

Biotechnology as a means to combat health challenges

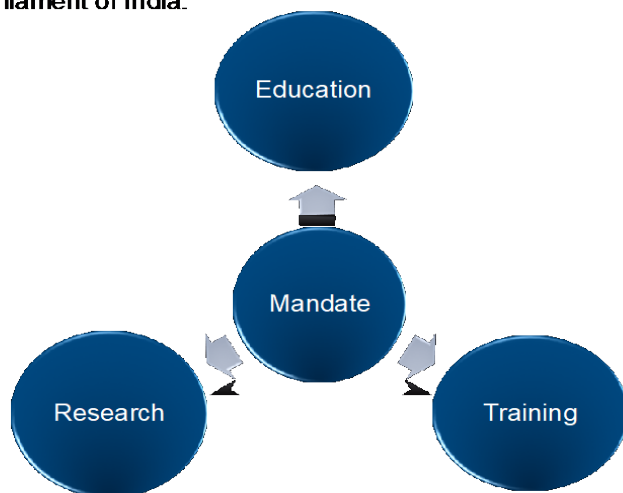
NCR-Biotech Science Cluster, Faridabad



UNESCO international symposium of the C2C
Presented by: C. V. Srikanth, PhD

RCB Vision and Mission

Regional Centre for Biotechnology (RCB) is an academic institution established by the Department of Biotechnology, Govt. of India with regional and global partnerships synergizing with the programmes of UNESCO as a Category II Centre. The primary focus of RCB is to provide world class education, training and conduct innovative research at the interface of multiple disciplines to create high quality human resource in disciplinary and interdisciplinary areas of biotechnology in a globally competitive research milieu. In 2016, RCB was recognized as an Institution of National Importance by the Parliament of India.



Academic Programmes

Integrated MSc-PhD Programme in Biotechnology: Offered to students with graduate degree in any discipline of science, engineering or medicine with significant emphasis on laboratory training.

Young Investigator Programme: A highly competitive award for meritorious PhDs mentored by RCB Faculty.

Multidisciplinary PhD Programme: Students with post-graduate degree (or equivalent) in any field of science or technology work under the mentorship of RCB faculty.

Short -Term Training Programme: Domain-specific programs designed to create a cadre of highly skilled scientists for high-end research and technology development.

Hands-on National Workshops: Offers a combination of theoretical knowledge and hands-on experimental training in biotechnology and biomedicine from experts in the field.

Science outreach: Events such as science day, open day, and lectures in different schools and colleges organized by RCB faculty



Regional Focus



➤ Institution of National Importance through an Act of Parliament (2016)

UNESCO & RCB

Following activities/ events have been successfully conducted with the generous support from the UNESCO:

2019:

- WORLD SCIENCE DAY: RCB in collaboration with UNESCO conducted an event on November 5, 2019.
- Regional Training Program on 'Developing Effective and Inclusive Science, Technology and Innovation Policy (STIP)' organised by United Nations Educational, Scientific and Cultural Organization (UNESCO) & Regional Centre for Biotechnology (RCB) held at NCR Biotech Cluster, Faridabad, Haryana from 6th to 8th March, 2019.

2021:

- Online Workshop on 'Mass Spectroscopy Based Proteomics' (12-13 October, 2021)
- Online Workshop on 'Basics of Electron Microscopy' (October 20, 2021)
- Online Workshop on 'Confocal Microscope-based drug screening (High content imaging)' (October 22, 2021)

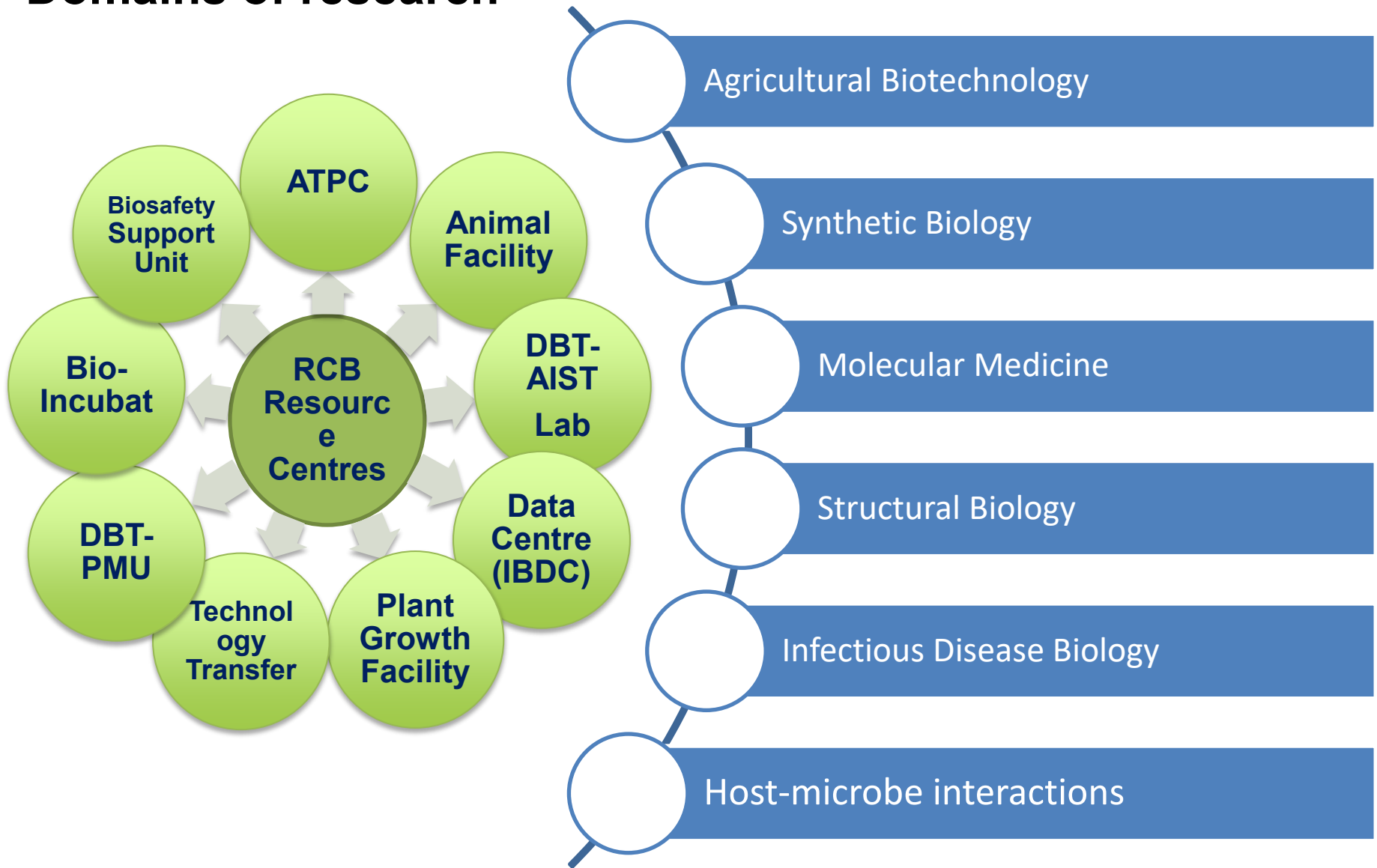
2023

RCB, UNESCO, UNEP and WHO, owing to mutual concern about air pollution on human health, organized a Panel Discussion on '**Mobilising Biotechnology for Clean Air**' on 7 November, 2023 at RCB, Faridabad.

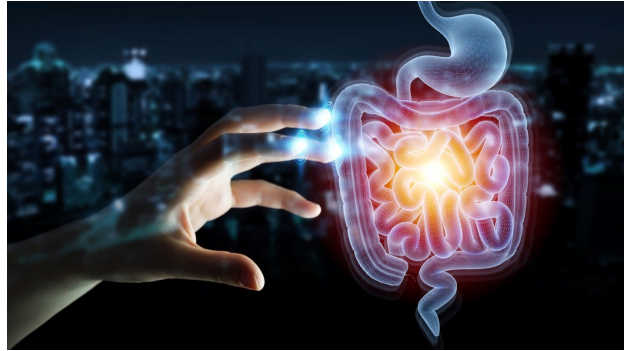
[RCB's future plans for further engagement/collaboration with UNESCO](#)

- Renewal of the Agreement with the UNESCO for the Category 2 centre status

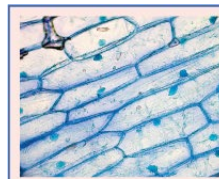
Domains of research



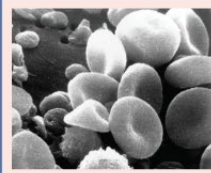
From biosphere to living cells of gut



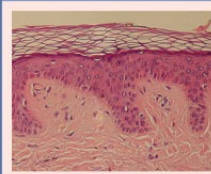
< 1 micron



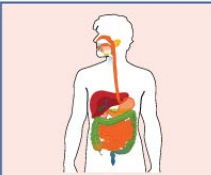
Organelles: The nucleus, dyed blue in these onion cells, is an example of an organelle.



Cells: Human blood cells.



Tissues: Human skin tissue.



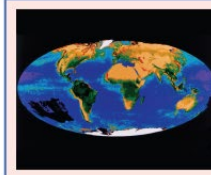
Organs and Organ Systems: Organs, such as the stomach and intestine, make up the human digestive system.



Organisms, Populations, and Communities: In a forest, each pine tree is an organism. Together, all the pine trees make up a population. All the plant and animal species in the forest comprise a community.

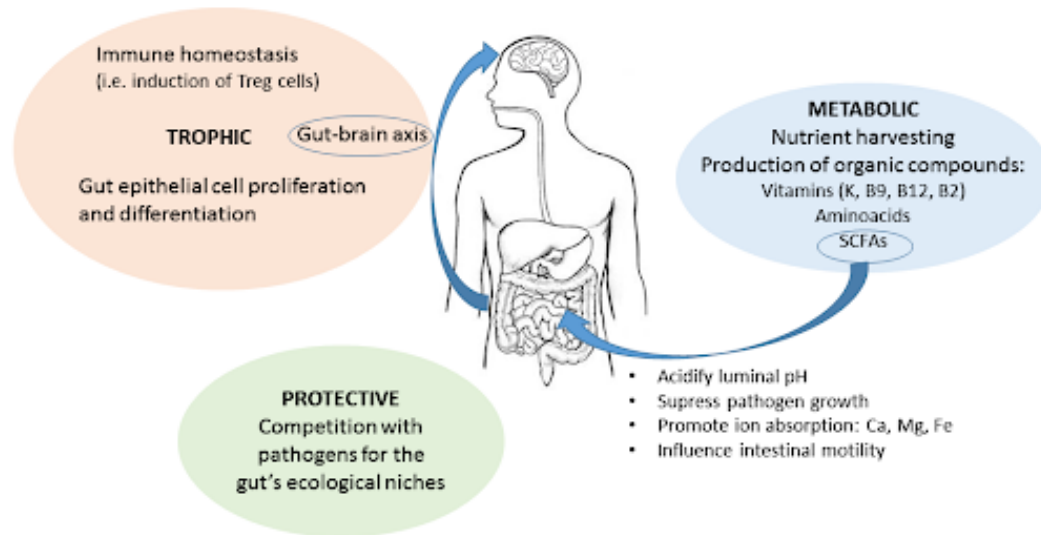


Ecosystems: This coastal ecosystem in the southeastern United States includes living organisms and the environment in which they live.

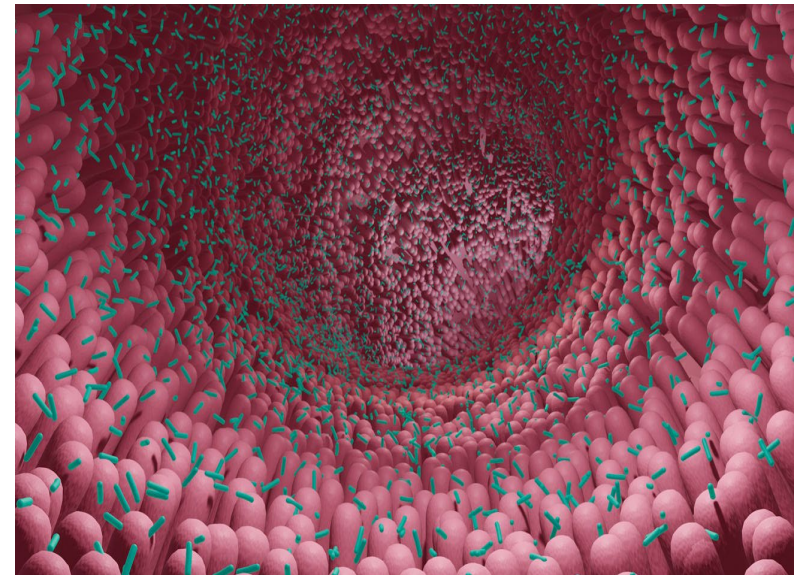
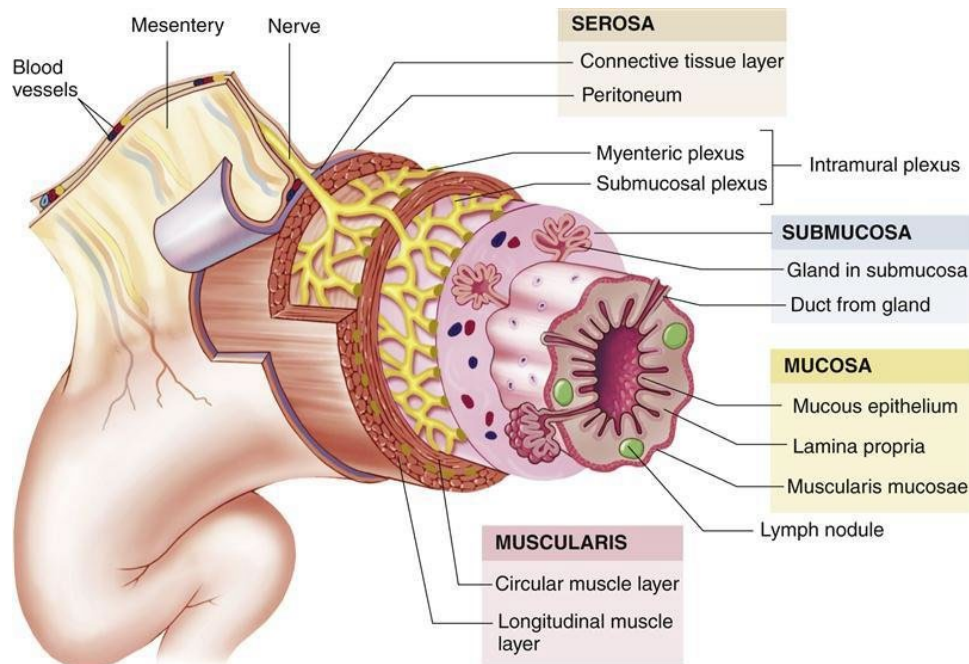


The Biosphere: Encompasses all the ecosystems on Earth.

>40000 km



- Roughly 100 trillion microbes
- 5,000 different species and
- Weighing approximately 2 kilograms

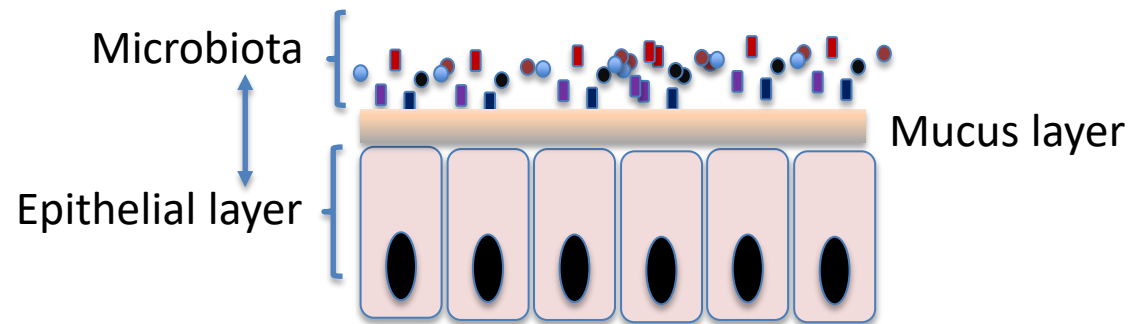


Cellular and Molecular determinants of IBD

Are we more microbe than man ?



Katrina Ray, Nature rev



Host Immune mediators

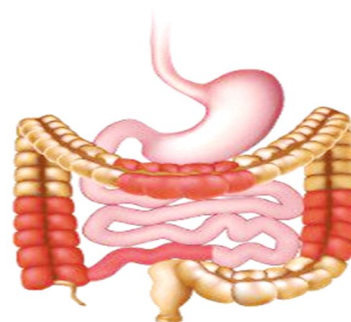


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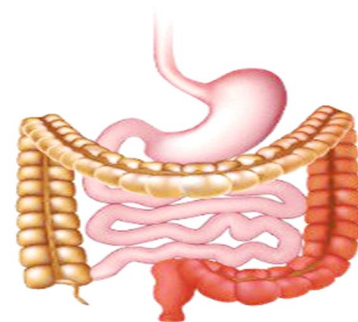
Gut Microbiota

Inflammatory Bowel Disease

- IBD is an immune-inflammatory disease of unknown etiology
- Multifactorial: Environment, microbiota and immune dysregulation etc.
- Recurrent diarrhoea, abdominal pain, fatigue, weight loss, blood in stool etc.
- More than 200 genes are known to be associated
- **Till date there is no cure for IBD**

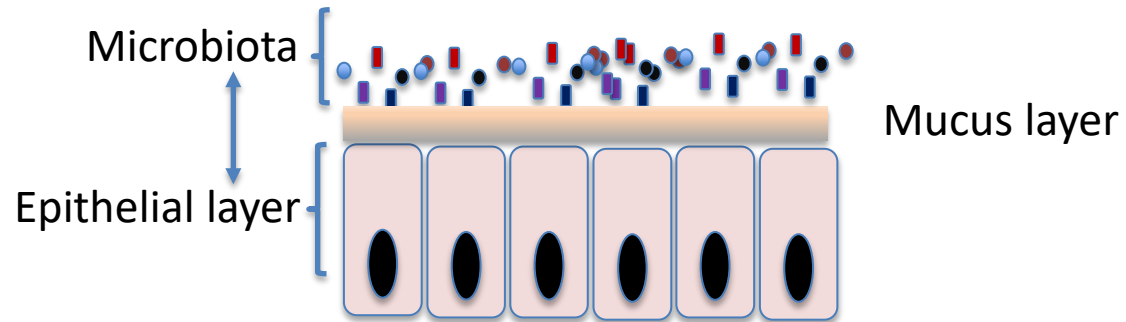


Crohn's disease
(CD)

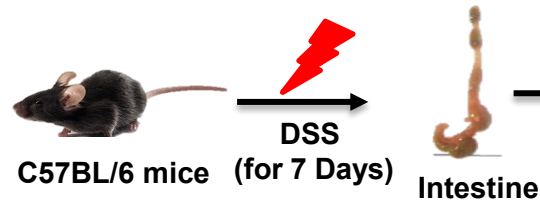


Ulcerative colitis
(UC)

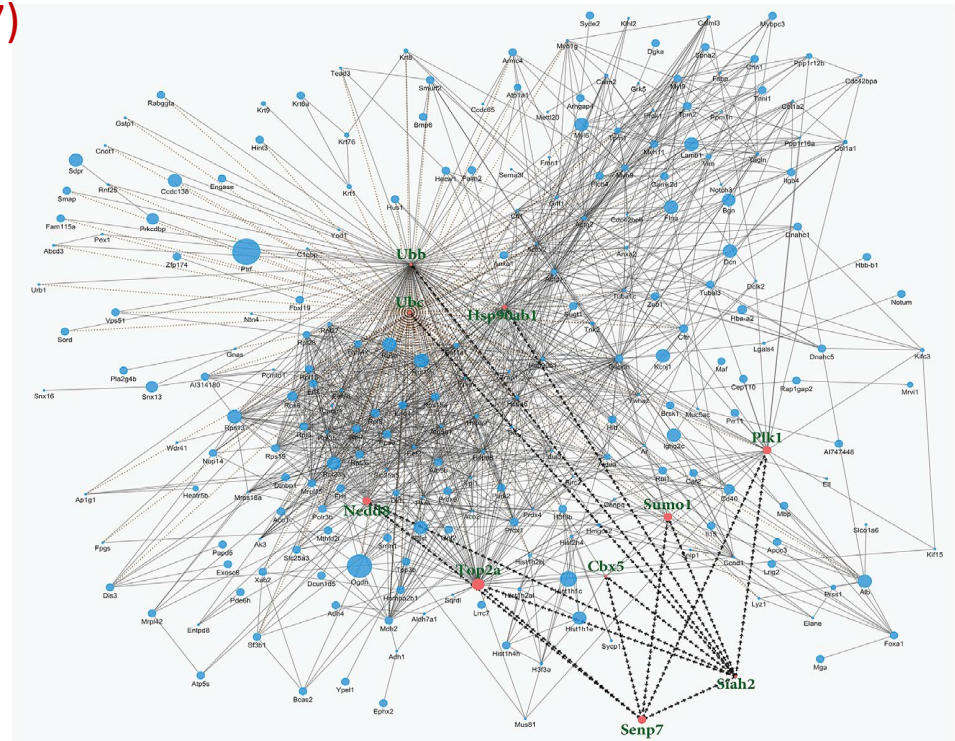
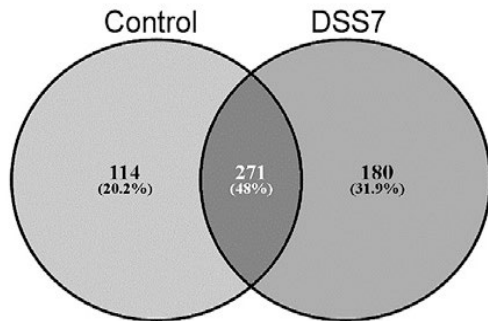
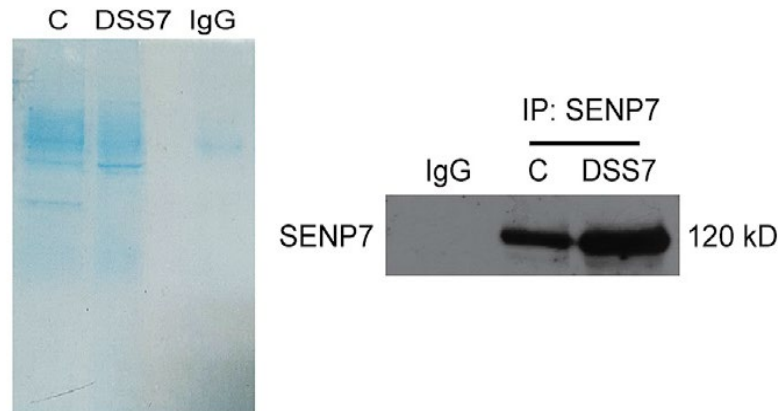
Using a murine model of IBD



An interactome hunt to identify regulators of gut inflammation



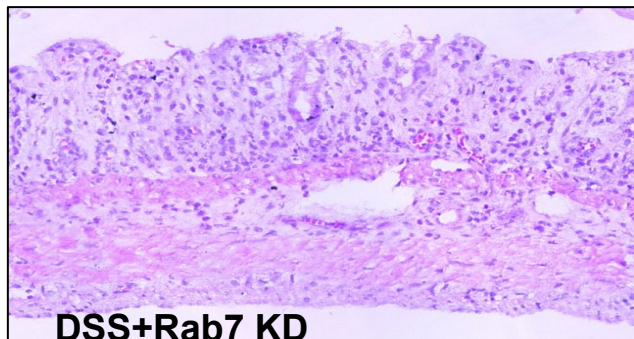
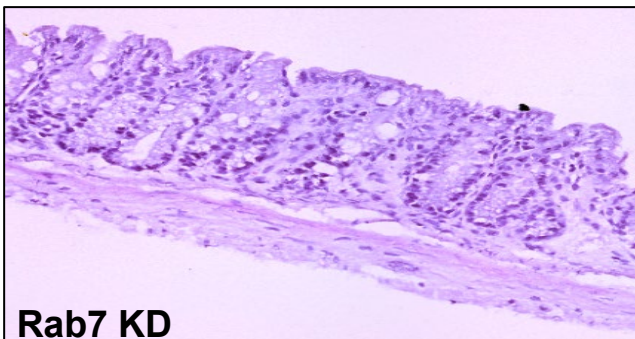
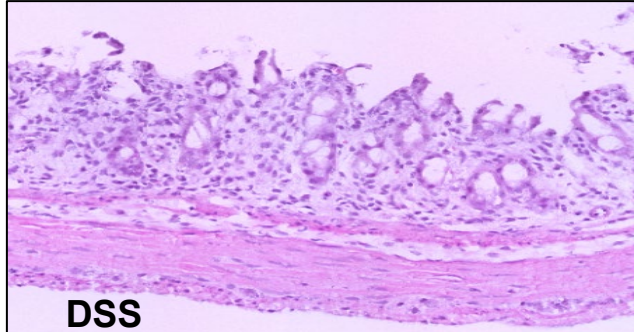
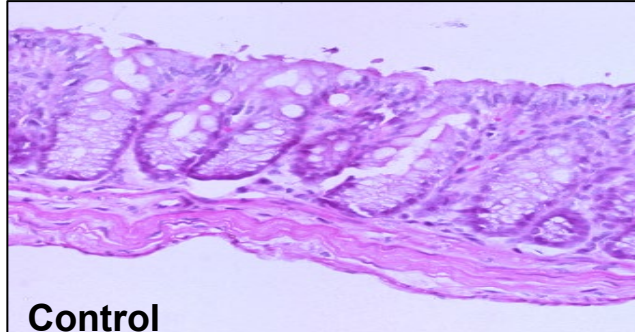
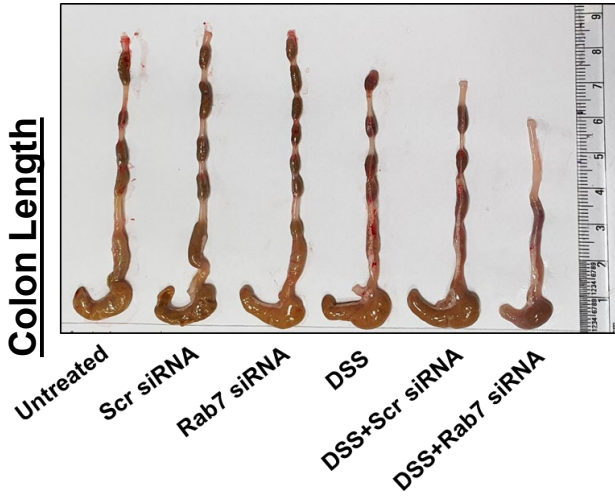
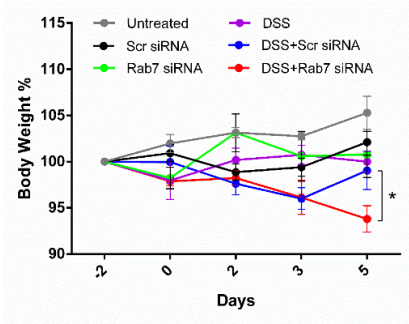
Identify
Protein of interest
(Rab7)



Interactor network of SENP7

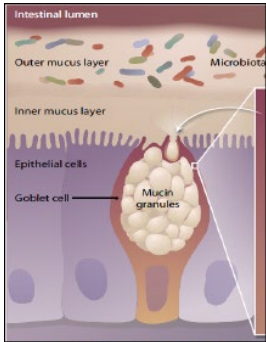
A gene called Rab7 was identified

Examining the extent of inflammation in Rab7^{KNOCK-DOWN} mice



Exacerbated gut inflammation in DSS treated Rab7^{KNOCK-DOWN} mice

Investigating Rab7 function in goblet cell



Mucus

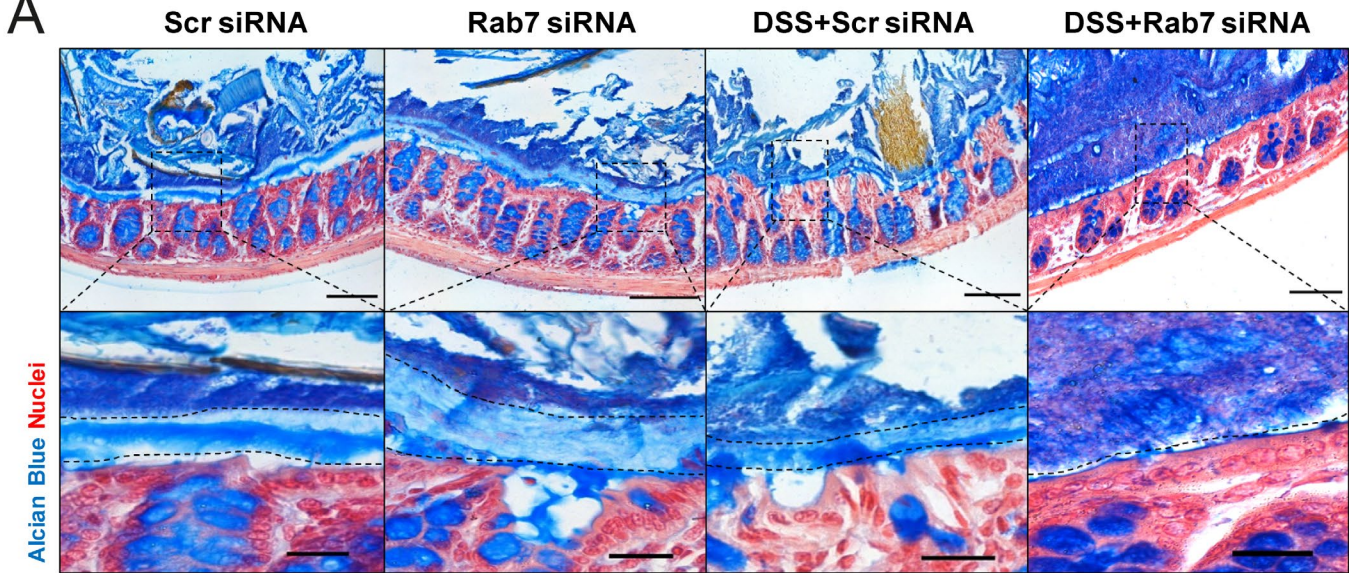
Antimicrobial peptides

Cytokines

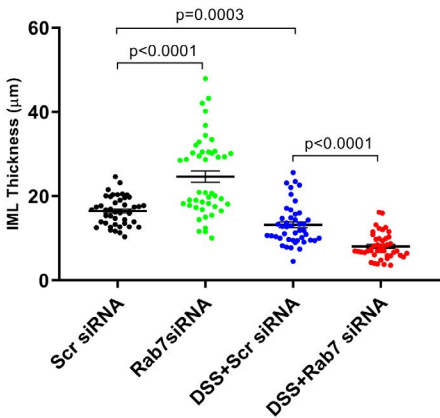
Priming APCs

(Chen et al, Science Signalling, 2014)

A

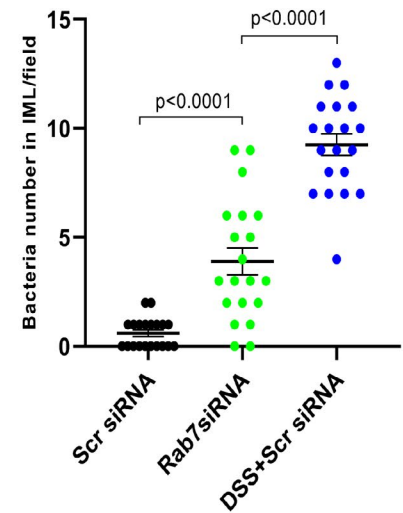
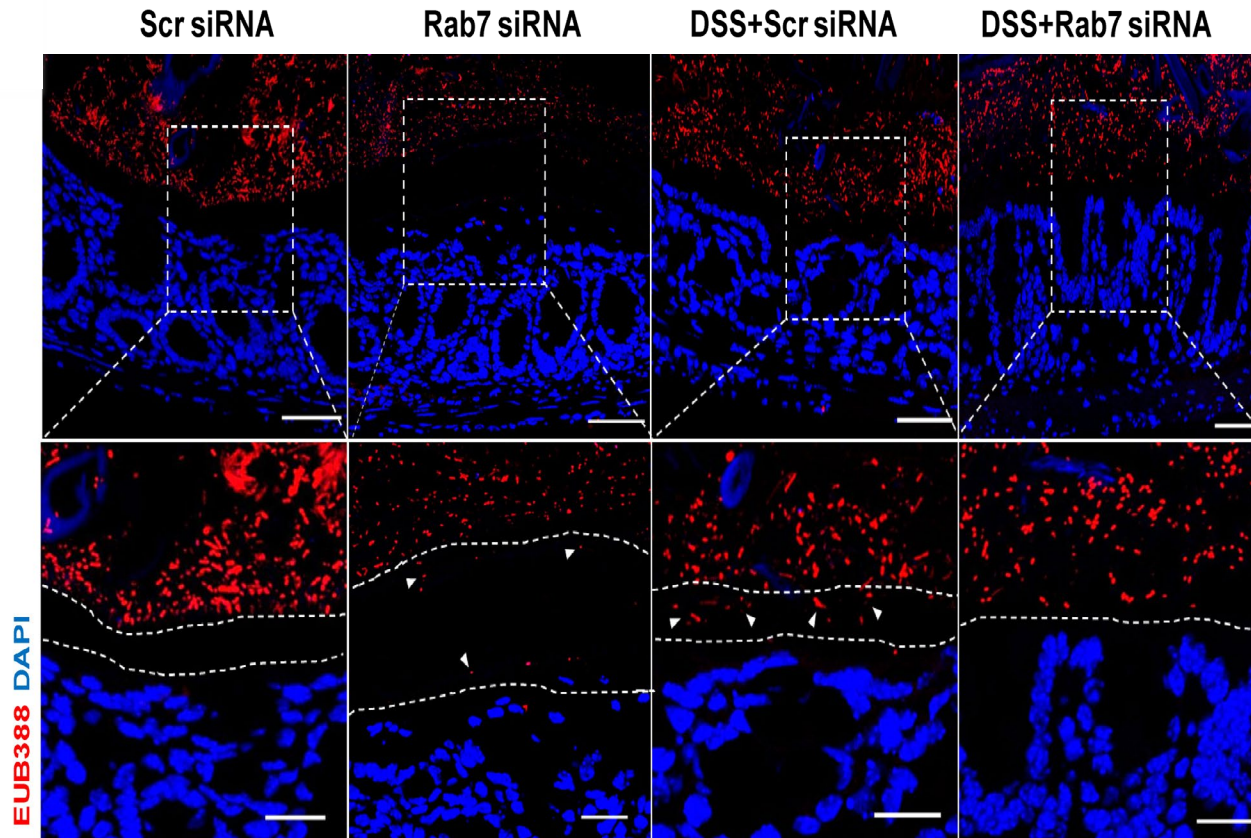


B



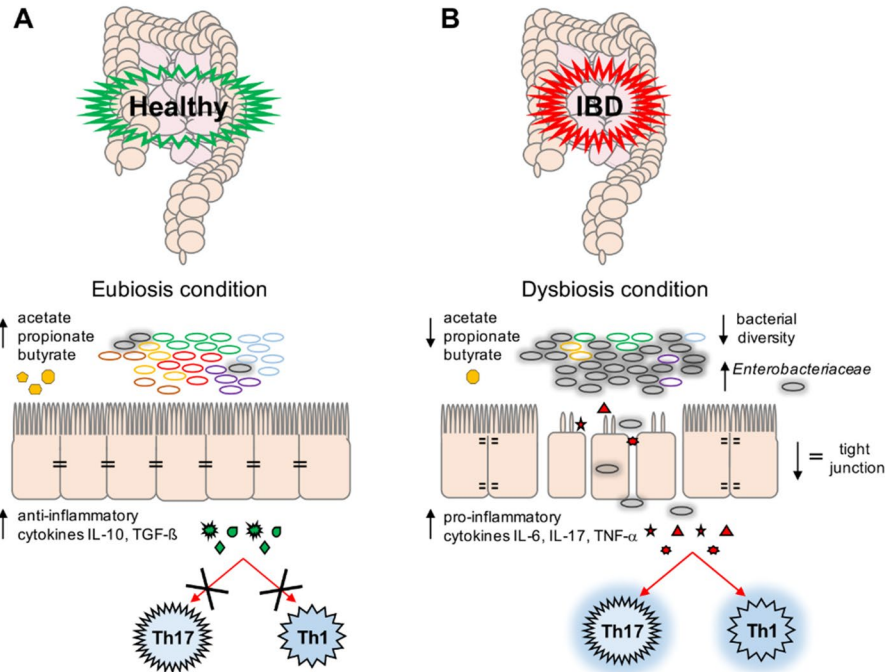
Rab7^{KNOCK-DOWN} mice display a compromised mucus layer

Fluorescence in situ bacterial staining for examining epithelial-microbiota interactions

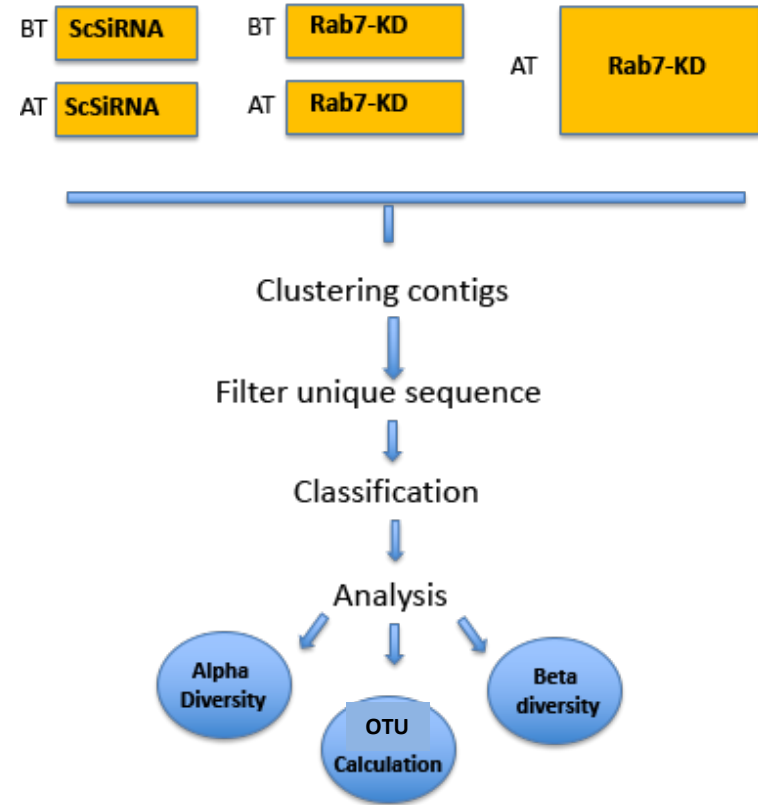


Rab7^{KNOCK-DOWN} mice display a compromised mucus layer and higher microbial penetration

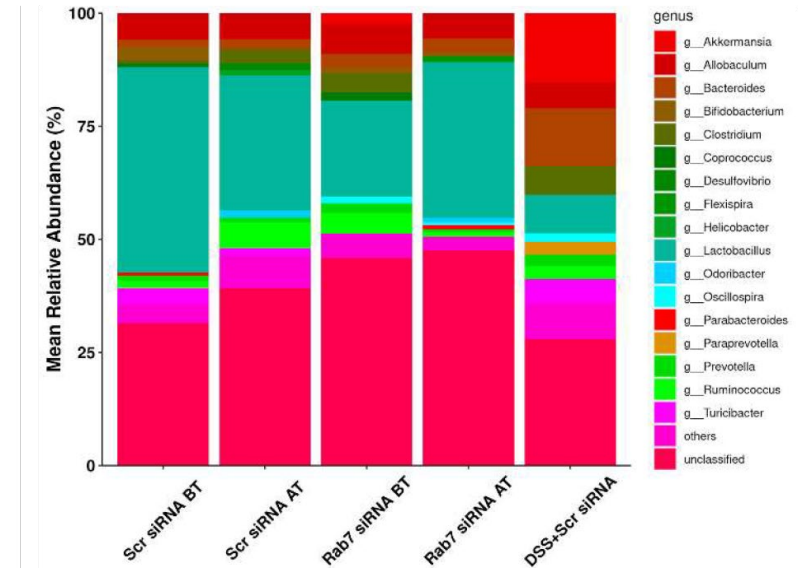
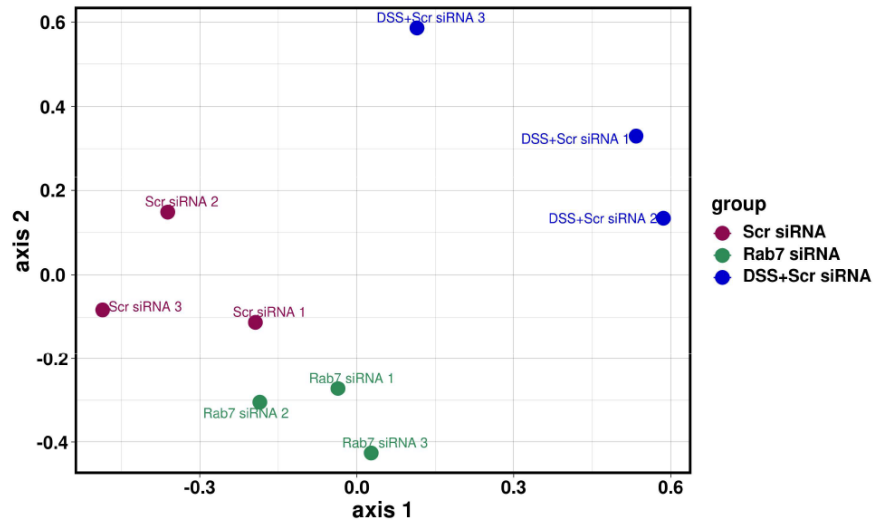
16rDNA based Metagenomics Profiling



Baldelli et al., 2021



16rDNA based Metagenomics



- Decreased microbial diversity richness in Rab7^{KNOCKDOWN} and DSS mice
- Substantial differences in the relative abundance
- Increased abundance of Bacteroidetes and decrease Firmicutes is observed
- Decrease of *L. mucosae* in Rab7-KD group was observed

Rab7^{KNOCK-DOWN} mice display altered microflora

ACKNOWLEDGEMENTS



Thank you all !!!!!



Department of
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**RCB
Core**

- Collaborators

Dr. Vineet Ahuja, AIIMS

Dr Gayatree Mohapatra, WI

Dr Vineet Ahuja, AIIMS

Dr Avinash Bajaj, RCB

**- RCB proteomics and
imaging facility
-SAF**

IndiaAlliance
DBT wellcome



WORK SUMMARY

