focusses on the application of shockwaves in clinical practice. We demonstrate the effect of shockwaves on the disintegration of multispecies oral biofilm and their possible use as an adjunctive antibacterial therapy for treatment of chronic periodontitis. Overall, this study explores the diverse applications of shockwaves and its effect on organisms paved way some interesting applications in biology and medicine.

Poster presentation depicting short snippets from this work will start
from 10:30 ° M

For more information depicting the research
(<http://www.be.iisc.ernet.in/seminars.html>)