Being Sustainable: Amrita University Case Studies

Harnessing Natural Resources for a Better Tomorrow

Shyam Diwakar
School of Biotechnology

AMRITA VISHWA VIDYAPEETHAM

CIOMS WGM, Merida, Spain

Oct 8, 2019

Shri. Ram Nath Kovind, Honorable President of India,
with representatives of the **Top 10 universities in India** in NIRF 2019 Rankings
including Amrita represented by **Dr. Sasangan Ramanathan,** Dean, Faculty of Engineering

AMRITA
VISHWA VIDYAPEETHAM

GLOBALLY RANKED No.1 PRIVATE UNIVERSITY IN INDIA

No.8
India University Rankings 2019
No. 5
Medical College in India 2019
NATIONAL INSTITUTIONAL RANKING FRAMEWORK

Top 500 in
Clinical, pre-clinical and Health, 2019
Top 500 in
International Outlook,
Industry income 2018
THE WORLD UNIVERSITY RANKINGS

No.1
Private University in India 2018
QS UNIVERSITY RANKINGS ASIA

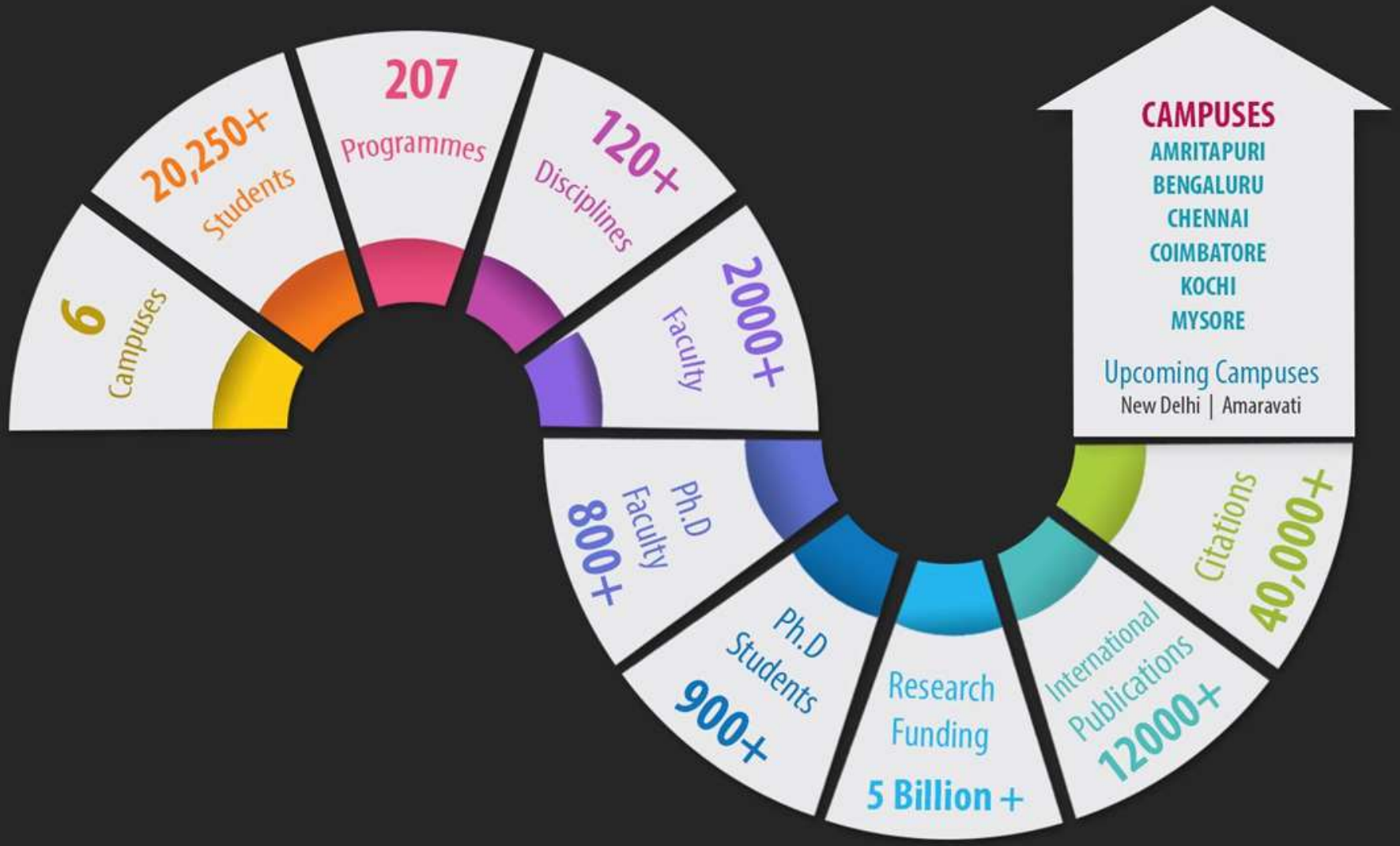
Considering there are approximately 11,900 universities regionally, this makes Amrita in the top 1.4% of all universities in Asia

No.1
Private University in India 2018
THE WORLD UNIVERSITY RANKINGS ASIA

Top 200 in BRICS
No.1
Private University in India 2018
QS UNIVERSITY RANKINGS BRICS

AMRITA VISHWA VIDYAPEETHAM | @ a Glance

A multi-campus, multi-disciplinary research university



Disciplines

Engineering

- Aerospace
- Chemical
- Civil
- Computer Science
- Electrical & Electronics
- Electronics & Communication
- Mechanical

Medicine

- MBBS/MD/MS
- Dentistry
- Nursing
- Pharmacy
- Ayurveda
- Allied Health

Sciences

- Nanosciences
- Biotechnology

Management

- Arts
- Humanities
- Communication
- Social Work

Vision & Goals, Mission

Education for Life

Impart a culture of the heart, based on enduring values and inner strength.

Compassion Driven Research

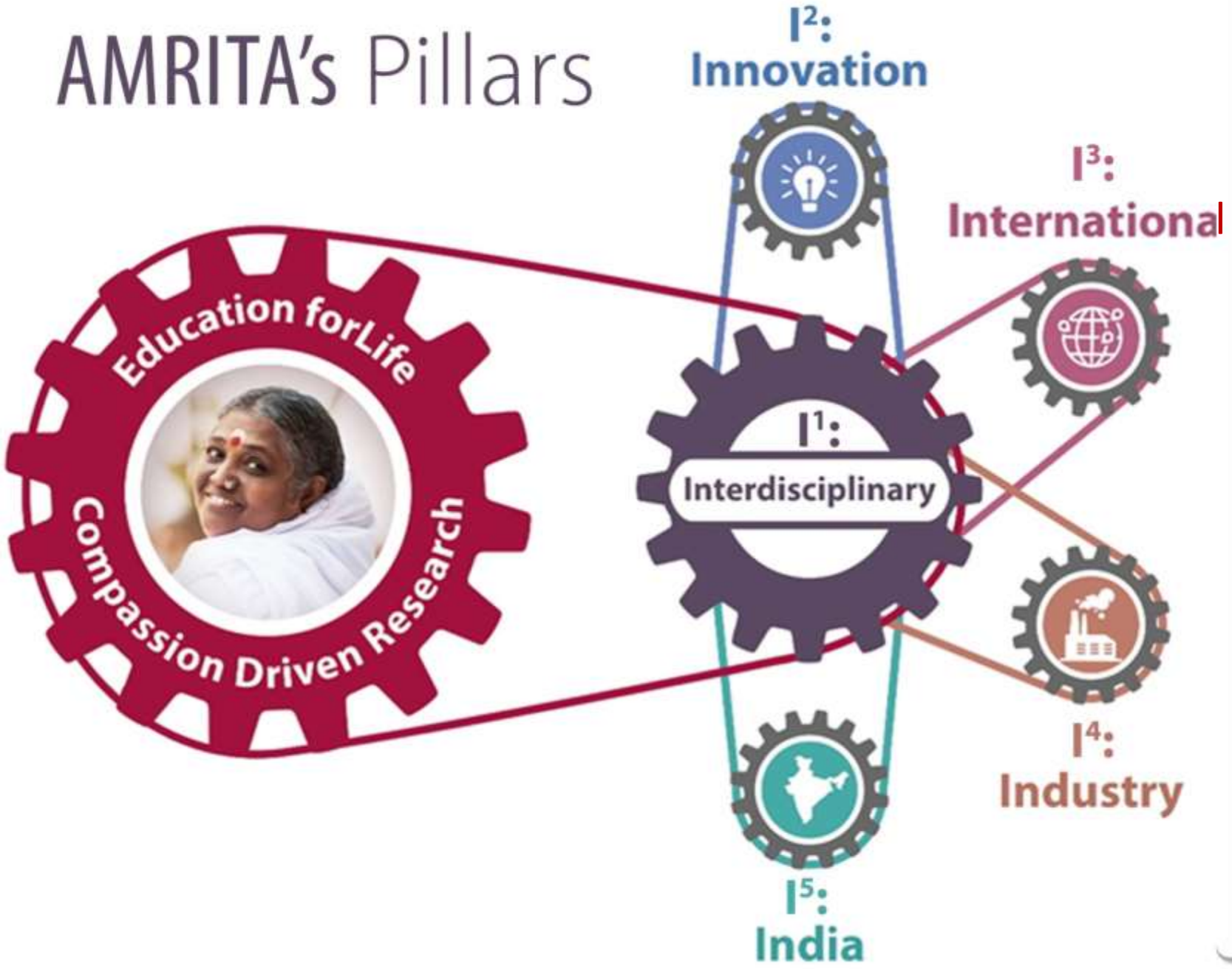
Reaching those who are at a vulnerable strata of society taking into account poverty, starvation, sickness, environmental pollution and contamination.

Global Impact

Solving globally recognized scientific and societal challenges including environment, development and health, through meaningful collaborations with world class universities and innovative approaches that will benefit the whole planet

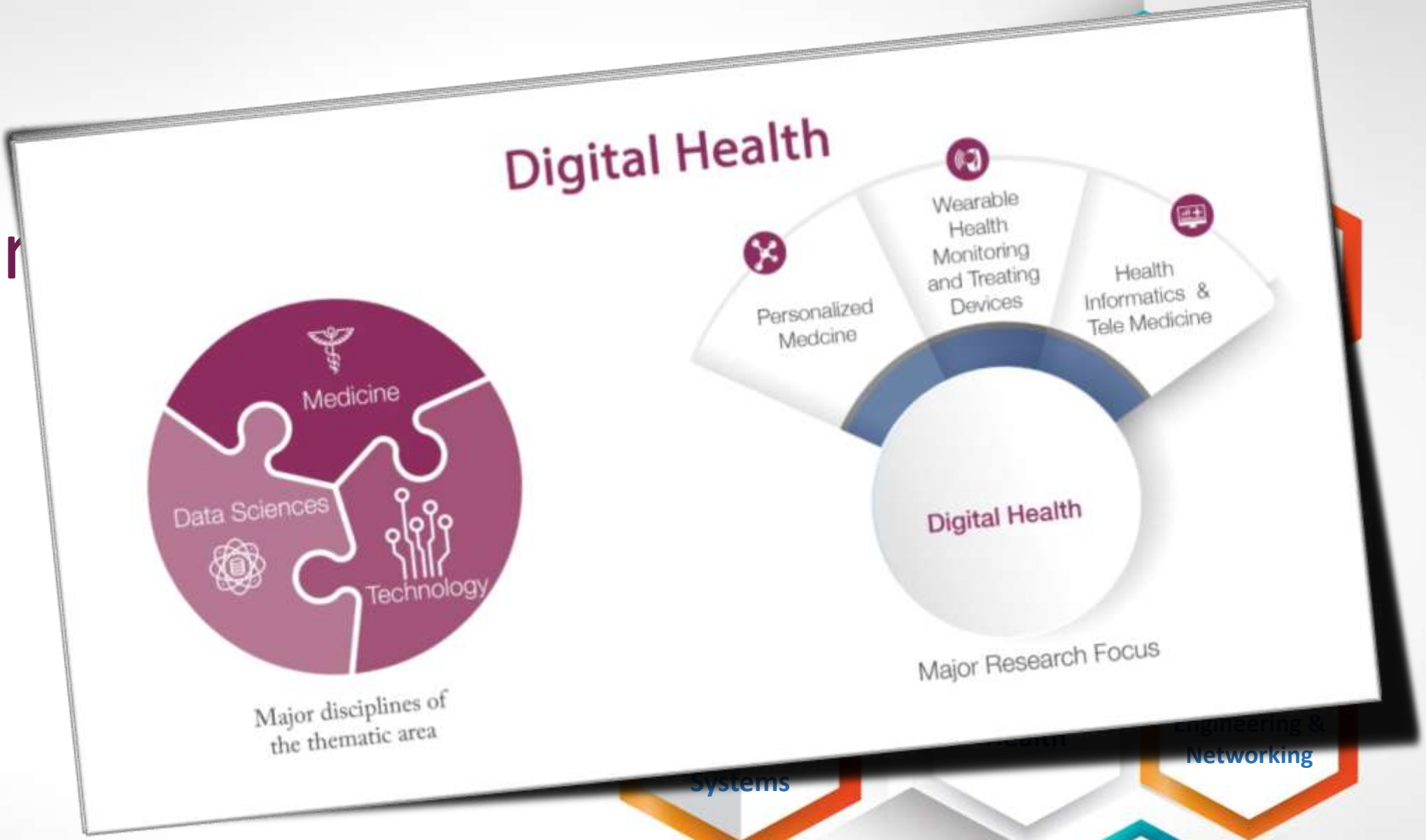
Our Chancellor
Sri Mata Amritanandamayi Devi (AMMA)

AMRITA's Pillars



Amrita Vishwa Vidyapeetham aims to become an Institution of Eminence by satisfying the objectives and characteristics stipulated by the IoE. We intend to do this by building upon the five fundamental, strategic pillars. Collectively we refer to these pillars as the five I's, noted hereafter as 5 Is.

I[1]: Inter



Systems

Networking

Automotive

- Robotic Deep Brain Stimulation
- Multi Organ Transplantation
- IoT for M… Monito…
- Insulin Pump/ Glucose Sensors
- Light Weight Bullet Proof Materials
- Healthca… Systems
- MARS Rover

Upper arm Double Hand Transplant

Inclusion criteria	*Exclusion criteria*
Bilateral distal forearm amputee	Unilateral hand amputees with no functional, social or financial impairment
Age 18-60 years of age	Brachial plexus injuries
Psychologically stable to successfully manage transplanted extremities	Congenital/syndromic hand anomalies
Financial stability	Paediatric traumatic amputees
Family and social support	Medial comorbidities including malignancy
	HCV infection
	HIV infection
	Non-correctable acute traumatic injuries

HCV: Hepatitis C virus

Data Diversity affects ICT and Medicine

Rare Breastbone Reconstruction on an infant using 3D Printing Technology

Dr. Sundeep Unnikrishnan, assisted by Dr.Brijesh, and Dr. Praveen executed the difficult 7 hours long surgery on 25th July, 2019. As planned, a part of her own 7th rib was used to reconstruct the missing bone of her chest.

Amrita surgeons 'printed-out' a life-size model of the baby's chest from her CT scan

Virtual laboratories in India

Virtual Labs 'Launch'

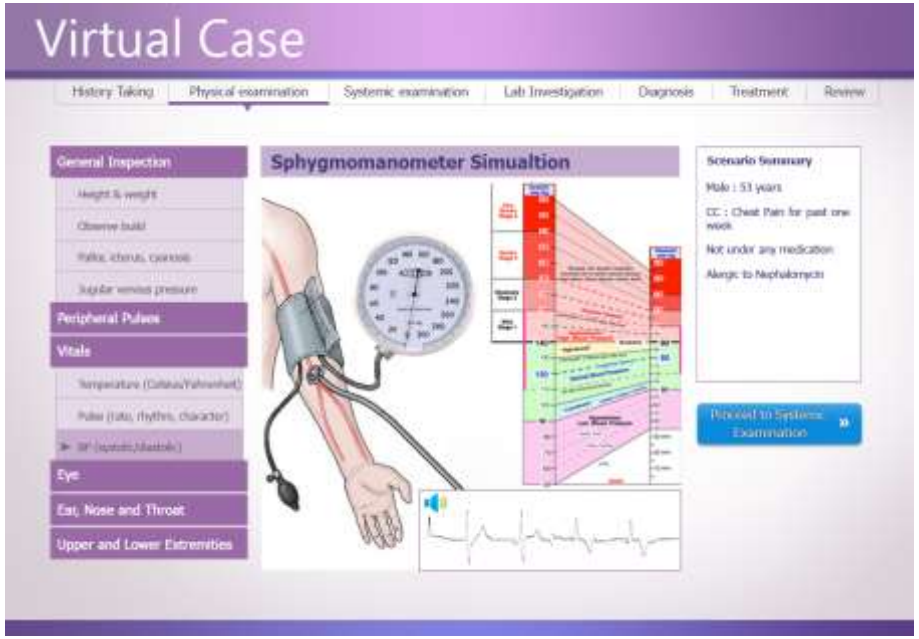
Virtual Labs were dedicated to the Nation on 23rd Feb, 2012

Participating Institutes

Over 1000 online experiments in engineering, biotechnology, physics, chemistry.

Freely available at www.vlab.co.in

MedSim



MedSim was a project by our Center of Research in Advanced Technologies for Education (CREATE).

Amrita CREATE was instrumental in learning tools and was involved in developing the Virtual Labs and its platform.

www.amrita.edu/center/create

Amrita wins XPRIZE Grand Challenge

A $7 MILLION GLOBAL COMPETITION TO
TRANSFORM THE LIVES OF ADULT LEARNERS.

Amrita Learning Reading App

Haptic devices for Skill Development

Haptic technology as a modality takes advantage of the sense of human touch by applying forces and vibrations to provide real life-like experience to the user. Pioneering contributions in the area of haptic systems for skill assessment and guidance for applications such as vocational education and training, physical rehabilitation, and medical simulation. Specific research areas include haptic rendering, haptic devices, haptic guidance and shared control schemes for haptic simulation

LIVE-IN-LABS®

AN INITIATIVE BY AMRITA UNIVERSITY

Live-In-Labs®

MISSION

Amrita University's Live-in-Labs® is designed to expose youth to problems faced by rural communities in India. Through experiential learning opportunities, the program aims to inspire innovation through empathy and the application of knowledge while developing collaborative problem solving abilities of participants.

The program emphasizes on mutual sharing and learning. It is designed as a two-way model which encourages students to be open to "other ways of thinking".

2.9 million+
Improved access to Education

4000+
Improved access to safe and cheap energy source

5000+
Improved Income generation opportunities

100,000+
Improved access to safe drinking Water

60,000+
Improved access to sanitation facilities

50,000+
Improved disaster preparedness

1200+
Students

300+
International students

600+
Faculty and researchers

250+
Villages across India

4357
Schools

1 million+
On field hours

HOW THE PROGRAM WORKS

1

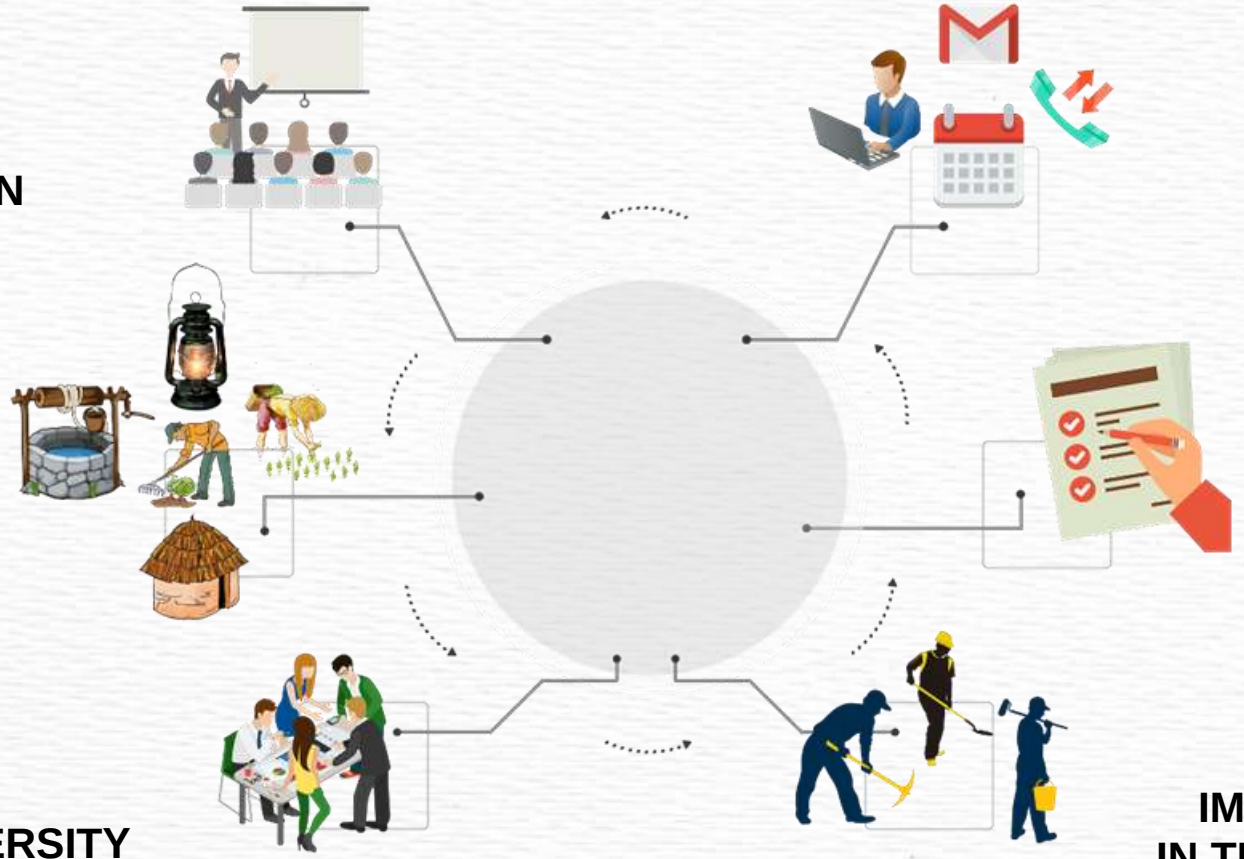
**ORIENTATION &
TEAM FORMATION**

2

**LIVE-IN &
EXPLORE THE VILLAGE**

3

**DESIGN &
TEST IN THE UNIVERSITY**



4

**IMPLEMENT
IN THE VILLAGE**

5

EVALUATION

6

PUBLICATIONS & FOLLOW-UP

THEMATIC AREAS

Energy & Environment

Water & Sanitation

Health & Hygiene

Livelihood & Skill Development

Education & Gender Equality

Waste Management & Infrastructure

Agriculture & Risk Management

JIVAMRITAM

An Initiative To Provide Clean Drinking Water To Rural India

10,000 VILLAGES, 20 MILLION PEOPLE

The Jivamritam project was inaugurated by the Honourable President of India, Shri Ram Nath Kovind, on October 8th, 2017 in Kerala, India.

In an effort to address water challenge and reduce the prevalence of waterborne diseases in rural communities in India, faculty, staff, and students of Amrita University conceptualized and designed the Jivamritam Filtration System. Each system is designed to serve a community of 300-400 families. The project includes research in the geographical distribution of water contaminants, filtration techniques and process, awareness programs, and community empowerment strategies.

PROJECTS AT GLANCE

Amrita Water Distribution System – Water Management in Rural India

Scalable and Sustainable Rural Sanitation Model

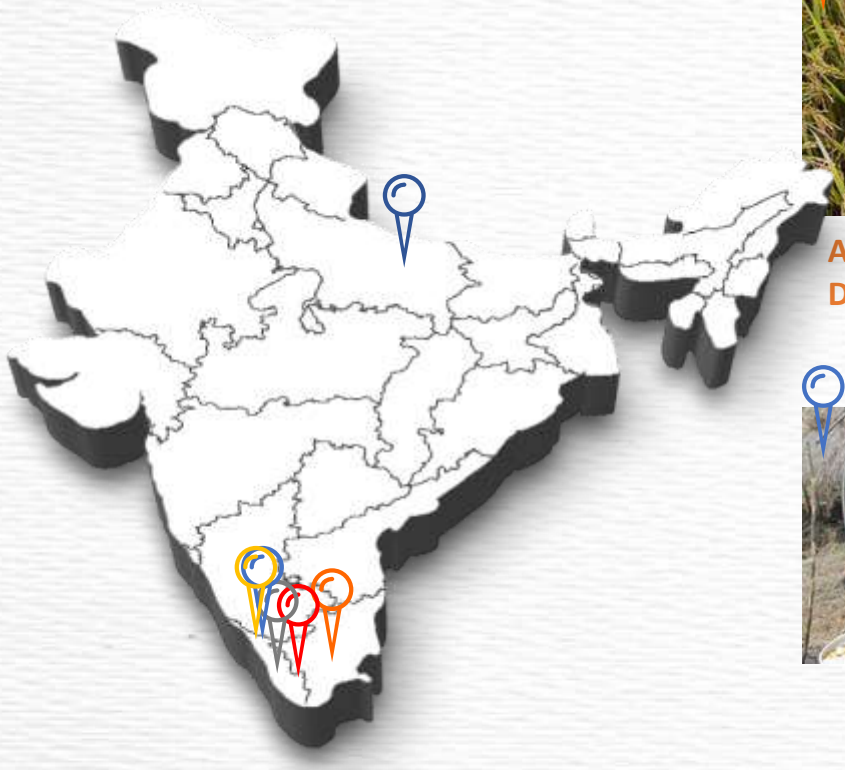
Public Health Awareness Program in Bihar

Amrita Micro Hydro Electric System - Illuminating Rural India

Amrita Awareness Ambassadors Program (AAA)

Amrita Sphuranam : Rural Electrification using solar Power

PROJECTS AT GLANCE



Agricultural Economics & Data Modeling

Empowering Artists

Health Economics

Lemon Grass Distillation

Impact Analysis of Teaching Methodology, Health, Social Awareness

Women's Self Help Groups for Health, Social, and Economic Interventions

25+ CENTRES OF EXCELLENCE

AMRITA VISHWA VIDYAPEETHAM

- Wireless Networks
- Nano Sciences
- Sustainable Development
- Cyber Security
- Women Empowerment
- Digital Health
- Computational Engineering
- Bio Medical
- Ayurveda

SUSTAINABLE DEVELOPMENT

SUSTAINABLE DEVELOPMENT GOALS

- 50+ Technologies Developed & Deployed
- 21 States
- 10 Patents Filed

Energy & Environment

Water & Sanitation.

Health & Hygiene

Livelihood & Empowerment

Education & Gender Equality

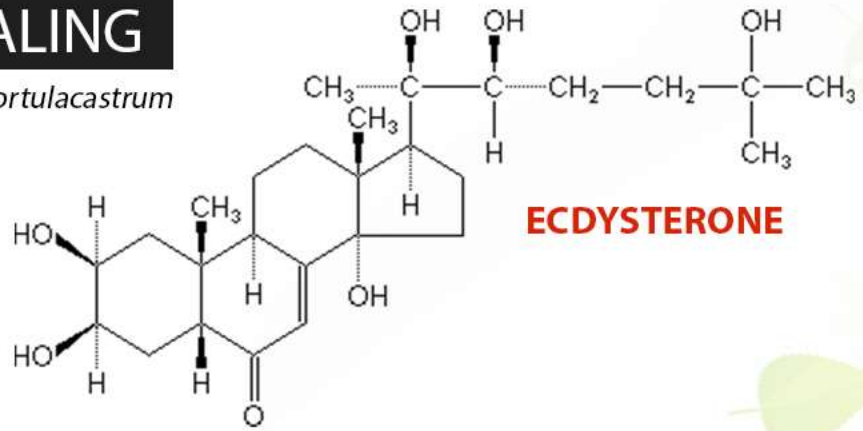
Waste Managt. & Infrastructure

Agriculture & Plantation


Traditional Medicine across the globe has been the primary means for maintaining health as well as treating and preventing human diseases

WOUND HEALING

Sesuvium portulacastrum



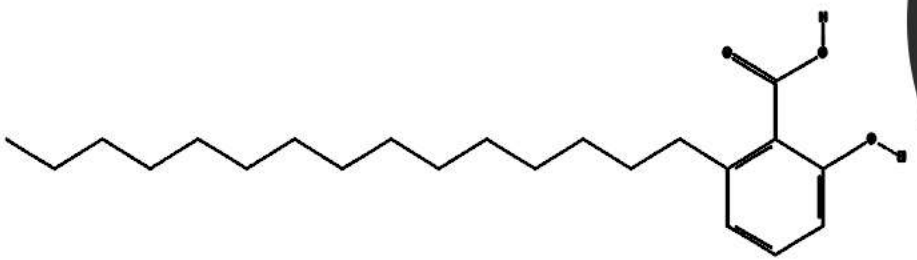
ECDYSTERONE

AMRITA VISHWA VIDYAPEETHAM UNIVERSITY
Established u/s 3 of UGC Act 1956
SCHOOL OF BIOTECHNOLOGY

NATURAL PRODUCTS
PHYTOCHEMISTRY

CANCER

Anacardium occidentale



ANACARDIC ACID

1521-0111/12/8204-614–622$25.00
MOLECULAR PHARMACOLOGY
Copyright © 2012 The American Society for Pharmacology and Experimental Therapeutics
Mol Pharmacol 82:614–622, 2012

Vol. 82, No. 4
79020/3792899

Anacardic Acid Inhibits the Catalytic Activity of Matrix Metalloproteinase-2 and Matrix Metalloproteinase-9[S]

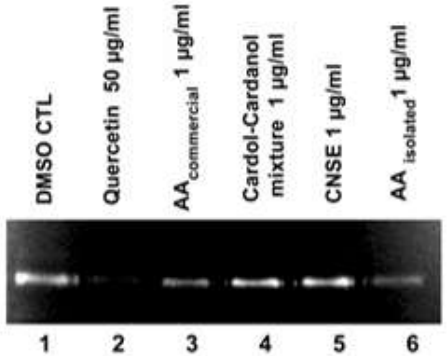
Athira Omanakuttan, Jyotsna Nambiar, Rodney M. Harris, Chinchu Bose, Nanjan Pandurangan, Rebu K. Varghese, Geetha B. Kumar, John A. Tainer, Asoke Banerji, J. Jefferson P. Perry, and Bipin G. Nair

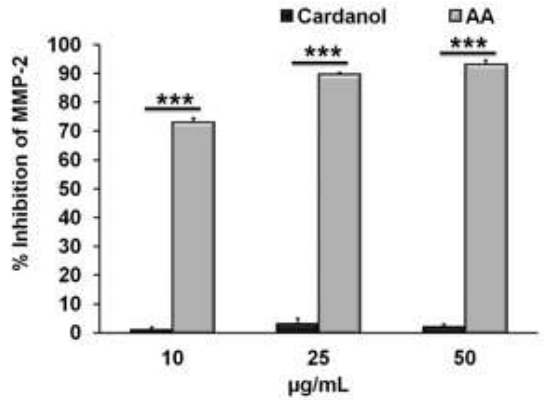
Amrita School of Biotechnology, Amrita Vishwa Vidyapeetham, Amritapuri, Kollam, Kerala, India (A.O., J.N., C.B., N.P., R.K.V., G.B.K., A.B., J.J.P.P., B.G.N.); 1060 Discovery Engineering, San Diego, California (R.M.H.); Skaggs Institute for Chemical Biology and Department of Molecular Biology, the Scripps Research Institute, La Jolla, California (J.A.T., J.J.P.P.); and Lawrence Berkeley National Laboratory, Berkeley, California (J.A.T.)

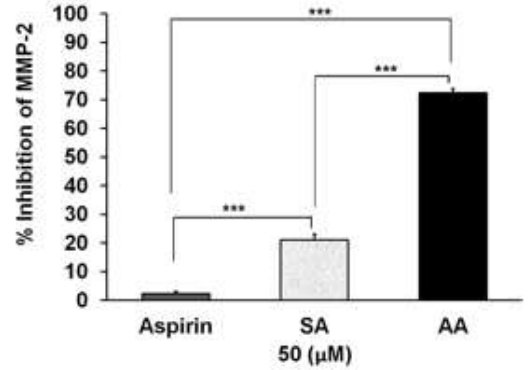
Received March 29, 2012; accepted June 28, 2012

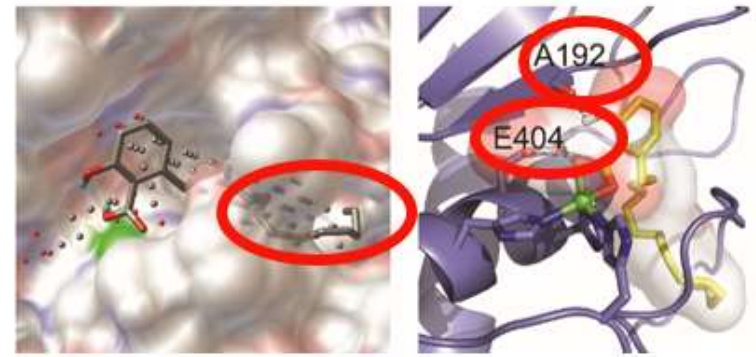
REGULATION OF GELATINASES BY ANACARDIC ACID

श्रद्धावान् लभते ज्ञानम्

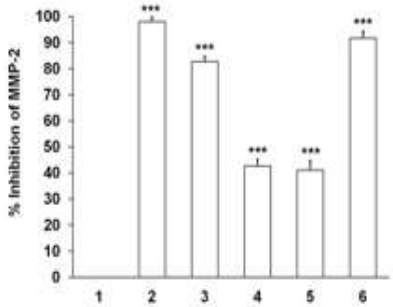


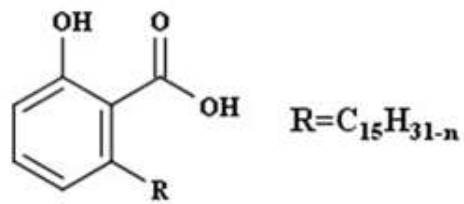






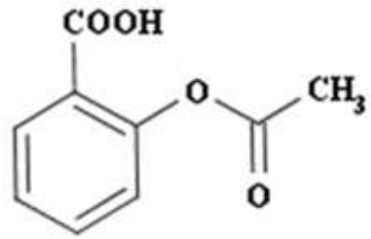
MMP-9





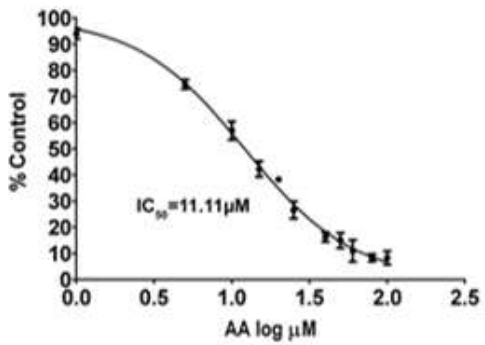
$R=C_{15}H_{31-n}$

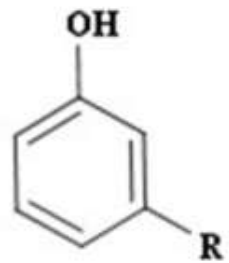
Anacardic Acid(AA)



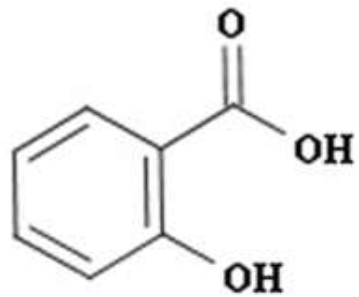
Aspirin

$R=C_{15}H_{31-n}$

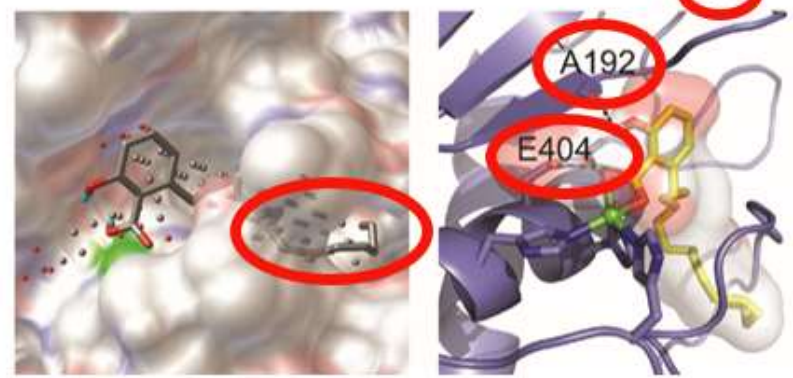




Cardanol



Salicylic acid

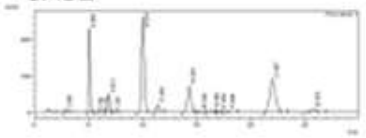


MMP-2

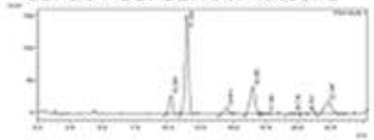
CELLULAR EFFECTS MEDIATED BY BIACACETIN

A non-zinc binding inhibitor of gelatinases

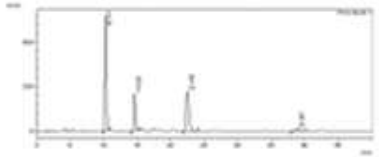
CNSE



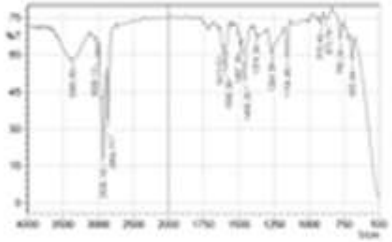
Cardol-Cardanol Mixture



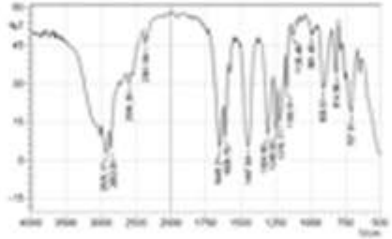
Anacardic Acid

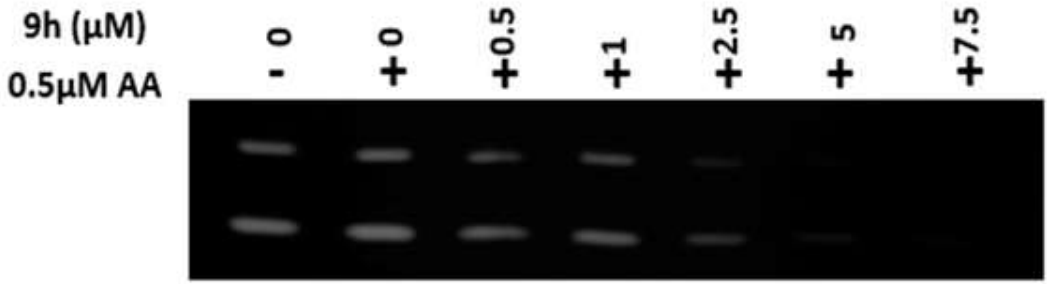


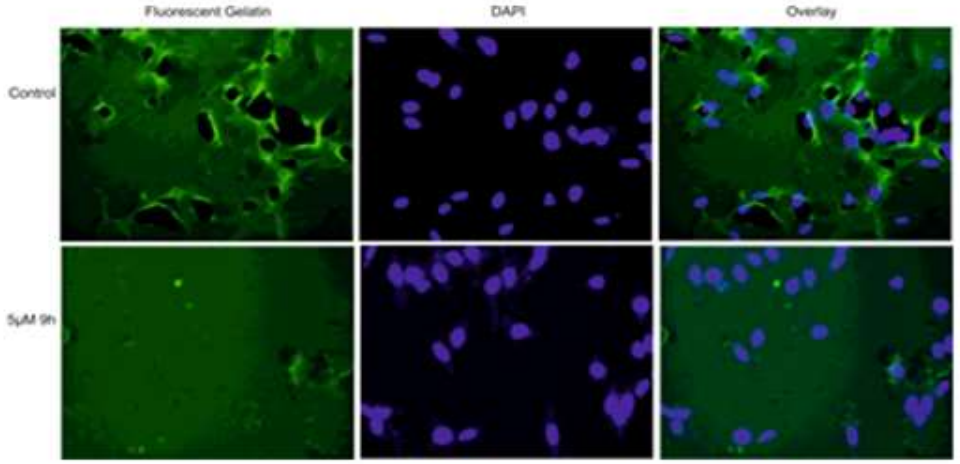
Cardanol

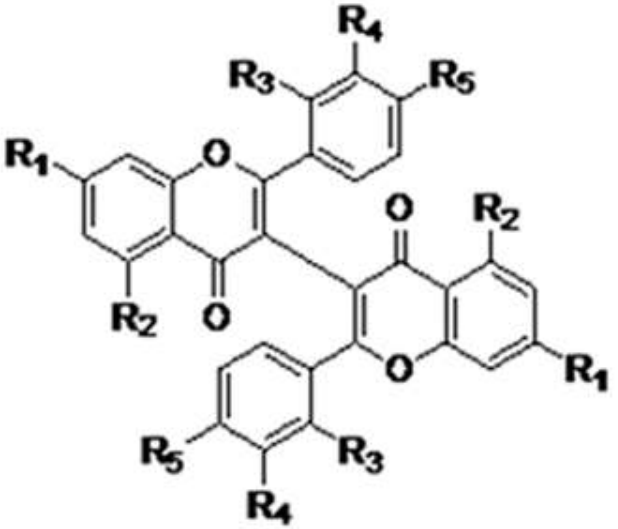


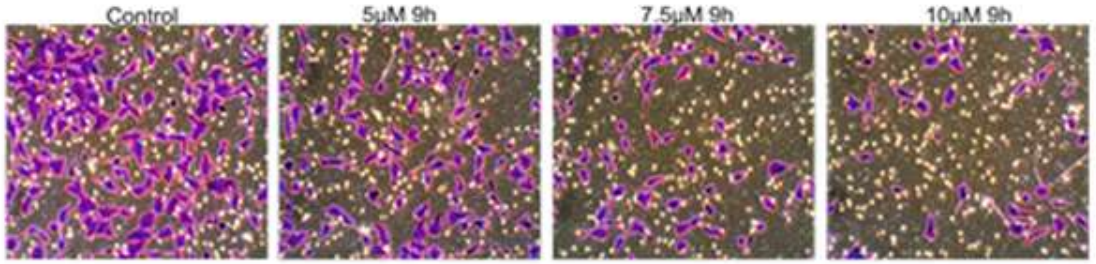
Anacardic Acid

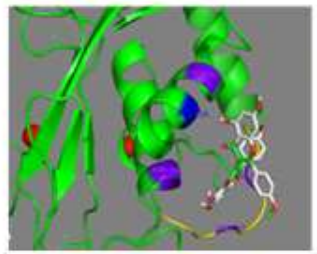


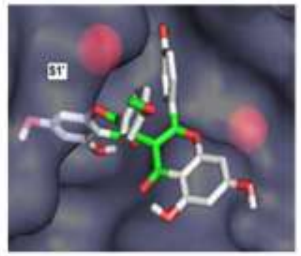












WATER

AN ESSENTIAL VITAL CRITICAL RESOURCE

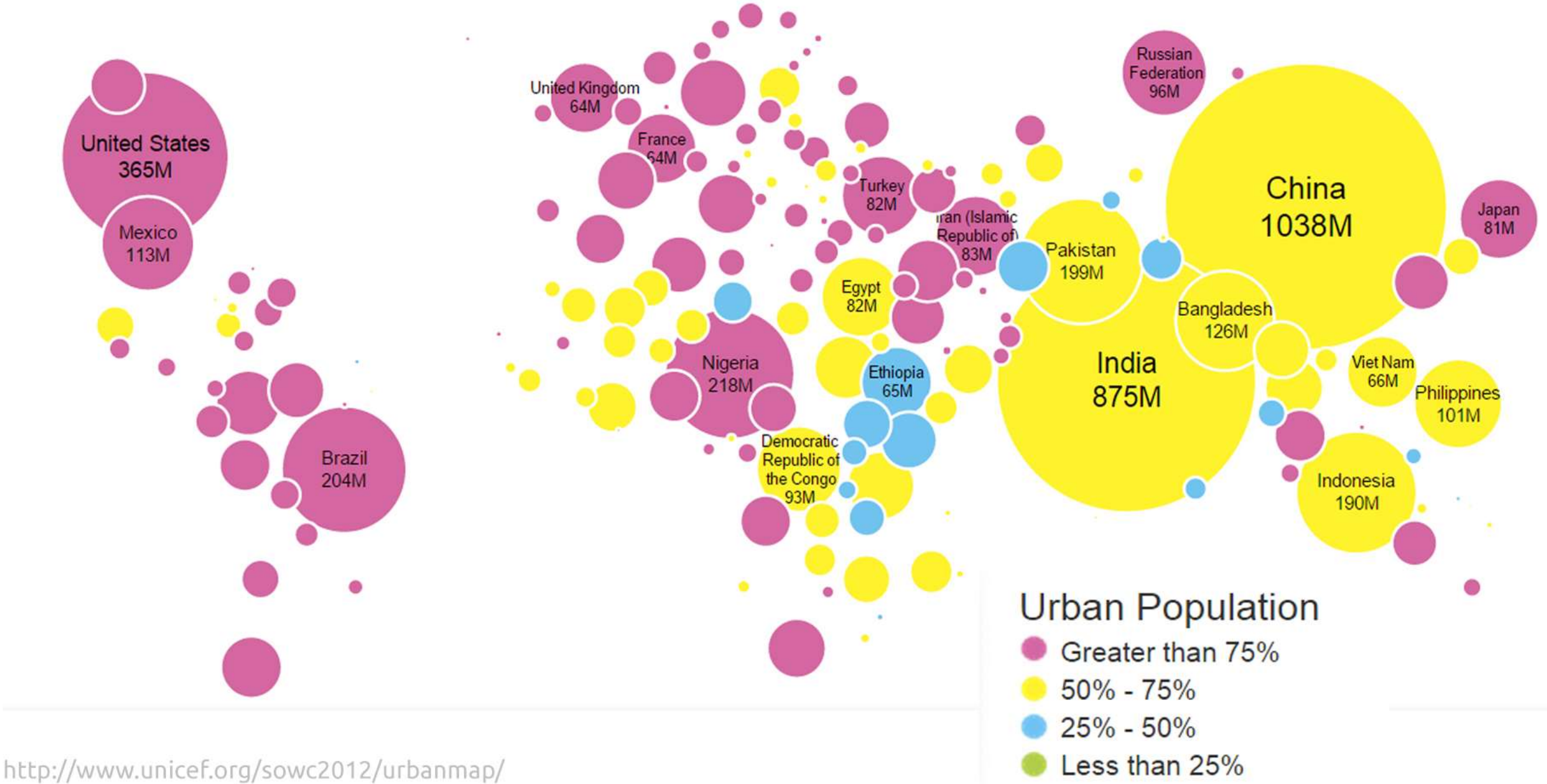
MANAGING WASTE-WATER

A MONUMENTAL CHALLENGE

2050

This graphic depicts countries and territories with 2050 urban populations exceeding 100,000. Circles are scaled in proportion to urban population size

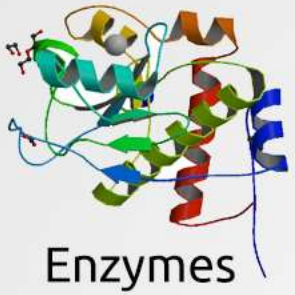
unicef



http://www.unicef.org/sowc2012/urbanmap/

BIO-CONTROL OF INFECTION & SMELL

Bacteriophages



Enzymes

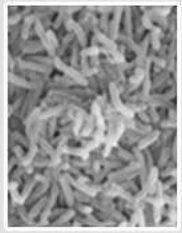
Bacteriocins

Small Molecules

Lytics
Broadcasting System

INFECTION

Bacteria



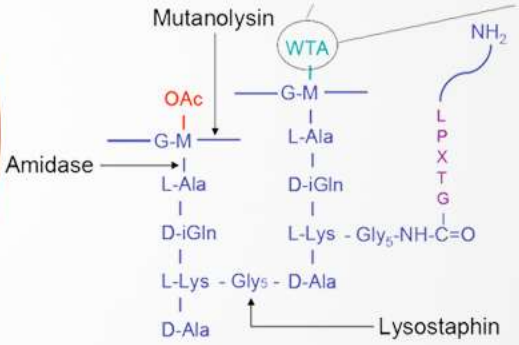
V. cholerae
E. coli, Shigella

Parasites

Giardia
Ascaris

MALODOUR

Sulfur Reducing Bacteria



BILL & MELINDA GATES foundation

AMRITA VISHWA VIDYAPEETHAM UNIVERSITY
Established u/s 3 of UGC Act 1956
SCHOOL OF BIOTECHNOLOGY

birac
Ignite • Innovate • Incubate

Listening to

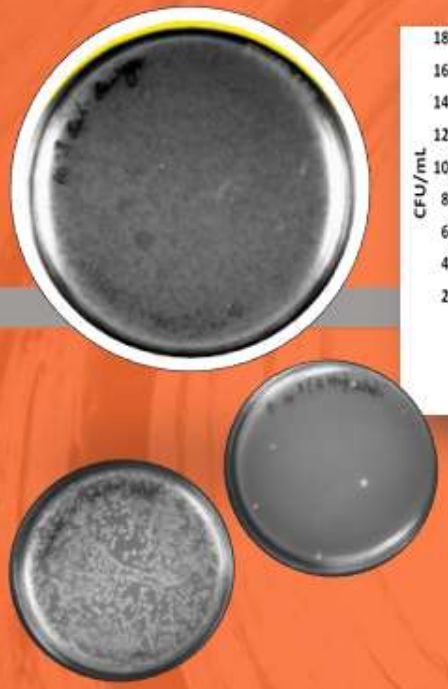
NATURE'S CUE

OUR APPROACH

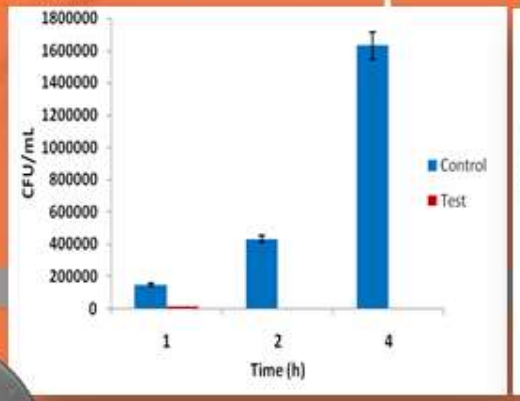
BACTERIOPHAGES TO REDUCE MALODOR

DISSEMINATING LYTIC AGENTS

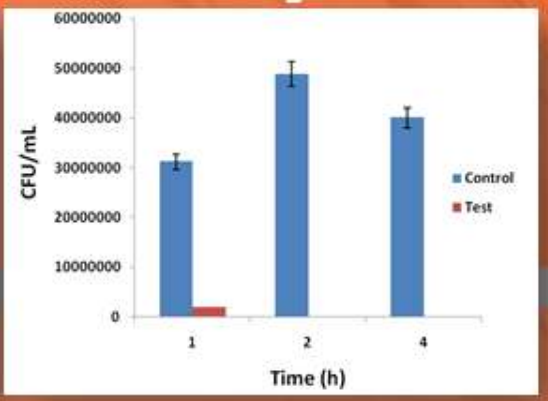
NATURAL PRODUCTS AGAINST PATHOGENS



Salmonella sp

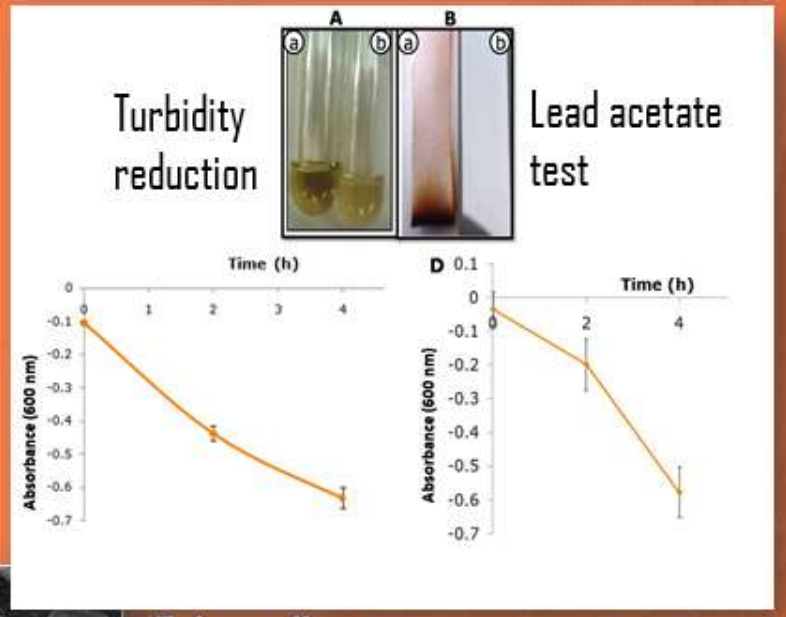


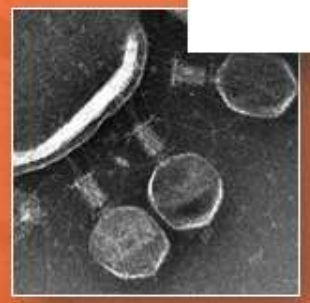
P. vulgaris



MALODOR PRODUCING COMPOUNDS

- Ammonia
- Acetic Acid
- Phenol
- Methyl Mercaptan
- Butyric Acid
- p-Cresol
- Ethyl Mercaptan
- Dimethyl Sulfide
- Hydrogen Sulfide





Salmonella sp

P. vulgaris

Listening to NATURE'S CUE

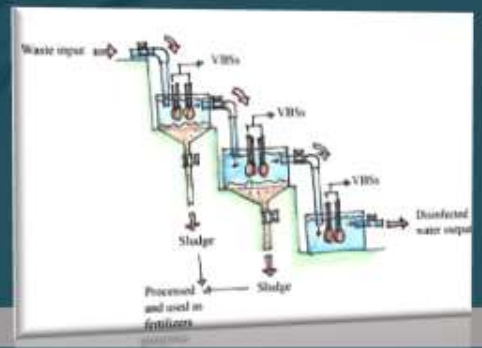
OUR APPROACH

BACTERIOPHAGES TO REDUCE MALODOR

DISSEMINATING LYTIC AGENTS

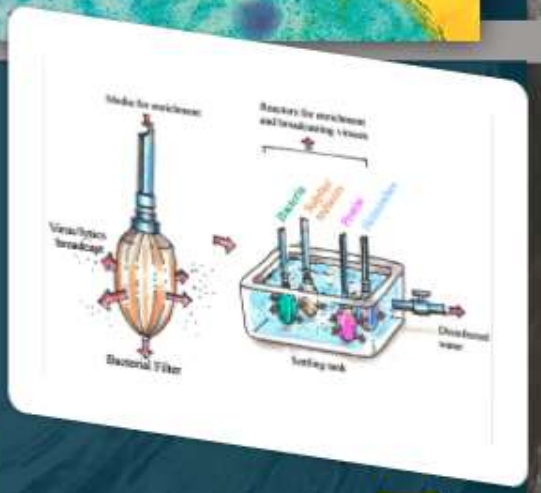
NATURAL PRODUCTS AGAINST PATHOGENS

Activated Charcoal



Diatomaceous Earth

Silicate Waste



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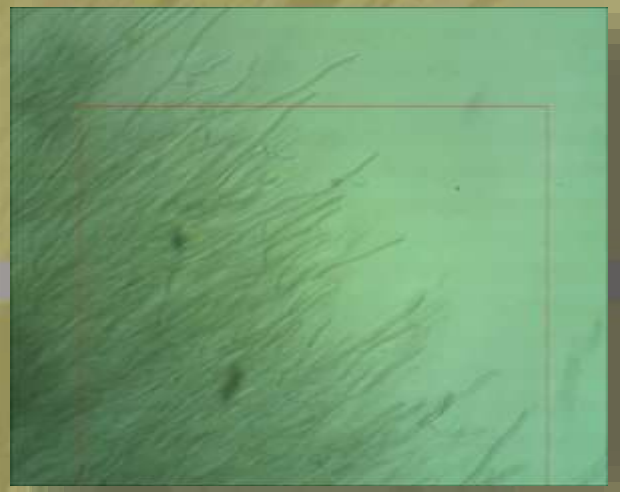


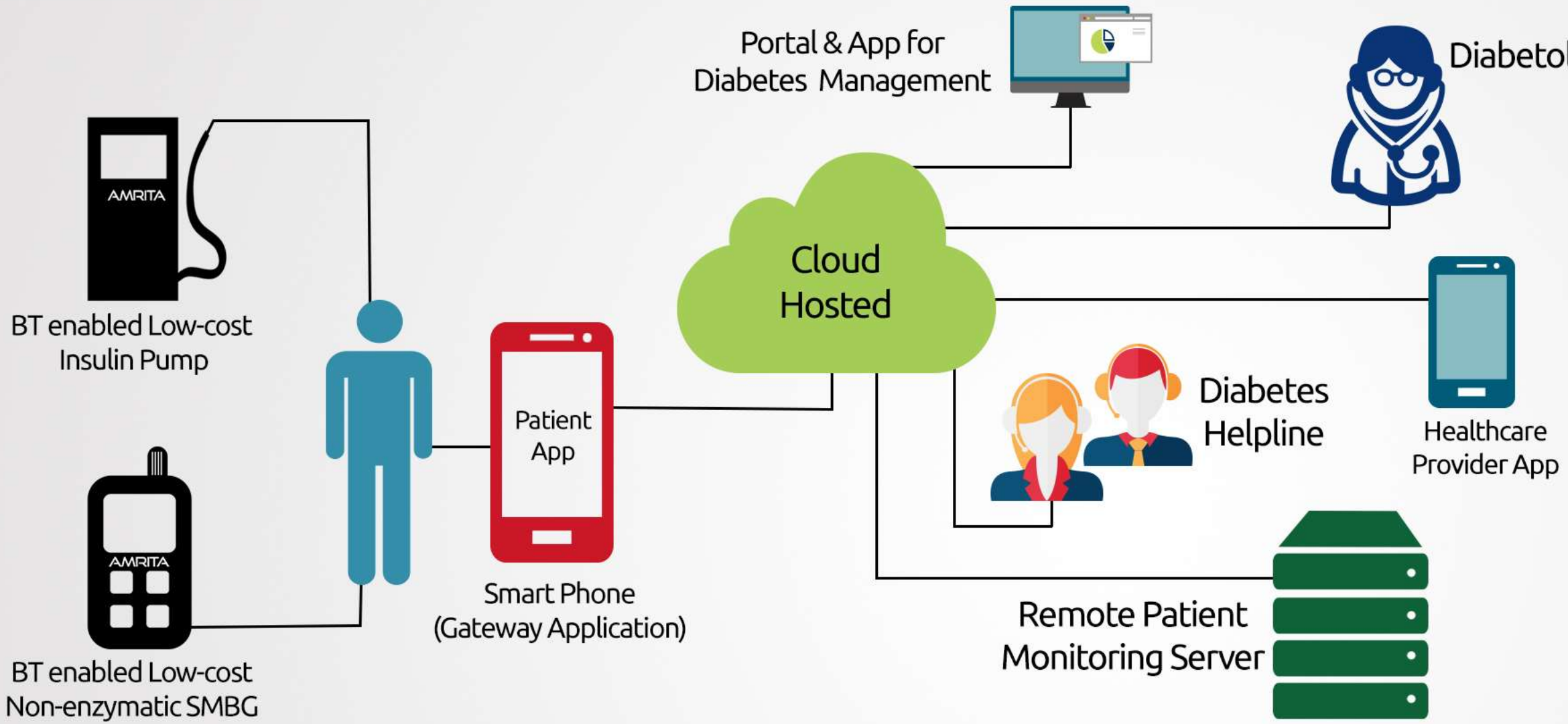
CHITIN CELL WALLED PATHOGENS

- FUNGI
- PROTOZOA
- HELMINTHES

CHITIN SYNTHASE INHIBITOR

Compounds	IC_{50} (μM/μg-mL)
Coconut shell extract	3.04 μg/mL
MEK extract of Berberis tinctoria	32.3 μg/mL
Hibifolin	51.3μg/mL (0.10μM)
Gallic acid	25.9μg/mL (0.14μM)
Cinnamic acid	36.2μg/mL (0.23μM)
Quercetin	104.4μg/mL (0.33μM)
Cashew nut shell extract (CNSE)	57.6μg/mL

LOW COST, SIMPLE & SMART DIABETES SOLUTION FOR INDIAN MASSES



WIPRO
Applying Thought

AMRITA VISHWA VIDYAPEETHAM
UNIVERSITY
SCHOOL OF BIOTECHNOLOGY

birac
Ignite • Innovate • Incubate

THE TAKE HOME MESSAGE

Solutions to be developed and evolved over time are of paramount importance for a sustainable future

Must meet the requirements of socio-cultural sustainability

Must be compatible with technological and institutional feasibility

Must be cognizant of economical affordability and environmental acceptability

A COLLECTIVE EFFORT TO ACHIEVE THESE OBJECTIVES IS THE NEED OF THE HOUR