## International Genetically Engineered Machine (iGEM) 2020 Team IISER Tirupati







# International Genetically Engineered Machine (iGEM)

The International Genetically Engineered Machine (iGEM) foundation is an independent, non-profit organization dedicated to the advancement of synthetic biology, education and competition, and the development of an open community and collaboration. This is done by fostering an open, cooperative community, and friendly competition.

iGEM's biggest program is the iGEM Competition. The iGEM Competition gives students the opportunity to push the boundaries of synthetic biology by tackling everyday issues the world faces. Made up of primarily university students, multidisciplinary teams work together to design, build, test, and measure a system of their own design using interchangeable biological parts and standard molecular biology techniques. Every year nearly 6,000 people dedicate their summer to iGEM and then come together in the fall to present their work and compete at the annual Jamboree.





# About us...

We are a team of Undergraduate students from IISER-Tirupati . Our team marks the Second year of our institute's participation in iGEM. While we all hail from different parts of India, we come together in the beautiful city of Tirupati to do science! Tirupati is a city located in the southern state of Andhra Pradesh in India, and it is home to the famous Sri Venkateswara Temple atop one of the seven hills. This makes our city a tourist hotspot, and the presence of Eastern Ghats make it a biodiversity hub! Our team has students from diverse academic backgrounds united by a shared passion for synthetic biology. iGEM is a great way for us to use our creativity and intelligence to create something meaningful (often also messy!).



# Motivation...

Apart from the well-known pollutants like SO, nitrous oxides, greenhouse gases, organic toxins from chemical factories etc., antibiotics is one of the pollutants which can be potentially extremely dangerous and is often ignored. One major consequence of antibiotic pollution is antimicrobial resistance (AMR). Darwinian selection theory, being inconsequential, promotes the development of antibiotic tolerant and resistant strains so that they are better adapted to their environment. This would lead to the development of ferocious superbugs that are multidrug-resistant and multidrug tolerant which would become catastrophic to the future of humanity. Although there is not enough data as of now, it is projected, by UN Ad hoc Interagency Coordinating Group on Antimicrobial Resistance, that by 2030, AMR could also force about 24 million people into extreme poverty, and by 2050 AMR solely will cause 10 million deaths.

AMR (2050)-AMR (2016)-Ischemic Heart Disease-Stroke-COPD-Lower respiratory infections-Alzheimer and other dementia-Trachea, Bronchus and Lung Cancer-Diabetes mellitus-Road injury-Diarrheal diseases-Tuberculosis-

10,000,000 deaths/year



### **G7** Science Academies' Statement 2015: Infectious Diseases and Antimicrobial Resistance: Threats and Necessary Actions

Emerging infectious diseases and antimicrobial resistance seriously endanger individual and global health. A comprehensive strategy is needed to tackle health threats from infectious diseases - one that requires a much more visible political and public profile and a cross-sectoral approach, involving health, agriculture, development, economy and other policy areas. The G7 Academies of Sciences call for: (1) accelerating research and production of new antimicrobial agents, vaccines and diagnostics, (2) prioritising the research agenda to fill knowledge gaps for key diseases, (3) installing global surveillance programmes, (4) raising awareness in society, and (5) a coordinated rapid response in the face of major epidemics. Only then can the necessary resources be generated to ensure optimal prevention, diagnosis, and treatment for all.

"Together with our partners, we're also stepping up the fight against antimicrobial resistance, one of the most urgent health threats of our time."

Dr. Tedros Adhanom Ghebreyesus, WHO Director-General



### **RESISTANCE HOTSPOTS**

Farm animals harbour more drug-resistant bacteria in countries where meat production has increased rapidly.



Identify and implement new sources of support, it nublic-private partnership shance

### CDC Put ishes Antibiotic Resistance Threats Report 2019

CDC's Antibiotic Resistance Threats in the United States, 2019 (2019 AR Threats Report) includes the latest national death and infection estimates that underscore the continued threat of antibiotic resistance in the U.S.

According to the report, more than 2.8 million antibiotic-resistant infections occur in the U.S. each year, and more than 35,000 people die as a result. In addition, 223,900 cases of Clostridioides difficile occurred in 2017 and at least 12,800 people died.

Dedicated prevention and infection control efforts in the U.S. are working to reduce the number of infections and deaths caused by antibioticresistant germs, but the number of people facing antibiotic resistance is still too high. More action is needed to fully protect people.

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### FIRST OPINION

## Antibiotic resistance: the hidden threat lurking behind Covid-19

By JULIE L. GERBERDING / MARCH 23, 2020







and that they are used only when medically necessary ...."

Statement by Federal Chancellor Angela Merkel at the 68th session of the WHO World Health ssembly in Geneva on 18 May 2015

### SVVADDLE

### INVISIBLE DANGER

By Aditi Murti Jul 29, 2019

Read more



ecdc.europa.eu #KeepAntibioticsWorking antibiotic.ecdc.europa.eu #EAAD

### Indian Newborns Are Dying of **Antibiotic-Resistant Infections**

# Project Plan...

your friends close and your enemies closer'.

### Our specific objectives to accomplish our goal are:-

### PART-1

### Antibiotic degradation



### To combat this we plan to build a safe disposal system which degrades the antibiotic before it is released into the environment using our enemy the antibiotic-resistant bacteria. As they say 'keep

### Preventing transfer of our Antibiotic resistance gene

Pssst! Hey kid! Wanna be a Superbug ..? Stick some of this into your genome ... Even penicillín won't be able to harm you ..!



### PART-2

### **DNA degradation and** Bacterial cell death by Apoptosis

PART-3

# Working of the bacteria...

# Treatment tanks would be setup in farms generating excreta waste. This tank will be use to treat excreta following steps



### Collected excreta from farm



Incubation

Addition of Engineered bacteria to degrade Antibiotics



### Induction of bacterial cell death



Excreta lacking antibiotics ready to be used as manure

## PAS ACHEVENES TEAM 2019- GOLD MEDAL

The first iGEM team from our institute grabed a Gold medal at Gaint Jamboree held at MIT Boston, USA. The aim of Coca Coli was to design a bacterium that helps combat colon cancer in a cost-effective and targeted manner.

We are looking forward to carry on their legacy to new heights in iGEM 2020

### Current Team Members

Abhinaba Muzumder Amogh Desai Omkar Mohapatra Purva Damale Purva Naik **R**Raajalakshmi Shubhrika Jain Srividya Vyjayanthi T Tejas Borkar Uddeshya Pandey Ved Mahajan Yogeshwari Kshirsagar







# Become a SPONSOR!

# The sponsors will be promptly promoted through social media, and at the at Giant Jamboree at MIT, Boston.

# during collaborations, on our website, during all social practices They will be accoladed and acknowledged at all our presentations.





Greenland

### Financial contribution by you helps learning and research on Antimicrobial Resistance at IISER Tirupati

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ndones

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Melbourne





## Contact us...

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# Follow us and stay tuned for updates...









### SCAN ME







## SCAN ME

