

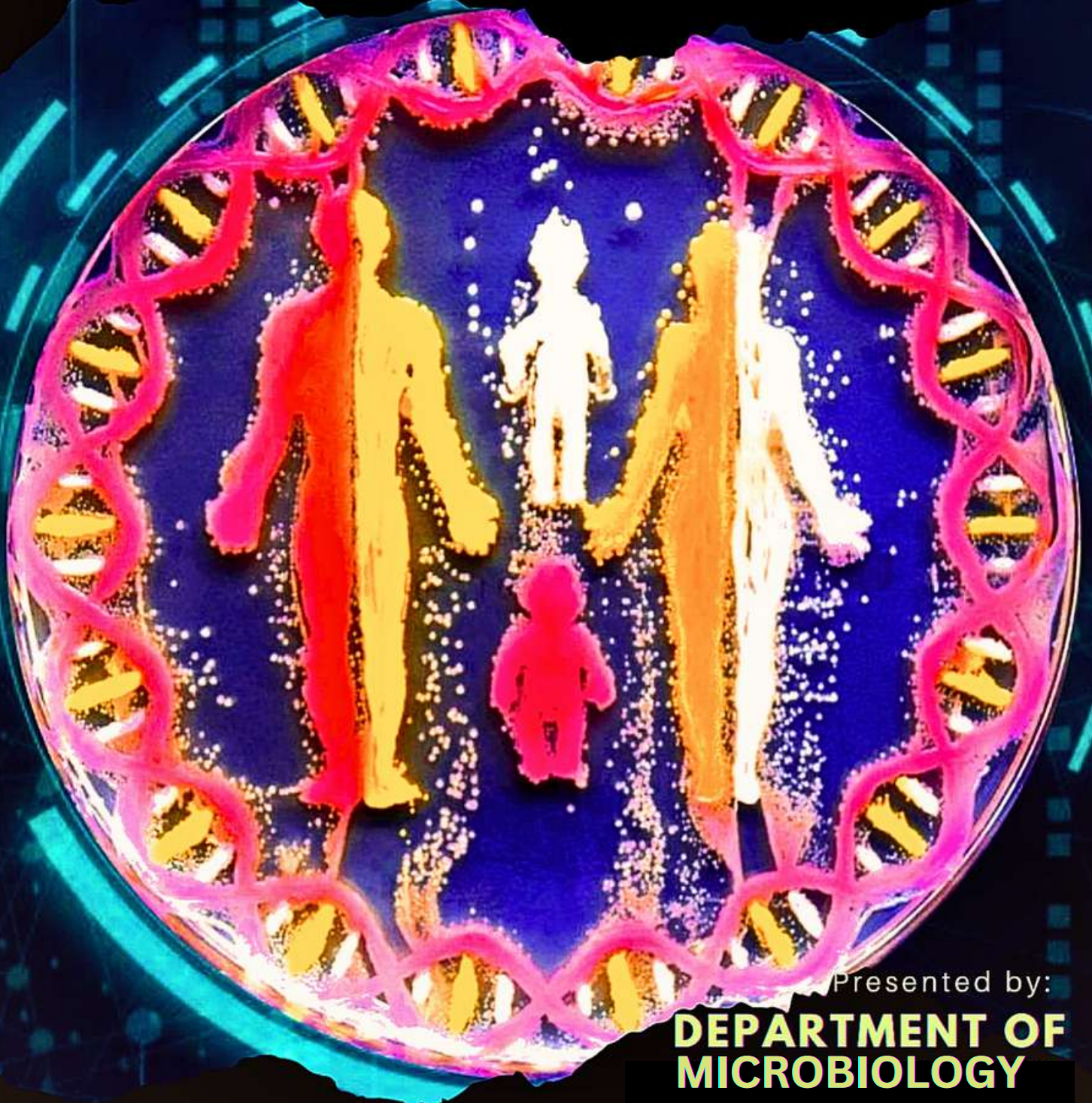


Scottish Church College

Issue 2 • 2023

SCI-TALKS

A JOURNEY THROUGH MICROBIOTA



Presented by:

**DEPARTMENT OF
MICROBIOLOGY**

The SCI-TALKS e - Magazine



ESTD. 1830

VOLUME 2 • ISSUE 2023

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FROM THE VICE PRINCIPAL'S DESK

Bringing out any magazine is a continuous process and a digital version is always privileged in that it can easily access even the unmindful reader's mind, both local and global. In the high noon of a digital age, as we see countless online publications throughout the globe, having a sustaining benchmark of content and quality is a challenge to any editorial collective. The Department of Microbiology of the college is now all set to release the second number of its e- magazine – SCI-TALKS - with much passion and fanfare. As I noticed, their inaugural number was a great success in setting up a quest for the avant-garde. Microbiology is a discipline that looks for the most primitive organisms on Earth. This is a matter dealing with the state of the art. The microbial facades have their latent aesthetic and practical potential. As they have captured the attention of designers and researchers, a magazine giving them privilege and agency can also go beyond the boundaries of the average and make a lasting impression on the online readers. I sincerely believe that the SCI-TALKS will find its own space to talk to the readers, albeit, electronic medium.

Dr. Supratim Das
Vice Principal
Scottish Church College, Kolkata
5th January, 2024





MESSAGE FROM THE IQAC COORDINATOR

It gives me immense pleasure to accord my heartfelt best wishes to the department of Microbiology on the launch of second edition of SciTalk- a students' magazine. I have gone through the first edition of the magazine and was appreciative about the content. I am sure the magazine will continue to provide an apt platform for the students to express and exchange their ideas on the recent development in the areas of science research- particularly pertaining to the field of microbiology. I would congratulate the students on their endeavour and would thank the departmental staff for extending their support for release of the second edition of the magazine. I would request the department to continue doing such good work.

Dr. Samrat Bhattacharjee
IQAC Coordinator
Scottish Church College, Kolkata
4th January, 2024





MESSAGE FROM HEAD OF THE DEPARTMENT

I am indeed proud and glad to see the second issue of Sci-Talks, the E-magazine of the Department of Microbiology, Scottish Church College, published for the session 2022-2023. This magazine is an outcome of the hard work of our students to bring out such a versatile publication. It exhibits the journey and achievements of the students and the teachers of the department experienced together during the year. Sci-Talk is a very cherished treasure for our institution and our department.

Kudos to the student members of the magazine committee and the students who have contributed to the magazine content. My sincere gratitude to the college management for their encouragement and cooperation in the publication of this magazine. I wish this initiative a great success.

With warm wishes and regards.

Smt. Richa Arora
HoD, Department of Microbiology
25th September, 2023



NOTES FROM THE FACULTY OF THE DEPARTMENT



Greetings and a warm welcome to our second issue of e-magazine “Sci-Talks”. We are proud to launch the second issue of “Sci-talks” which is definitely much informative and enriched with the scientific contents. This magazine is different from others as it is digital and completely written, compiled, edited and designed by the students. I appreciate the hard work of the students to create this e-magazine.

After receiving the support from our Respected Principal Ma’am, Vice Principal Sir, the teachers and the students of the Department of Microbiology, I hope, this magazine would be a huge success.

With warm thanks.

Dr. Malabika Chakraborty
Faculty, Department of Microbiology
Scottish Church College, Kolkata

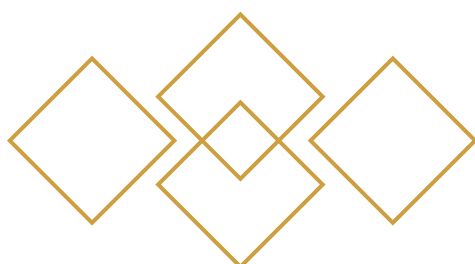




It is a matter of pride to pen down the message for the 2nd edition of Sci-talks, the departmental magazine of microbiology Scottish Church College. My heart fills with immense pleasure as I perceive the progress being made at this department. Education is not just about the subjects that only are learnt and taught; rather it is a lifelong exercises. In our Department education a holistic perspective is approached. Our department always seeks to engage students in the teaching/learning process and encourages students' personal and collective responsibility. The "Sci-talk" is a platform for the students to express their creative pursuit which develops in them originality of thought and perception.

I extend my warm wishes to the college authority, editorial team, students and colleagues on the publication of 2nd Edition of Sci-talk.

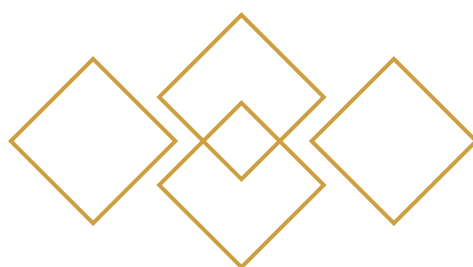
Mrs. Koly De
Faculty, Department of Microbiology
Scottish Church College, Kolkata





I am extremely overwhelmed to pen down my message for this year's e-magazine Sci-Talks 2023. This is the 2nd volume of this magazine published by the students of the Department of Microbiology, Scottish Church College. As is the tradition of our college, the Department of Microbiology also places equal stress on the academic development, extra-curricular and co-curricular development of the students. Through this magazine students can hone their writing, creative and technical skills. As we all know, education can open our eyes and expand our minds unlike anything else. I am sure one will enjoy browsing through the magazine. I take this opportunity to congratulate and thank the students for their consistent dedication and hard work in bringing out this edition of Sci-Talks. I wish this magazine a great success.

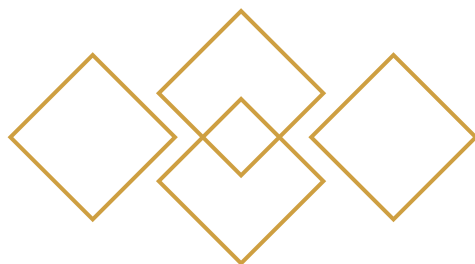
Dr. Senjuti Halder
Faculty, Department of Microbiology
Scottish Church College, Kolkata





It is indeed an exhilarating moment that our department is going to release the 2nd issue of its e-magazine 'Sci-Talks'. It is quite a 'Dream comes true moment' for us, which we, the professors dreamt and our students executed giving it a shape. I would like to take this opportunity to congratulate and thank everyone whose tireless efforts have made it a great success.

Dr. Tina Mukherjee
Faculty, Department of Microbiology
Scottish Church College, Kolkata



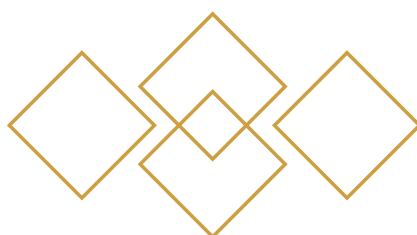


It is indeed my proud privilege and delight to bring forth to you that the Department of Microbiology of our college is successfully publishing its annual departmental e-magazine- the 2023 edition of SciTalks. SciTalks is an amalgamation of creativity and innovation which are the two essential elements necessary to foster successful education. Our departmental magazine is an eloquent expression of scientific progress and a platform for the students to articulate their capabilities and analyze their research interests, creativity and scientific insights.

I congratulate the editorial board members for bringing out this e-magazine for the year 2023, which in itself is an achievement, considering the efforts and time required. I wish all the students great success on their efforts in publishing this issue of SciTalks and many more subsequent ones in the years to come. Hope you like this endeavour of our budding scientists! Let's keep communicating through SciTalks!

With warm wishes and best regards,

Dr. Tamanna Sultana,
Faculty, Department of Microbiology,
Scottish Church College, Kolkata.



FACULTY ADVISORS

PROFESSORS OF THE DEPARTMENT OF MICROBIOLOGY



NON TEACHING STAFF OF THE DEPARTMENT



PHOTOS OF COMMITTEE MEMBERS

ALONG WITH THEIR RESPECTIVE SEMESTERS

1. GRAPHIC DESIGNERS



Rajdip Roy (4)



Meheli Roy (4)



Anubhav Ghosh (4)



Sudipto Singha (4)



2. COORDINATORS



Ariyan Adak (6)



Adil Hossain Warsi (4)



Tiyasha Ghosh (6)



Parthib Saha (2)



Debapriya Chattopadhyay (2)



2. EDITORIAL TEAM



Aishy Dutt (4)



Meheli Roy (4)



Sonakshi Saha (2)



Anubhav Ghosh (4)



Rajdip Roy (4)



Debasmitta Choudhury (6)



Sudipto Singha (4)



Ariyan Adak (6)



Aishi Bhattacharya (4)



FACULTY ACHIEVEMENTS

11th to 13th February

Prof. Dr. Tina Mukherjee chaired a technical session of
Multidisciplinary Webinar on Climate Change: Impact on Agriculture
Environment and Sustainable Development.

INTERNATIONAL MULTIDISCIPLINARY WEBINAR ON "CLIMATE CHANGE IMPACT ON AGRICULTURE, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT"

Jointly Organised By



International Academy of
Science and Research (IASR),
Kolkata, West Bengal



Gurukul Edutech Education
and Research Foundation,
Kolkata, West Bengal



Scientific and Environmental
Research Institute (SERI),
Kolkata, West Bengal

Date: 11- 12- 13 February, 2022

Certificate of Participation and Appreciation

This is to certify that *Dr. Tina Mukherjee* of *Scottish Church College, Kolkata, West Bengal* has participated as *CHAIRPERSON* of *A Technical Session* in the *International Multidisciplinary Webinar on "Climate Change Impact on Agriculture, Environment and Sustainable Development"* held on *11- 12- 13 February, 2022* through *Google Meet*.

Dr. Sudip Barat
President
International Academy of Science
and Research, Kolkata, West Bengal

Dr. Jnanendra Narayan Sengupta
Chairman
Gurukul Edutech and Education Research Foundation,
Kolkata, West Bengal

Dr. Tridib Bandopadhyay
Chairman
Scientific and Environmental Research
Institute (SERI), Kolkata, West Bengal

Date: 13th February, 2022

Certificate No.: 202202190



30th to 31'st March

Dr. Tina Mukherjee, Dr. Malabika Chakraborty and Dr. Senjuti Halder acted as resource persons in the national seminar conducted by IFEE and NESAI on Environmental Pollution, organised at Mahishadal Raj College.



23rd April

Smt. Richa Arora was appointed as State Coordinator, WB for Microbiologist Society India for the sessions 2021-22 and 2022-23.



11th June

Prof. Dr. Malabika Chakraborty was invited as Plenary Speaker in the international webinar on "Climate Change and its impact on Ecosystem: Mitigation and Adaptation".

Celebrating World Environment Day 2022
**International Webinar on "Climate Change and
Its Impact on Ecosystem: Mitigation and Adaptation"**

Jointly Organised By:



International Foundation for
Environment and Ecology
(IFEE), Kolkata, West Bengal



Govt. Degree College Kilhotran,
Jammu and Kashmir



Bhairab Ganguly College,
West Bengal

Date: 10-11 June, 2022

Certificate of Participation and Appreciation

This is to certify that Dr. Malabika Chakraborty of *Scottish Church College, Kolkata, West Bengal* has participated in the International Webinar on "Climate Change and Its Impact on Ecosystem: Mitigation and Adaptation" held on 10 -11 June, 2022 through Google Meet as **PLENARY SPEAKER** and presented a paper on "Impact of Climate Change on Biodiversity."

Dr. Tridib Bandopadhyay
President
International Foundation for
Environment and Ecology, Kolkata, West Bengal

Prof. (Dr.) Javed Iqbal Zargar
Principal
Govt. Degree College Kilhotran,
Jammu and Kashmir

Prof. (Dr.) Subhranil Som
Principal
Bhairab Ganguly College,
West Bengal

Date: 11th June, 2022

Certificate No.: 202206142



20th September

Smt. Richa Arora acted as a resource person and judge for the poster making competition organised by THK Jain College in collaboration with MBSL.



20th December

**Smt. Richa Arora judged an oral presentation competition organised by
THK Jain College in collaboration with MBSI.**



PUPIL ACHIEVEMENTS

1. STATE LEVEL Poster Making Competition, MSI (WB Unit)

23rd April

Anish K. Dawn and Ankit Majhi of Semester 4 secured 5th position.



2. Modern Trends In Microbiology (MTIM), St. Xavier's College, Kolkata

23rd September

Anish K. Dawn, Suprava Acharya and Ankit Majhi of Semester 4 secured 2nd position.



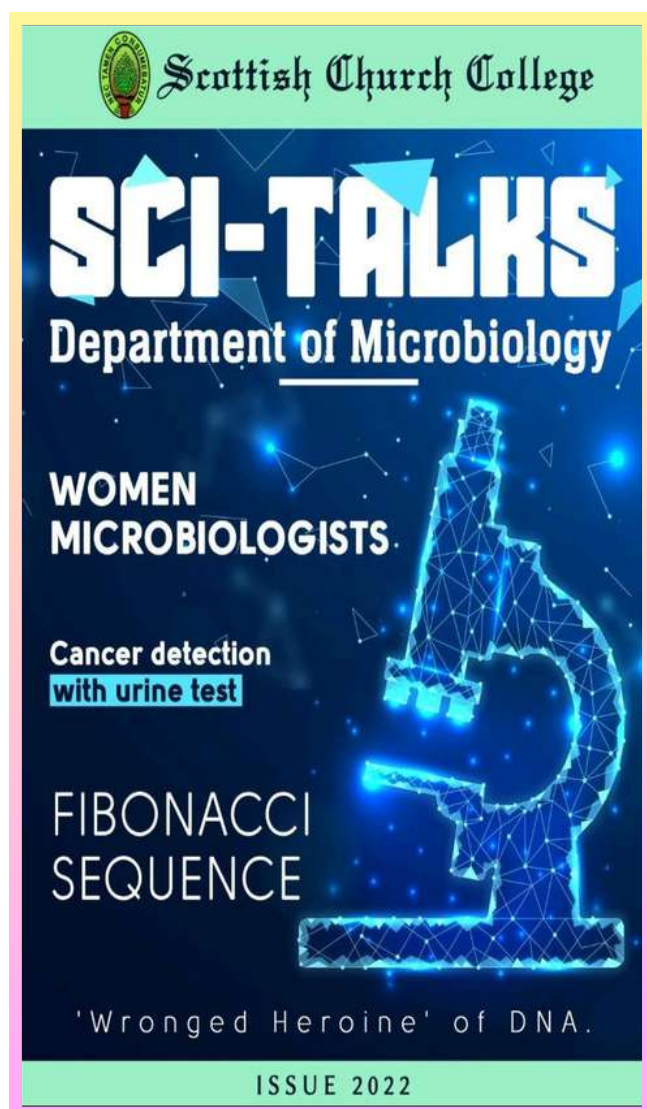
DEPARTMENTAL ACTIVITIES

NATIONAL SCIENCE DAY 2022

SCI- TALKS: Volume 1

28th February

Inauguration of the 1'st issue of the departmental Magazine, SCI-TALKS

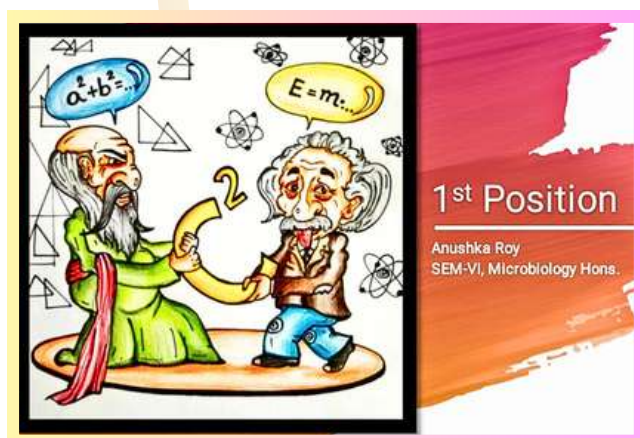


Science is believed to be the language of the few but this is a gross understatement, most people do not associate professionally with science but the impact of this minority is immense. After all quality triumphs over quantity but, to acknowledge science as a part of daily life and to integrate it inclusively for it to become the language of the masses; the National Science Day was conceptualised. Science is the art of logic and understanding and annually the 28th of February is marked to celebrate the discovery of the Raman effect by Indian physicist Sir C. V. Raman, for which he was awarded the Nobel Prize in Physics in 1930 by encouraging and celebrating all “science-loving” people. Our relation with science is very odd, it’s as if the subtitle to an Oscar-winning foreign movie, everyone loves to watch it but few are invested in it to read the subtitles and understand the subplots. But as the saying goes one doesn’t have to be a scientist to love science, you just have to be curious and creative enough. So, to make the subtitles clearer to more people for them to enjoy the movie in its subtleties the Department of Microbiology of Scottish Church College collaborated with National Environmental Science Academy (NESA) WB Chapter and the Nature Club of the college to celebrate the momentous day with events, competitions and the launch of a departmental e-magazine “Sci-Talks”



The event was graced by many eminent guests and distinguished members. Principal Dr. Madhumanjari Mandal, Vice-principal Dr. Supratim Das, and secretary Dr. Swapan Kumar Mukhuty of Scottish Church College addressed the online gathering after the Head of Department Prof. Richa Arora welcomed the attendees. The chief guest and judge of one of the events was Dr. Amit Krishna De, former executive secretary and adviser of Indian Science Congress Association and founder secretary of NESAs, WB Chapter, and was welcomed by Prof. Dr. Malabika Chakraborty. He enlightened the gathering with his words simultaneously encouraging and inspiring the many students attending the meeting remotely. The programme was graced by Dr. Rini Roy, assistant professor of microbiology of Bidhannagar College; Dr. Tanmay Rudra from SERI; Dr. Arnesha Guha from NESAs and academic president of SERI along with Dr. Sudip Barat from the department of Zoology, North Bengal University who addressed the meeting and conveyed their thoughts. The celebrations were also graced with the presence of Dr. Subhendu Bikash Patra, convener of NESAs WB Chapter; Dr. Krishnendu Das from NESAs; Prof. Dr. Minakshi De of Surendranath College, and many more.

The programme had a sci-toon competition which showcased many great artworks that were submitted on the topic 'science- my superpower' and the results were announced by IQAC Coordinator of Scottish Church College, Dr. Samrat Bhattacharya. An exciting extempore competition was held before the sci-toon competition and was participated by the students of the college. The students presented excellently on relevant topics as said by judges Dr. Rini Roy and the chief guest Dr. Amit Krishna De during the announcement of the results. The chief guest also took note that the magazine was entirely student made and coordinated, guided by the faculty members, and brought attention to the fact, that the magazine was beyond expectation with user-friendly interface, interesting design and anecdotes, fun facts and crosswords for making it appealing to the mass. The speakers were enthralled with the gusto of the participants and were especially encouraging with their kind words and appreciation for the organization and conduct of the programme. The events came to an end with the vote of thanks by Prof. Dr. Senjuti Halder. Even though the meeting was at its last lap the celebrations continued. The programme ended on a high note with a tad bit more appreciation of science in the minds of everyone.



WELCOME FRESHERS

26th March

A fresher's welcome programme for batch 2021- 2024 was organised by the department.



26th November

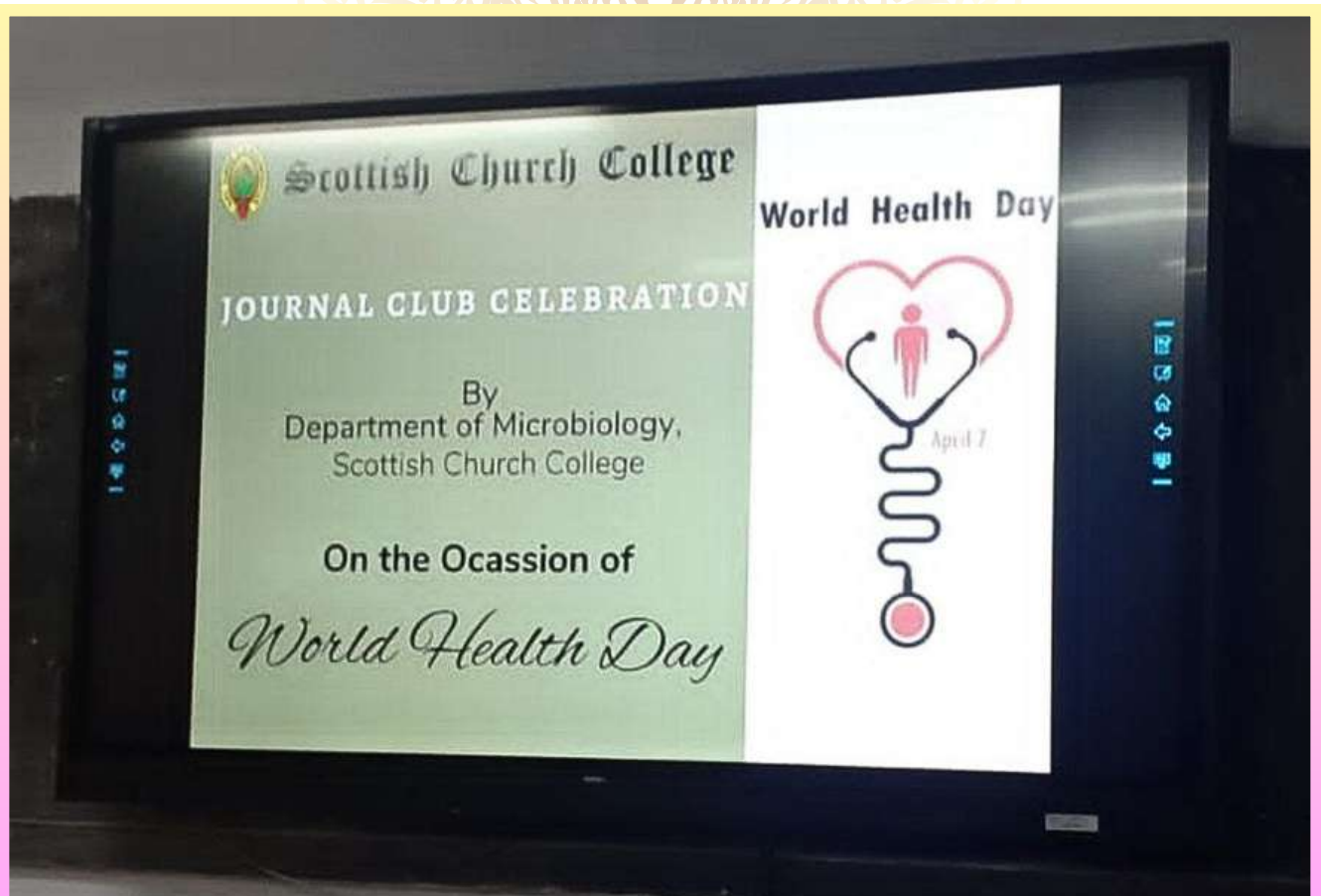
This was followed by another fresher's programme for batch 2022- 2025.



WORLD HEALTH DAY

7th April

The Journal Club of the department celebrated World Health Day where presentations were given by the students of Semester 4.



MICROBIOME FOOD FESTIVAL

8th April

Microbiome food festival was organised by the department in collaboration with Microbiologists Society, India.



INDUSTRIAL VISIT

DEPARTMENTAL EXCURSION: United Breweries, Kolkata

9th April and 30th April

Departmental excursion was organised for Semester 6 of batch 2019-2022. The students were separated in 2 batches, due to Covid restrictions.



DEPARTMENTAL EXCURSION: Yuksom Breweries, Sikkim

10th and 15th November

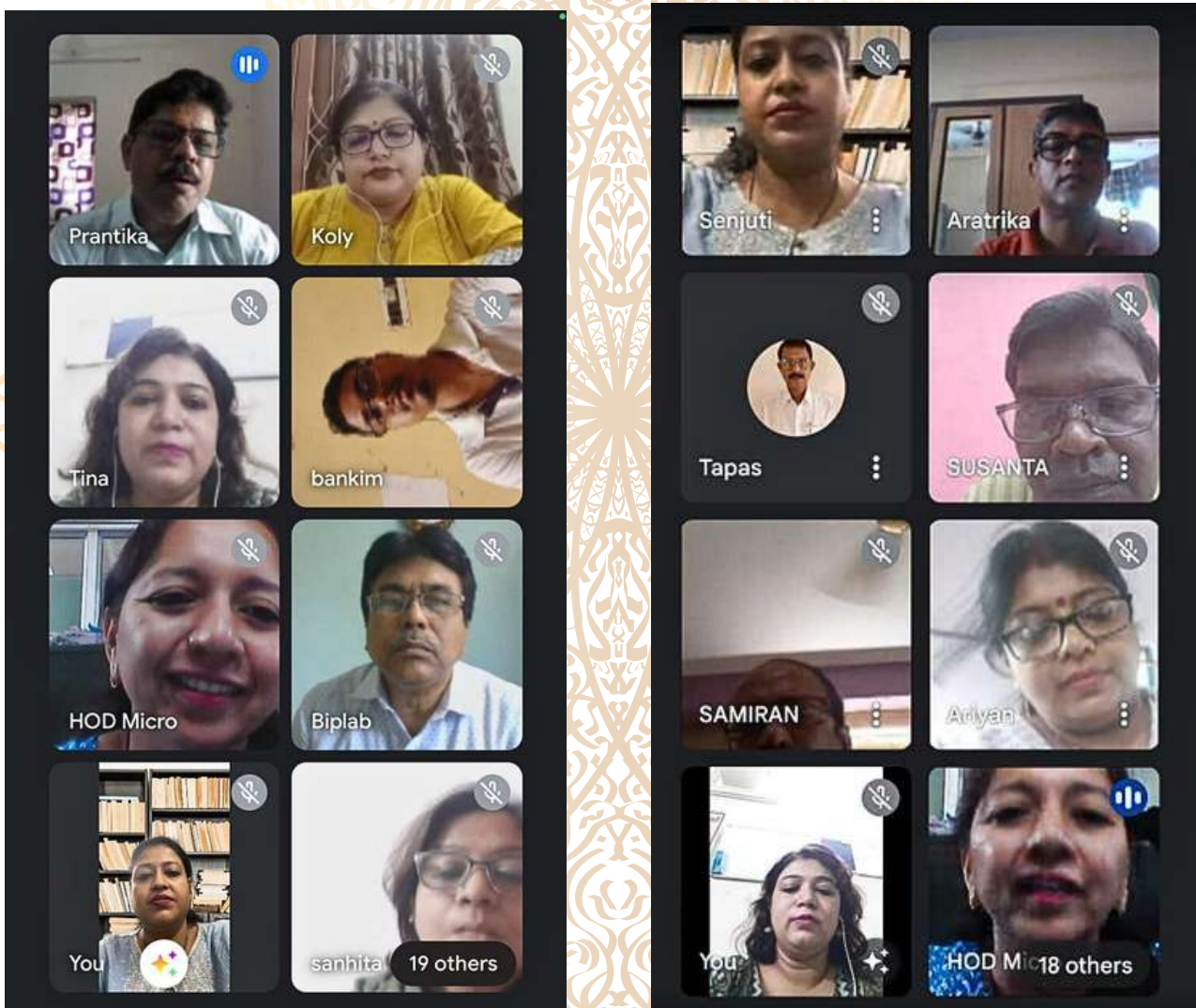
**Departmental excursion was organised for Semester 5 of batch
2020-2023.**



ONLINE PARENT-TEACHER'S MEETING

7th May

An online parent-teacher's meeting was conducted.



ADIÓS SENIORS

5th August

A farewell programme for Semester 6 of batch 2019 - 2022 was organised by the department .



HAPPY TEACHER'S DAY

6th September

Teacher's Day was celebrated in the Department by the students.



ORIENTATION PROGRAMME

27th September

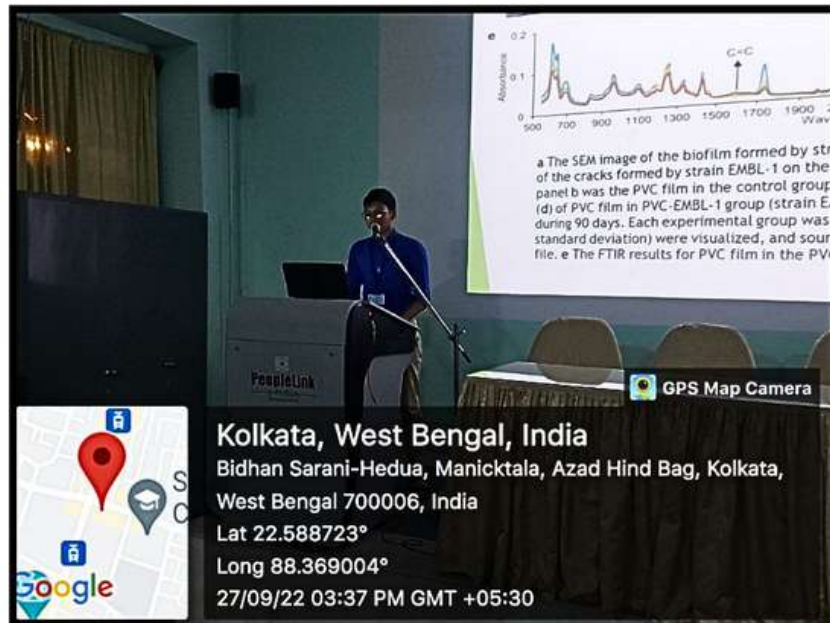
Orientation programme was organised for the students of Semester 1.



INTERNATIONAL MICROORGANISMS DAY

OBSERVED BY THE DEPARTMENT

27th September



Presentation was conducted by Rajdip Roy and
Anubhav Ghosh of Semester 3

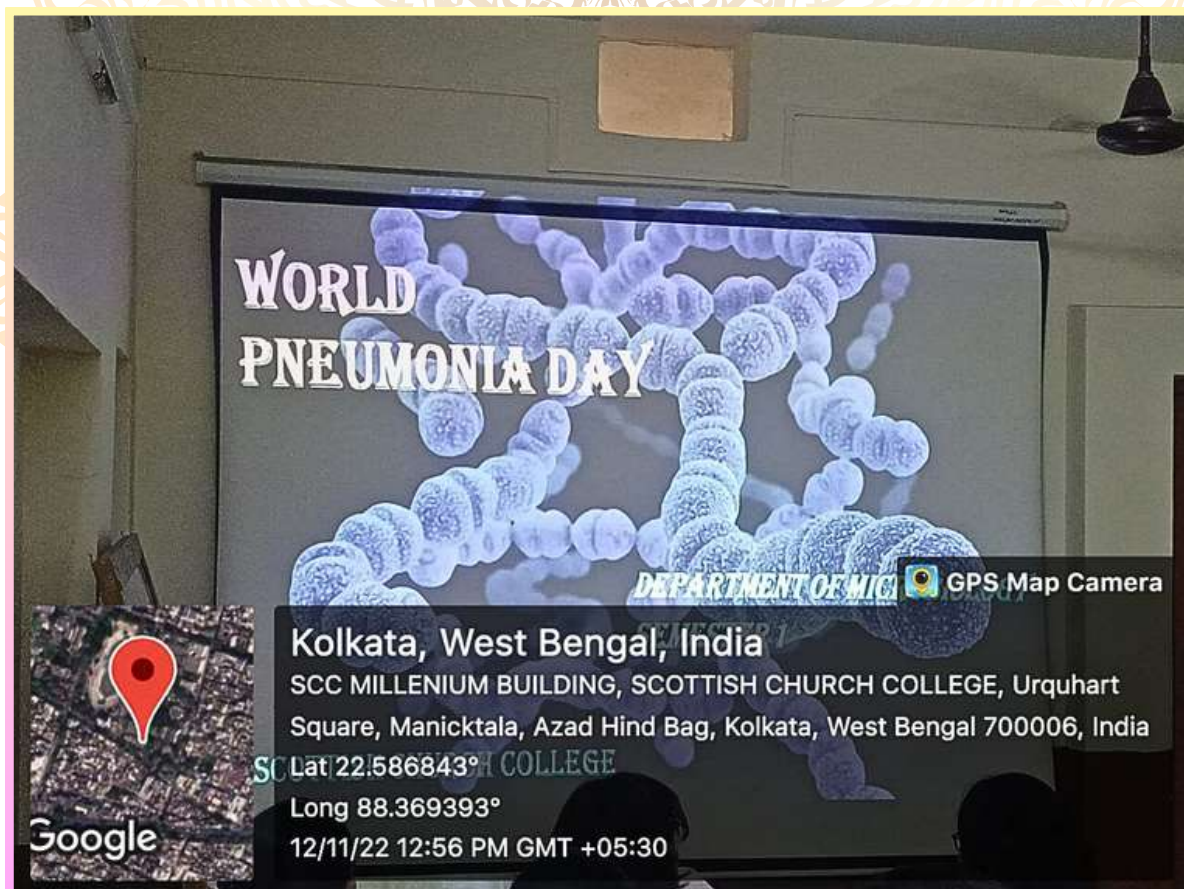


WORLD PNEUMONIA DAY

OBSERVED BY THE DEPARTMENT

12th November

World Pneumonia Day was observed by the department.
Presentation was conducted by Sonakshi Saha and Aparna Khanra of
Semester 1.



MODEL MAKING COMPETITION

Theme - Basic Aspects of Microbiology

28th November

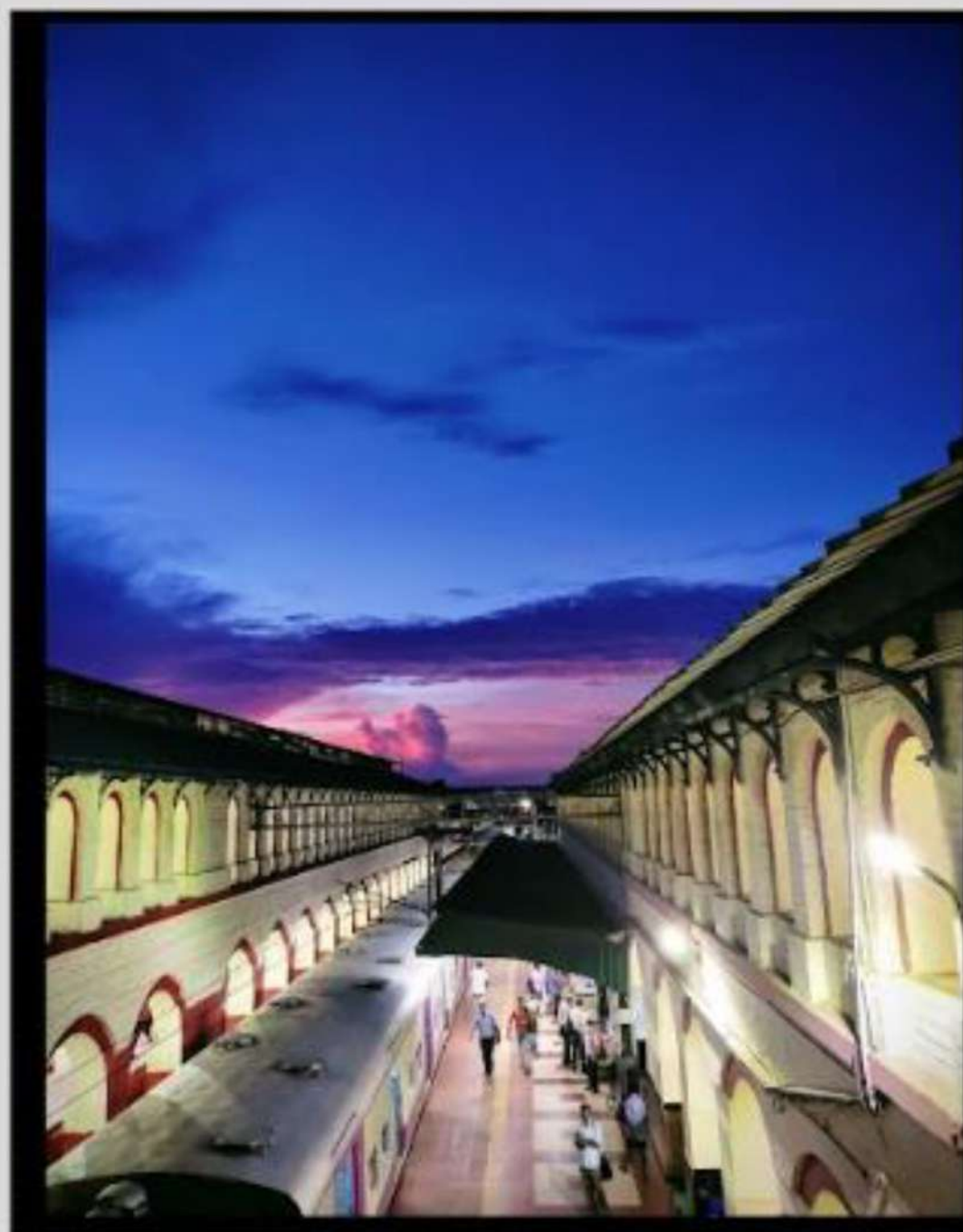
A model competition was organised by the department on the topic “Basic Aspects of Microbiology” in collaboration with Microbiologists Society, India. Prof. Dr. Dhrubajyoti Chattopadhyay, Vice Chancellor SNU and Dr. Swapna Mukherjee, State President MBSI graced the occasion and judged the competition.



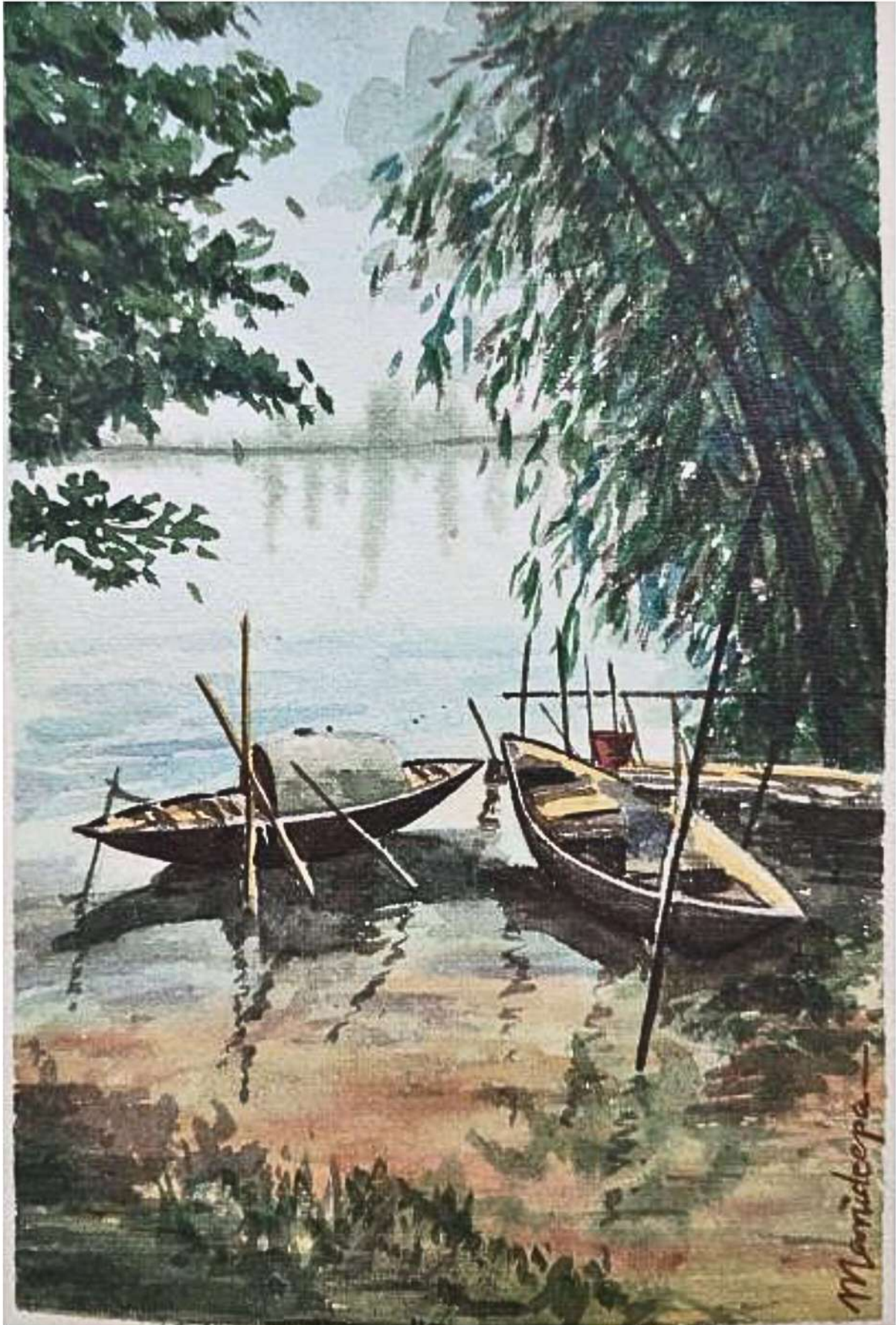


Through The lenses

• FOCAL POINT •



By: Teemothi Gayen (Sem-6)

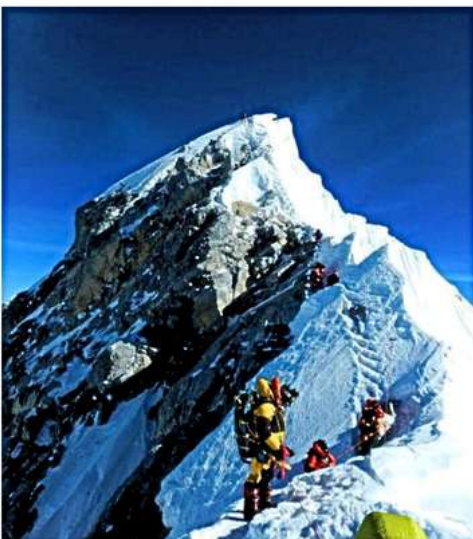


Manideepa Barua, 2nd Semester,
Microbiology Hons.

Microbiology
Antibiotic

MICROBIAL FOOTPRINTS ON THE MOUNT EVEREST

*Debasmita Choudhury,
6th Semester,
Microbiology Hons.*



“Even at thousands of meters high, germs are inescapable, according to new research at the University of Colorado Boulder.” — CTV News

In the past decades, scientists have been unable to identify and determine human-associated microorganisms from samples collected above 26,000 feet. A recent research at the University of Colorado, Boulder, published its findings in *Arctic, Antarctic and Alpine Research* — a journal on behalf of the Institute of Arctic and Alpine Research (INSTAAR) — and indicates that humans are leaving behind a settlement of robust microbes that can withstand harsh environmental conditions at elevations as high as Mount Everest and can lie dormant in the snow for centuries.

The study marks that with the rapid advancement of science, for the first time ever, next-generation gene sequencing technology has been put into application for analysis of the Everest soil, enabling scientists to gain insight into its microbial composition. The study not only highlights the covert impact of tourism on the world's highest peak but also could lead to discoveries about the environmental limits of life on Earth as well as the possibility of life on planets with a similar setting.

"There is a human signature frozen in the microbiome of Everest, even at that elevation", said Steve Schmidt, senior author on the paper and professor of ecology and evolutionary biology.

Although the researchers weren't really surprised to find microorganisms of human origin — since microbes are everywhere and could possibly be blown away by air over some distance shortly after someone had sneezed on a nearby camp! What stirred them, however, was the fact that if such is the case, the microbes that live in a warm, moist environment like the human nose and mouth were resilient enough to survive in subzero temperatures and other environmental extremes.

The team at CU Boulder analysed samples from Antarctica and Andes to the Himalayas and the high Arctic. Usually, human-associated microbes are not found in these places to the extent that they are found in the Everest samples. Based on the observations, Schmidt connected nature explorers who were headed to Everest and had set their final camp in South Col (7906 m) — a rocky dip between Mount Everest and its sister peak Lhotse. He asked them to collect samples, which they did and sent them back to Schmidt.

Graduate students in the team — Dragone and Solon — analysed these samples using modern and traditional techniques. Then, they carried out extensive bioinformatics analyses of the DNA sequences to determine the diversity of organisms rather than their abundances. They were able to find microbial DNA related to humans, like staphylococcus, which can cause staph infections and food poisoning. They also found streptococcus bacteria, which is often associated with strep throat. Most of the DNA sequences were similar to extremophiles previously detected in the Antarctica-Andes samples. Among fungi, the most abundant one was in the genus *Naganishia*, which can withstand extremes of cold and UV radiation.

Although this isn't the first time trails left by humans have made a mark on the highest peak, with the increase in tourism, the amount of trash left behind in the snow is also bound to increase. The researchers don't expect this microscopic impact on Everest to significantly affect the broader environment. But this study does imply the potential for life far beyond Earth, if one day humans step foot on Mars or beyond.

"We might find life on other planets and cold moons," Schmidt concludes, "We'll have to be careful to make sure we're not contaminating them with our own."



[Sources: ScienceDaily, CTV News, New York Post, InsideNoVa]



Through The lenses

• FOCAL POINT •



By- Ankit Majhi (Sem-6)

HOT TAKE

The Story of Henrietta Lacks—Immortal Legacy or Scientific Injustice?

Adil Hossain Warsi, 4th Semester, Microbiology Hons.

The field of science is no stranger to debates of ethics and morality, nor is it immune to condoning acts of injustice in the name of development and research. In this regard, the much-discussed story of Henrietta Lacks is a prominent example of the scientific community turning a blind eye to the injustices suffered by the less privileged for scientific progress.



In 1951, a young mother of five named Henrietta Lacks from Virginia, United States, visited The Johns Hopkins Hospital, Baltimore, complaining of vaginal bleeding. Upon examination, renowned gynecologist Dr. Howard Jones discovered a large, malignant tumor on her cervix. A sample of her tumor was taken without her knowledge or consent and used to create a cell line known as HeLa, which became one of the most important tools in medical research.

HeLa cells have been instrumental in numerous medical and scientific breakthroughs. HeLa cells were used by Jonas Salk to develop the first polio vaccine in 1955. HeLa cells are often used as a model for studying cancer, both in terms of understanding how cancer cells grow and in testing potential new treatments. HeLa cells have been used in numerous studies to map the human genome and understand the role of specific genes in disease. HeLa cells are widely used in drug discovery and testing, allowing researchers to screen potential drugs for effectiveness and toxicity.

The immortal cell lines are still extensively used in scientific research, but what of the very mortal woman whose cells have revolutionized the biomedical field? Lacks did not benefit from any of the treatments or cures that resulted from the use of her cells. Furthermore, Lacks' family had no knowledge of the use of her cells in medical research until over 20 years after her death, and even then, they were not consulted or compensated for their contribution to science. The exploitation of Lacks' cells and the lack of recognition and compensation for her family is an example of the utmost scientific injustice.

Scientific injustice refers to the exploitation or harm inflicted upon individuals, communities, or groups through the process of scientific research or the application of scientific knowledge. This can occur through the use of biased or discriminatory research practices, the withholding of information, or the failure to recognize and compensate those who have contributed to scientific advancements.

On October 4, the 70th anniversary of her death, Henrietta Lacks' family filed a federal lawsuit claiming unjust enrichment and non-consensual use of her cells and tissue samples.

The case of Henrietta Lacks highlights the importance of ethical considerations in scientific research, including informed consent, fair compensation, and equity in the distribution of benefits. It also underscores the need for greater attention to be paid to issues of justice and equality in science, in order to ensure that the advancements made through scientific research benefit all members of society.

References:

- <https://www.sciencedirect.com/science/article/abs/pii/S0167779922000695>
- <https://www.hopkinsmedicine.org/henrietalacks/upholding-the-highest-bioethical-standards>



Through The lenses

• FOCAL POINT •



By: Shreya Bera (Sem-2)

MICROBES CAN BE USED TO SOLVE CRIMES

Subhronil Adak, 2nd Semester, Microbiology Hons.

In the current scientific era, we can see that the importance of micro-organisms is proving to be inversely proportional to their size. New techniques and methods involving microbes prove to be better and just as scientifically sound as the previous ones used, like scientists have found that microbes can be used to solve a crime. For example, it might be hard to catch a sex offender using DNA if the offender used a condom. However, bacteria found in pubic hair could be used to identify such suspects.

Solving crimes by analysing fingerprints or DNA is now standard practice. A new study, however, tests the feasibility of tracing a criminal using the microbes they left at the crime scene. DNA profiles of the bacteria that live on the pubic hair could identify rapists, according to preliminary research.

The first study published in the journal **INVESTIGATIVE GENETICS**, that individuals have a unique profile of bacteria on their pubic hair.

We all know that hairs are commonly found at crime scenes but in most cases, they do not provide human DNA unless they are forcibly removed, leaving some parts of their roots attached. Thus, it becomes quite difficult for identifying individuals only on the basis of hair samples collected at the crime scene.

They did their examination and concluded that scalp hair samples had many common environmental microbes but the pubic hair samples were much more specific to individuals. This suggested that microbial communities in pubic hair may be useful as 'microbial signatures' to identify individuals.

The bacterial profiles were also able to identify whether the individual was male or female. For example, females had *Lactobacillus* and *Gardnerella* species of bacteria whereas these bacteria did not normally occur in the males. Males generally showed presence of species of *Corynebacterium*.

Without hair being transferred DNA from the microbes on pubic hair can be transferred during sexual activity. If future research supports these findings, it may be possible to check for the transfer of bacteria between victims and suspects in rape cases.

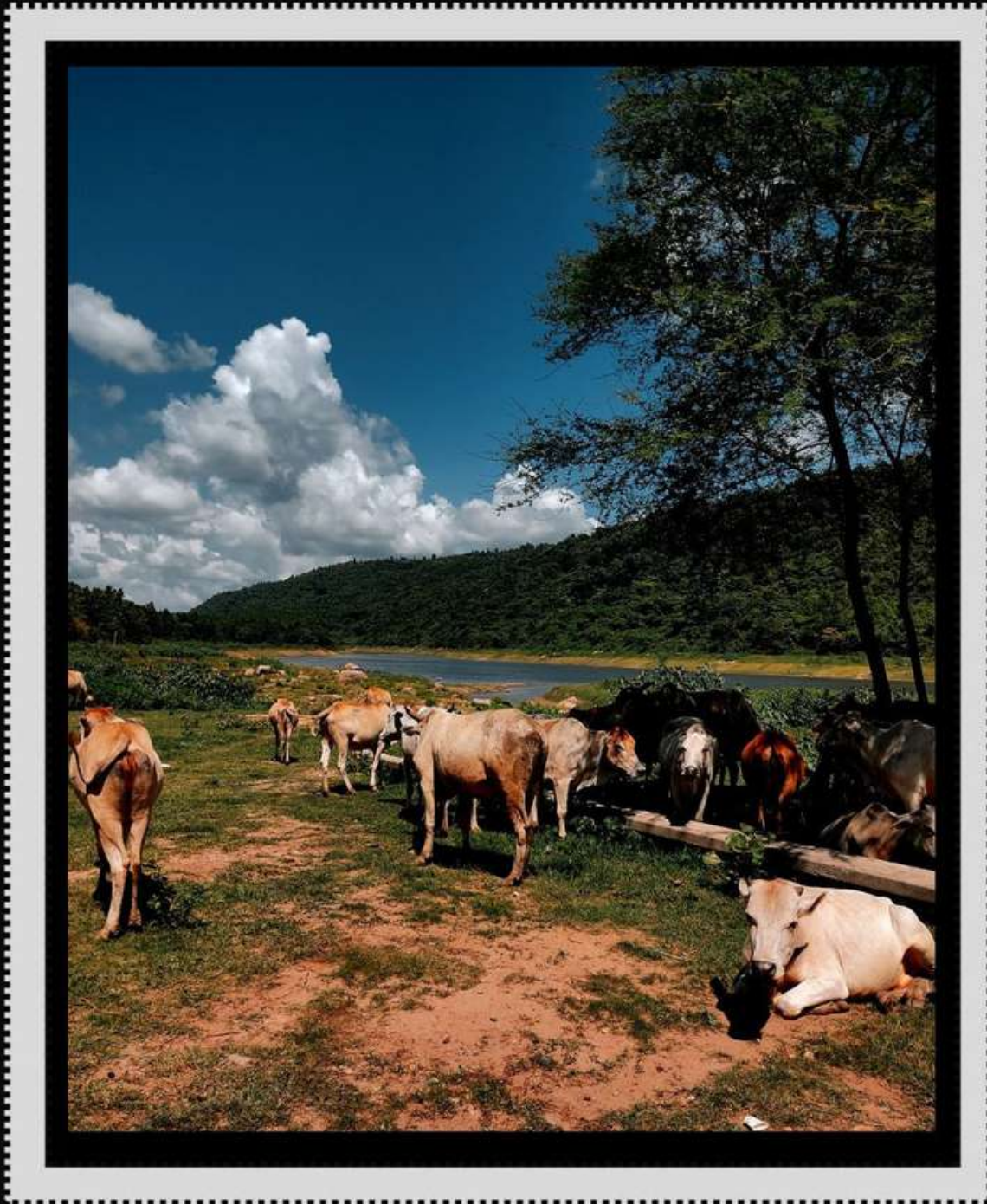
We can actually swab the victim's genital area and the suspect's genital area and see if the bacteria's transferred or not. We may cut the pubic hairs and extract the DNA from them for better results and identification of the criminal.

So, it very well may be some time before a criminal's microbial load commits them to jail. Be that as it may, the potential for it to be utilized in this manner appears to be captivating. More work is sure to follow. As you read this, the no. of microbes inside of you and on your skin roughly equals the number of cells in your body. In some ways, we are as much microbe as we are human.



Through The lenses

• FOCAL POINT •



By: Pritha Saha (Sem-1)

Taking Care of Skin Microbiota

Priya Das, 6th Semester,
Microbiology Hons.

The skin is the largest organ and the outer most interface between the human body and its environment.

Many regional differences overlap the skin topography. For instance, temperature and humidity are higher at vaulted sites, such as the groin or armpit (approx. 37degree Celsius) and lower at body extremities such as fingers and toes (approx. 30 degree Celsius)

Sebaceous gland density is an important variable factor involved in the secretion of many lipidic compounds, including fatty acids that contribute to acidification of skin pH which varies between 4.2 and 7.9 depending on the site of measurement.

These characteristics induce many possibilities for creating different ecological niches housing numerous bacteria, fungi, virus, archaea also mites. Some of them are harmful parasite, some of them are benefitting for skin health and others are commensal.

Gender, lifestyle, hygiene, cosmetics, oral medications, climate, age etc are the factors that helps to differ microbial population of skin from one individual to another.

Due to pollution, stress, unhealthy lifestyle and food habit skin may react detrimentally and fasten the aging process. A study showed that the use of makeup, including foundation and powder significantly increased community diversity on the forehead skin.

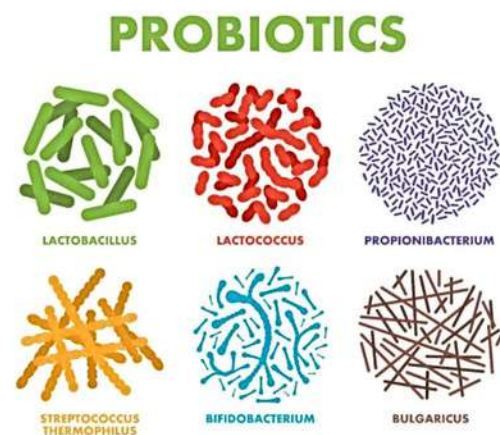
The beneficial effects of some cosmetic compounds, such as preservatives against the growth and biofilm formation of cutaneous *S. aureus* or pathogenic *C. acnes* have been described. These chemical compounds are also involved in the inhibition of commensal bacterial survival.

A compromised skin barrier may cause rosacea, eczema or acne break outs. In this case a good microbiome of probiotic bacteria repairs skin health, reduces inflammation, maintains the pH level of skin and prevent the growth of harmful bacteria.

Since probiotics contribute to a healthy balanced microbiome on skin, they also work to help minimize visual shiness of age, namely fine lines and wrinkles and overall improving elasticity of skin. That's why probiotic skin cares are a hype these days.

Incorporating live probiotic cells in a cosmetic product is somewhat impossible and lysates used in probiotic skincare range are not as much of benefitting.

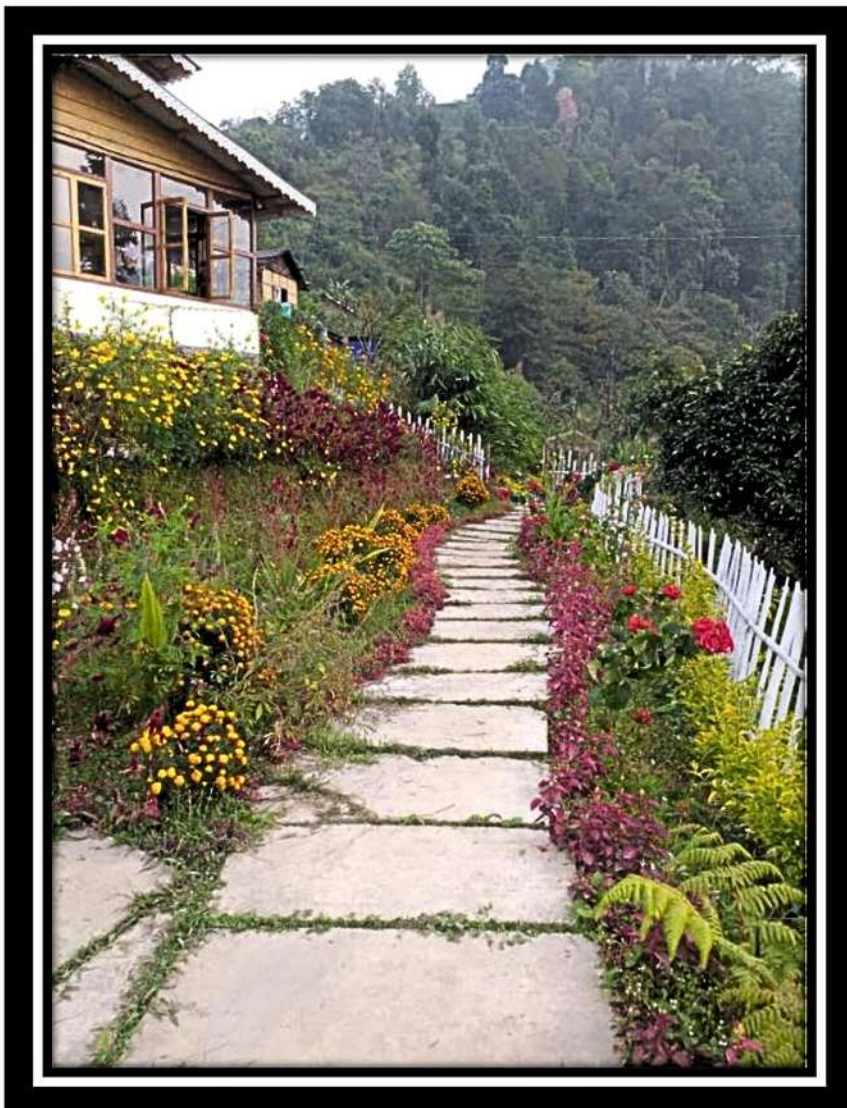
Instead, a promoting ground for probiotics on skin, using active ingredients such as: alpha hydroxy acids, niacinamide (Vit B3), hyaluronic acid etc is much more beneficial.



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-
1. “Photography takes an instant out of time, altering life by holding it still.”
– Dorothea Lange



Aishy Dutt
4th Semester, Microbiology Hons.

NATURE

AND MICROBES

— *a surprising duo*

Ever since the time of creation, Nature has been full of surprises- some good and some dreadful. One of them is being the habitat for life forms- plants, animals, humans and microbes. The most interesting among them is the interaction of microbes and nature and its existence on the earth in different forms. Here are a few examples of such interactions.

1. Fungal Garden of Insects

Leaf cutter ants like *Atta colombica* collect and carry leaves which is used to build their colony and feed the fungus garden, above the colony which usually appears as a white mat. The queen ant carries a small Fungal inoculum in the back of her mouth. At an appropriate place, she inoculates it over a plant material. After that, the fungus grows and the ant lays egg over it. The fungus provides essential amino acids and proteins to the ant and the ants in turn provide them with an appropriate environment to grow.



Some ants farm fungus as a source of food



Termites have protozoa in their gut that digest cellulose

2. Protozoan-Termite relationship

This is the earliest example of a 'mutualistic' relationship between protozoa and bacteria. Flagellated protozoa live in the gut of termites (those who ingest wood). The termites cannot digest cellulose on their own and hence the endosymbiont protozoa living in its hind-gut digest the cellulose which releases the nutrients for the termite as well as for themselves. The termite in turn provides anaerobic conditions for the protozoa for its metabolism.

3. Reef building Corals

Reef building corals contain endosymbiotic algae, dinoflagellates called Zooxanthellae. These stony corals are similar to sea anemones but have smaller coral polyps. The symbiotic algae with the coral stimulate calcification through CO₂ fixation and hence supplies the host with O₂, CO₂ and nitrogen compounds. The pigments produced by corals protect both the algae and its host from U.V. The algae Zooxanthellae also give the reef building corals its striking colour, as seen in the picture.



Coral and algae share a symbiotic relationship in reefs

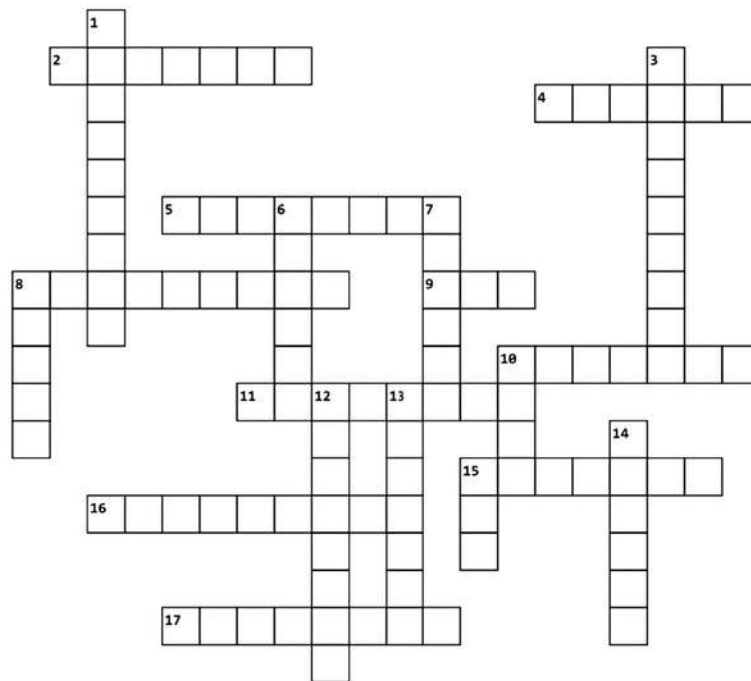
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Atreyee Sarkar, 4th Semester, Microbiology Hons.

CROSSWORD



ACROSS

2. Plasmids with cos sites
4. Frozen carbon dioxide
5. The first micro-organism that can survive on a diet of virus only
8. Electricity producing bacteria
9. Genes in ColE1 plasmid that protect the bacteria from its own toxin
10. An approximate number of non-radioactive elements that can be found in a smartphone
11. The common name of cephalalgia
15. Mammals that build dams across rivers using stones and branches
16. A handheld microscope made using paper; costs about a dollar only
17. A ketone pentose

DOWN

1. A pox-like disease that was declared a global emergency last year
3. Used to stain proteins separated in thin layer chromatography
6. Vector of sleeping sickness is ____ fly. FITB.
7. pH of media on which fungi grows
8. A supercooled liquid
10. Sequence of development stages in an ecological community
12. Lightest solids ever made; very heat resistant
13. The NASA project that plans to send man to the moon again
14. Liquid form of this gas can defy gravity and move upwards
15. A computer term that was coined because a moth got stuck in the CPU



Through The lenses

• FOCAL POINT •



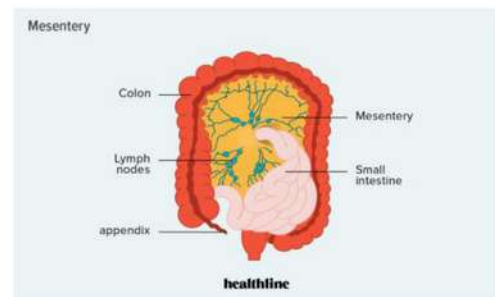
By: Meheli Roy
(Sem-4)

MESENTERY

— *the 79th organ of the human body*

The word “mesentery” is derived from ancient Greek, meaning “mid-intestine” or “midgut”. First identified by J. Calvin Coffey, a professor at the University of Limerick, in 2017, the mesentery is now officially the human body’s 79th organ. Mesentery is a double fold in the peritoneum (lining of the abdominal cavity) that attaches the intestines to the abdominal wall. It was originally thought to be a fragmented structure which was part of the digestive system. In 2012, microscopic and electron microscopic examinations showed the mesentery to be a single structure. Thus, mesentery is an internal organ.

*Aishy Dutt
4th Semester
Microbiology Hons.*



The discovery of this organ and further research into its anatomy, structure, functions, and diseases put together, creates the basis for a whole new area of science – mesenteric science.

This organ was first described by the Italian polymath Leonardo di Vinci in 1508, but had been ignored throughout the centuries, until now. The first illustrations of the structure by Vinci indicated its continuity as a single membrane. Famed Austrian anatomist Carl Toldt described the persistence of all portions of the mesocolon into adulthood in 1879. His findings were however, largely ignored in favour of British surgeon Sir Frederick Treves in 1885, accurately depicted a mesentery that was associated with the ascending and descending colon. In 2018, a research team led by colorectal surgeon J. Coffey is said to have given ***“sufficient evidence to support the reclassification of the mesentery as an organ. The research conducted contradicts hundreds of years of gastrointestinal anatomy literature. It states that the mesentery is made up of several independent, fractured structures.”*** He has seen the mesentery to be harmonious and continuous, reaching from the duodenum to the rectum.

The discovery of mesenterium did not go unnoticed as Gray's Anatomy, the world-renowned medical textbook, sites like Encyclopaedia, Britannica, Wikipedia incorporated this organ. The organ made its way into the Guinness Book of World Records and the evidence for the organ's reclassification is now published in the Lancet Gastroenterology and Hepatology.

The mesentery has many important functions – both anatomical and physiological. It is thought to play a role in the intestine's immune response as well as gastrointestinal diseases. It contains the blood supply and lymphatic system of the intestine, and it is an integral part of the portal system. It holds the intestines in place and ensures that they do not collapse while standing so that no disruption causes motility inside the intestines.

It takes the help of nodes to monitor the environment within the intestines, responding to cues and triggering local and systemic immune responses. It regulates inflammation, blood clots (systemic fibrinolysis) and coagulation pathways. Clinicians have discovered conditions such as malrotation and Crohn's Disease (CD). In CD, the mesentery is frequently thickened, rendering haemostasis (keep blood within a damaged blood vessel) challenging. It involves fat wrapping as well - extension of mesenteric fat over the circumference of gastrointestinal tract, and this may indicate increased mesothelial plasticity. Thrombosis, or blocking of veins and arteries by blot clots, of the superior mesenteric vein can cause mesenteric ischemia, also known as ischemic bowel.

Medical students and researchers are repeatedly investigating deeper into what role the mesentery might play in abdominal diseases. In an embryological study, all abdominal digestive organs – liver, spleen, the pancreas and the intestine develop either in or in contact with the mesentery. They have also found a connection between the gut, the mesentery, and the brain. This discovery has exciting and widespread implications for gastrointestinal research, treatment, and patient outcomes. It holds a great impact on surgical procedures, most notably by reducing blood loss in abdominal surgery, making them safer.

In addition, having a newfound clarity of the structure of the mesentery allows advances in the potential development of treatments for associated diseases. This discovery has paved the way for new research into the mechanisms and treatments of common gastrointestinal diseases, diverticulosis, and colorectal cancer. Clarification of the radiological appearance of the human mesentery enables a clearer conceptualization of mesenteric derangements. This is of immediate relevance in the spread of cancer like colon cancer. As more understanding is gained on mesentery, it has led to less invasive surgeries which reduce complications but also accelerate the recovery period and even reduce costs. Total or complete mesocolic excision (CME) uses planar surgery and extensive mesenterectomy to minimise rupture of the mesentery and maximise lymph nodes yield. Application of this T/CME reduces local five-year recurrence rates in colon cancer from 6.5% to 3.6%, while cancer-related five-year survival rates in patients eradicated for cure increased from 82.1% to 89.1%.

Thus, to conclude, the discovery of the 79th organ of the body has opened up a vast scope for research and set up a whole new branch of science. Something which has been unknown for centuries has now become one of the greatest discoveries of the 21st century!

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*Ankit Majhi, 6th Semester,
Microbiology Hons*

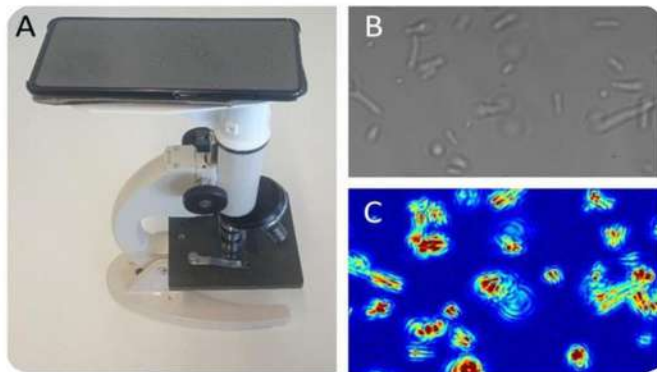
Optical Nanomotion Method for Antibiotic Susceptibility Testing

Tiyasa Das, 6th Semester, Microbiology
Hons.

Antibiotic Resistance continues to be a major threat to global public health. Antibiotic resistance is a phenomenon where the bacteria evolve over time to resist the effect of the drugs that were designed to kill them. Just in 2019, 1.27 million deaths were attributed to antibiotic resistance, as reported by *The Lancet*. An effective way to limit the spread of the resistant bacteria consists of detecting the most effective drug. Antibiotic sensitivity testing (AST) is a method that uses culture methods that expose bacteria to antibiotics. Unfortunately, typical ASTs take up to 24 hours or longer – a time frame that can mean life or death in a clinical setting.

Now, researchers led by Dr. Sandor Kasas at École polytechnique fédérale de Lausanne (EPFL) and Professor Ronnie Willaert at Vrije Universiteit Brussel have developed a fast, cheap, and widely accessible method based on optical microscopy that performs an AST with single-cell sensitivity. The joint research project published in PNAS describes that the technique uses a basic and conventional optical microscope, a camera or a mobile phone, and a dedicated software.

“We have developed a technique in our laboratories that allows us to obtain an antibiogram within 2-4 hours – instead of the current 24 hours for the most common germs and one month for tuberculosis.”, said Dr. Sandor Kasas, EPFL.



The pictures indicate:

a. Setup to conduct Optical Nanomotion Detection based antibiotic susceptibility test: a low cost optical microscope and a mobile phone are enough.

b. Optical image of *E. coli* bacteria.

c. Same field of view as B in false colors that highlight bacterial displacements, red: high amplitude motion, blue: no displacement.

This technique is known as Optical Nanomotion Detection (ONMD). It oversees the monitoring of nanoscale vibrations of a single bacterium before and while being exposed to antibiotics. ONMD monitors the microscopic oscillations of bacterial cells (nanomotion) that are important to living organisms and can be considered as a “signature of life.” Nanomotion lasts so long as the organism is alive but halts immediately when it is dead. Here, bacterial nanomotion is recorded. We see all individual cell displacements are monitored and displayed as a movie. The monitoring is done via a basic optical microscope, a video camera or a mobile phone.

The procedure entails placing a 0.6-1 μL droplet of the bacteria solution in the microfluidic analysis chamber, that is eventually placed under a traditional optical microscope. The organisms are observed with the optical microscope and movies of about 10 seconds are recorded (30 fps). A homemade MATLAB software detects every single-cell displacement during 200 frames and analyses the distance travelled by the cells. The pixels that change the most appear in red, while the ones that change the least appear in blue.

The use of ONMD was successful in detecting the sensitivity of numerous bacteria to the respective antibiotics. *Escherichia coli*, *Staphylococcus aureus*, *Lactobacillus rhamnosus*, and *Mycobacterium smegmatis* are sensitive to the antibiotics ampicillin, streptomycin, doxycycline, and vancomycin. This was determined in less than two hours. The ONMD not only monitored the life and death transitions but also detected the changes in bacterial metabolism due to exposure to antibiotics.

The authors state, "***The simplicity and efficiency of the method make it a game-changer in the field of AST***".

Indeed, this is a huge step forward towards the development of new antibiotics against the ever emerging drug-resistant bacteria. The simplicity of the method makes it widely accessible and easily implemented and might see wider applications in the days to come.

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[Testing antibiotic resistance with a fast, cheap and easy method \(phys.org\)](#)

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Through The lenses

• FOCAL POINT •



By: Soumili Kanji (Sem-2)

Vancomycin Resistant Enterococci

Threat of Drug Resistance

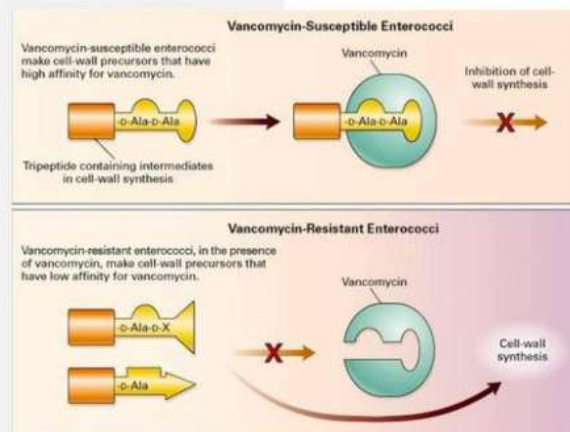
Anish Kumar Dawn
6th SEM
Microbiology Hons.

It becomes a threat to human beings that bacteria and other microorganisms have shown a great ability to develop resistance to virtually every antimicrobial agent used for therapeutic purposes. Two factors might have played a role in the prevalence of vancomycin-resistant enterococci, and these are:

1. Enterococci are a part of normal gut flora.
2. Increase in the use of vancomycin for the treatment of documented or presumed *Clostridium difficile* enterocolitis.

Enterococcal infection: About 90% of enterococci infections in humans are caused by *Enterococcus faecalis*; another 5%–10% are caused by *E. faecium*. *E. faecium*, being resistant to antimicrobials, can cause nosocomial infections as well. The most frequent infection caused by *Enterococci* is a urinary tract infection. The other infections are intra-abdominal and pelvic sepsis, surgical wound infections, bacteremia, etc. Enterococcal endocarditis is relatively rare.

Treating the infections caused by Vancomycin-resistant *Enterococci*: The infections mainly caused by Vancomycin-resistant *Enterococci* are hospital-associated severe infections, urinary tract diseases, etc. Asymptomatic carriers of the disease can also be found. Most isolates of enterococci, whether vancomycin-resistant or not, remain susceptible to nitrofurantoin. It is successfully used to treat UTIs. Because resistance to penicillin and ampicillin is currently not frequent in strains of *E. faecalis*, these agents can be used to treat most strains of vancomycin-resistant *E. faecalis*.



Antimicrobial resistance in *Enterococci*:

All enterococci are resistant to many of the antimicrobial agents, such as penicillin, cephalosporins, and carbapenems (where they show a low level of resistance). Recent years have observed an increase in penicillin and ampicillin resistance in *E. faecium* strains. Because of these circumstances, vancomycin was the 'last hope' to treat multi-drug-resistant *Enterococci*.

The threat actually lies in the transfer of resistance genes to other more pathogenic gram-negative bacteria. The vancomycin resistance phenomenon can be transferred from enterococci to *S. aureus*, *Listeria* sp., streptococci, etc. *Streptococcus bovis* can harbour the Van B resistance phenotype. This is a great concern for microbiologists to fight against these bacteria, as the phenomenon of vancomycin resistance can spread worldwide.

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“Nature is the source of all true knowledge.”

—Leonardo da Vinci



Lisa Das, 2nd Semester, Microbiology Hons.

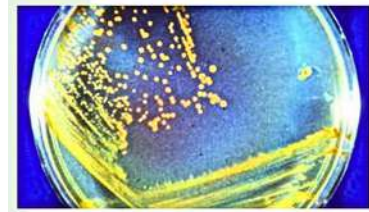
Aishi Bhattacharyya, 4th Semester, Microbiology Hons



To travel, to experience and
learn: that is to live.
— Tenzing Norgay

DO MICROBES LIVE ON MARS

Anushka Adak, 4th Semester, Microbiology Hons.



*Deinococcus
radiodurans*

Can there ever be life outside of the world?

Was Mars once a planet with life? Future: Will there ever be life on Mars? These are a few of the questions that researchers have been working to resolve for a while. However, no proof has yet been discovered that would persuade even a substantial portion of the scientific community that life has ever existed on the red planet. However, the data does suggest that Mars was once a habitable planet.



There is no question that the area was once submerged in water according to the discoveries made by NASA's Opportunity rover at Eagle Crater earlier this year. However, there was liquid water on the Martian surface, which suggests that there may have been living things there. With an average temperature of -62 degrees Celsius, the red planet today is more akin to a frozen desert. And because Mars' atmosphere is so thin, radiation is another persistent danger.

The discovery of orbiter photos displaying geologically recent erosion channels on the slopes of Martian craters in June 2000 gave rise to further speculation that there is current life on Mars. The evidence points to the possibility of liquid water in Mars' nearby geological formations. The limits of microbial life's ability to survive when subjected to ionising radiation, such as those found on Mars, have been established by researchers. The team then introduced six different kinds of Earth-based bacteria and fungi to a model Martian surface ecosystem. *Deinococcus radiodurans* emerged as the winner without a doubt. The hardy bacteria, known as "Conan the Bacterium" because of this, appeared to be ideal for life on Mars. The bacteria is polyextremophile, which means it can withstand extreme temperatures, acidity, and dehydration. One of the most radiation-resistant species known to science is the hardy bacterium. The bacteria could endure 1.2 million years just below Mars' surface in the arid radiation and dry, icy climate, outlasting some other known microbes known to survive on Earth for millions of years. According to the latest research, Conan the Bacterium could withstand radiation exposure of 140,000 units when it was frozen, dried, and buried beneath the Martian surface. This is 28,000 times more radiation exposure than is necessary to kill a human.

The genomic organisation of Conan the Bacterium connects chromosomes and plasmids, allowing the cells to maintain their alignment and recover from radiation damage.

According to study author Michael Daly, a professor of pathology at Uniformed Services University of the Health Sciences,

"Although *D. radiodurans* buried in the Martian subsurface could not survive dormant for the estimated 2 to 2.5 billion years since flowing water disappeared on Mars, such Martian environments are regularly altered and melted by meteorite impacts."

Multiple missions to Mars will be launched as part of the NASA and European Space Agency's Mars Sample Return programme to collect and return samples that the Perseverance rover collected. The Jezero Crater on Mars is the location of an old lake and river delta, and the rover team is hoping to learn whether life has ever existed there from the rock and soil samples collected there. Even micro-fossils of prehistoric microbial life may be present in the samples. A group of researchers from NASA's Johnson Space Flight Centre, led by David McKay, reported in 1996 that they had found proof of microscopic fossil life in a meteorite from Mars. When an asteroid or comet struck Mars 16 million years ago, it created a crater that allowed the meteorite to escape. The 2-kilogram piece of Martian rock continued to orbit the Sun in an elliptical path until it was captured by the Earth around 13,000 years ago. When a meteorite-hunting crew discovered it in the Allan Hills in 1984, it had been in glacial Antarctica since its landing. The sample was assigned the number ALH84001. Nobody initially thought it might have come from Mars. Ten years later, when scientists looked at ALH84001 more closely, they discovered that it was one of the so-called SNC meteorites, which are believed to have originated on Mars and not an ordinary meteorite. This type of meteorites all have minute amounts of gas that closely resembles the Martian atmosphere. ALH84001 was more than 4 billion years old and had probably lived when liquid water, a need for life, was frequently found on the surface of Mars. Because of this, McKay and his team were interested in ALH84001 because they believed that the rock might contain microscopic and molecular proof of past Martian life.

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Ancient microbes may have survived below Mars' surface | CNN
Evidence for Microbial Life on Mars: Fossilized Bacteria? | AMNH



Through The lenses

• FOCAL POINT •



By: Debapriya Chattopadhyay (Sem-2)



SPICINESS AND FUNGUS

Abhishikta Chanda, *4th Semester, Microbiology Hons*

What if it were claimed that the spice in chilli peppers originated to protect the plant against fungal predators rather than to entice hungry diners?

Like many fruits, peppers are colourful, delicious, and appetizing in order to draw insects that aid in pollinating the seeds. Fruits entice insects that are good for the plant's existence, but they also draw seed-destroying consumers. Fruit chemistry therefore balances precariously. Predators must be deterred by the compounds the fruit produces, yet seed dispersers must not be adversely affected. In the case of the pepper plant, certain plants evolved capsaicinoids to fend off fungus predators. Capsaicin is the most widely used capsaicinoid. There are various concentrations of this hot substance in pepper plants.

We've observed that different peppers of the same sort from the grocery store have varying levels of heat. It makes sense that there would be variations in spice levels in nature. For instance, the amount of capsaicin produced by the *Capsicum chacoense* species of pepper, which are found in south-eastern Bolivia, varies widely.

This mutation has a connection to the fungi that can harm seedlings. The likelihood of the seeds surviving decreases with the severity of the infection. Nearly the majority of Bolivia's *Capsicum chacoense* plants are hot in the southwest corner of the country. The plant population grows milder the further north or east you go, until more than 70% of plants stop producing capsaicinoids. Capsaicinoid concentrations from the 30% of plants that do generate it are less than a third of those from the population of entirely spicy plants.

It's not quite as simple as more fungus, more spice when it comes to the link between spices and fungi. The foraging insects that bite the pepper and provide the fungus with a direct route to the fruit and seeds are the ones that cause fungal infection. Fruit that had not been damaged by insects exhibited no symptoms of a fungus infection, and the quantity of foraging scars was linked with the severity of the infection. Plants are more vulnerable to fungus infection in places with higher insect populations. These were often plants of the hot kind. These hottest peppers suffered more bug bites than the other parts of the Bolivian population of *Capsicum chacoense*.

Both spicy and non-spicy peppers had an increase in fungal infection of seeds as the number of foraging scars rose, but the rise in infection was almost twice as great in non-spicy peppers. The amount of fungus in hot peppers is roughly half that in mild peppers. When the fungus was tested in the lab with various capsaicin doses, there was a dose-dependent reduction of fungal growth. Fewer fungi grew when there was more capsaicin in the growing medium. Combining fungal and insect predation led to the creation of hot peppers. We humans can credit these combined forces for giving our food some spiciness.

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The spice keeps the fungi away



Science stories of Kolkata

Abhishikta Chanda, 4th Semester, Microbiology Hons.



Recently, a travelling exhibition was organised in Kolkata, by a joint initiative of Goethe Institute, Max Muller Bhavan and Indian Museum. This aims to locate the position of humankind through water, soil, plant, rocks and weather. This exhibition was conceptualised by Bruno Latour, a professor of sciences, and Peter Weibel, an artist and curator.

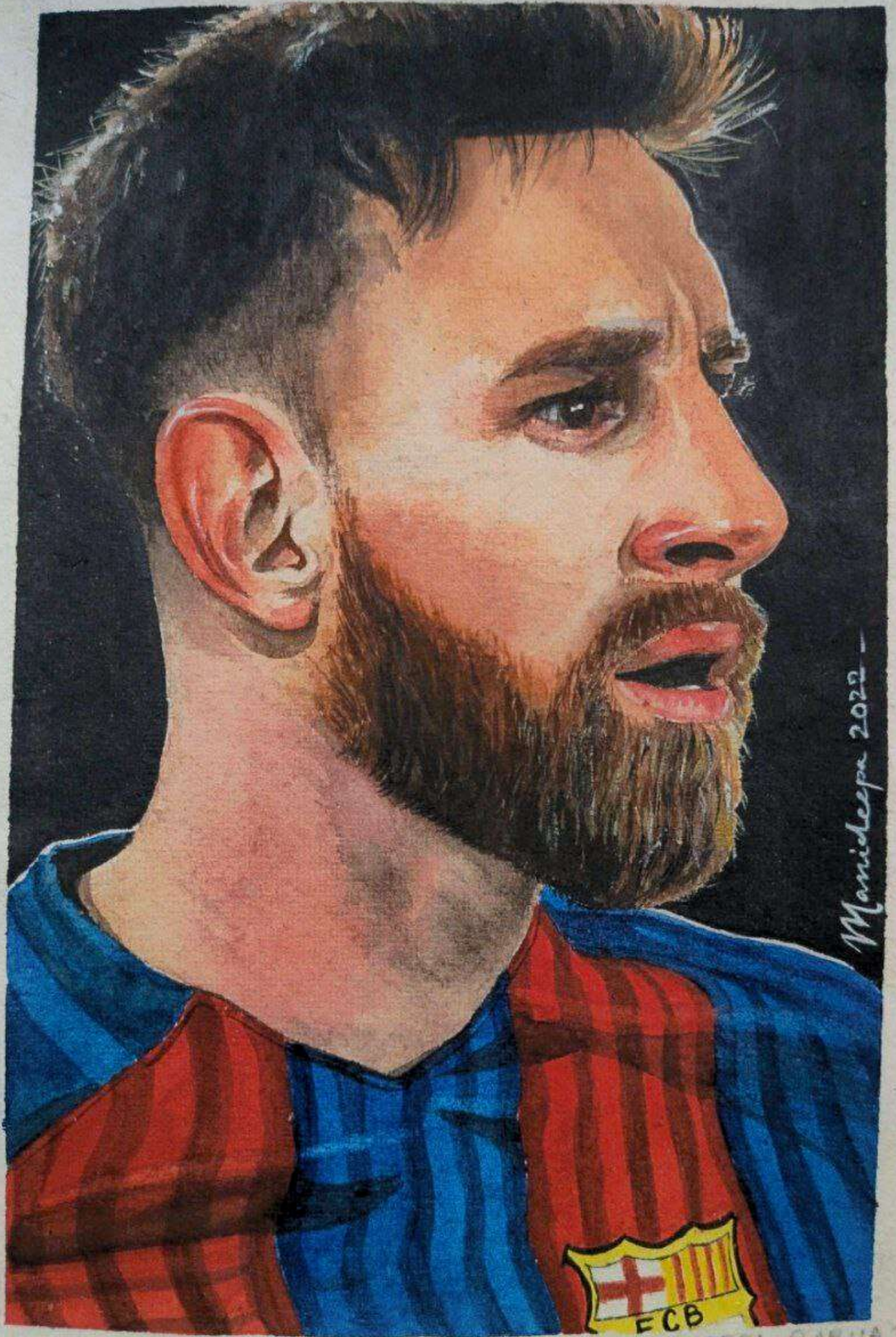
These sculptures are made by Maksud Ali Mondal to describe the relationship between the living and the physical world. The sculptures are made of organic materials like sugar, soil, food waste and straw, sugarcane and fruitpulp. These structures symbolise "MUSHROOM CLOUD".

The concept behind this is very beautiful and the artist has blended art, creativity and science in the most astonishing way possible. These sculptures are inspired by the Hiroshima and Nagasaki bomb blasts during World War II. Hundreds of innocent lives were devastated by this heinous act of USA. Now, these sculptures symbolise new life that arose from the same mud and earth where the blasts took place. The spherical part of the sculpture depicts the smoke occurred due to the bomb blast. Here, the artist has cultivated fungus (Edible mushroom) on the mud and the other sculpture is made of jaggery. The artist wanted to convey that all lifeforms will keep on growing and after a very long period of time, they will get degraded and a new lifecycle would restart from that same mud where these fungi and sugars have undergone biodegradation. This teaches us that no matter what, life always finds a way.



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Manideepa 2022



MANIDEEPA BARUA
MICROBIOLOGIST MEM-1

New Synthetic *E. coli* – immune to Bacteriophage Infection

Anushka Chakraborty, 6th
Semester, Microbiology Hons

As we know that *E. coli* is used widely for production systems in several industries so the scientists use the bacteria's genome to make it more productive. Although the bacteria can get infected by bacteriophage and the transfer of unwanted genetic material across the organism can halt production due to safety standards and faulty products. So, the scientists have been working on the bacteria's genome in the hope of making it more productive for industries.

This year on March 15, researchers from Harvard Medical School published in a paper named 'Nature' about a new strain of *E. coli* that can resist infections caused by viruses but is unable to release its modified genome reducing the chances of incorporating modified genetic materials in to the natural cells.

The Harvard researchers created the new strain by using the synthetic bacterium produced by the UK researchers in 2021 that has reduced number of codons. The synthetic bacterium used contains only 61 sets instead of 64 sets of naturally occurring codons. The three specific codons excluded from its genome were - two encoding for serine and the other one instructs the protein assembly to stop. Furthermore, the UK researchers also removed the bacterial genome, that is, the transfer RNA or tRNA which correspond to the codons. As the tRNAs are responsible for incorporating the amino acids in the growing protein chain, bacteriophage that will infect the bacteria would find its cellular machinery defective and unable to sustain the viral replication. But the bacteria would be able to live with the 61 sets of codons.

The Harvard researchers infected the synthetic bacterium with viruses isolated from the environmental samples and found out that there are still some groups of viruses that can affect the bacterium. On further research, the scientists found out that the virus itself carries the tRNA molecule that overcomes the resistance made by the bacterium and the virus can use its own tRNA molecule to sustain its replication.

As the synthetic bacterium had a susceptibility to some bacteriophages, the researchers then decided to work with the viral tRNAs to make the bacterium inaccessible to bacteriophages as well. For this to happen, the scientists added 'trickster tRNAs' in the bacterial genome that were derived from the virus' own tRNAs but modified so that they add leucine instead of serine when reading the viral genome. Both the amino acids – serine and leucine are found in the nature but both have different properties. This means that the new synthetic bacterium produced provides tRNAs to the virus but ultimately produced non-functional proteins. None of the viruses could overcome this genetic barrier and could infect the bacteria.

Later, the scientists inserted a codon of unnatural amino acid 'biphenylalanine' in the bacterial protein sequence making the bacterium dependent on the biphenylalanine for growth. This was done to prevent the synthetic bacterium to flourish in the environment as it would have a major evolutionary advantage and by doing this, the growth of the synthetic bacterium got limited and can only grow when the desired amino acid, biphenylalanine is supplied.

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<https://www.the-scientist.com/news-opinion/new-synthetic-e-coli-is-immune-to-bacteriophage-infection-71046>



Haimanti Ghosh, 2nd Semester,
Microbiology Hons.

CAN SKIN BACTERIA CURE CANCER?

Madhuparna Das, 6th Semester, Microbiology Hons.

The skin is covered in millions of microbes, typically existing in harmony with the host. While studying one such type of bacteria that lives on the skin, scientists have stumbled on a powerful new way to fight cancer. Millions of bacteria, fungi and viruses live on the surface of our skin. They play a crucial role in maintaining the skin barrier and preventing infection, but there is a lot still unknown about how the skin microbiota interacts with the host's immune system.

The bacterial species *Staphylococcus epidermidis* is known to elicit a strong adaptive immune response in the form of CD8 T cell production in the host responsible for battling severe infections or cancer. By genetically modifying these bacteria to produce a tumor antigen, the live bacteria were rubbed on the fur mice infected with cancer. This method helped to trick the mouse's immune system to produce CD8 T cells targeting the chosen antigen. These cells travelled throughout the bodies of the mice, rapidly proliferating on finding a matching tumor. They either slowed the tumor growth or extinguished the tumors altogether.

Mystery of the idle T cells.

T cells are like the immune system's special task forces. Trained to attack specific signatures on invaders — called antigens — the T cells launch themselves from their bone marrow base and are off to attack their targets.

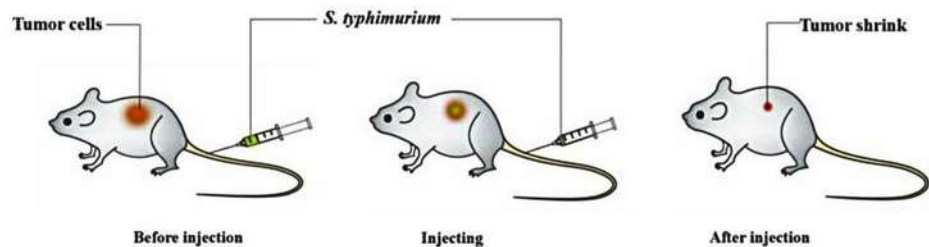
One of the primary questions that arises is why would the host waste its energy in making T cells designed to attack useful colonizing bacteria?

Weirdly, *S. epidermidis* causes the body to create especially potent CD8 T cells that do not cause any inflammation. Instead of traveling throughout the body to hunt for their target, they seemed to stay right below the skin surface, without generating any immune response.

Staphylococcus epidermidis can be engineered to produce a different type of antigen called ovalbumin, the antigen has been incorporated into many mouse tumor lines, including an aggressive melanoma

Introduction in Mice

First, the mice were swabbed with either the live engineered *S. epidermidis* or the friendly wild-type bacteria, or the killed version, or no bacteria at all. After six days, the mice were injected with melanoma cells that expressed ovalbumin.



Two types of observations were noted:

- Mice who got the wild-type or killed bacteria, or no bacteria at all, rapidly developed skin tumors.
- The mice who got the live engineered *S. epidermidis* saw a slow tumor growth, or no growth at all.

Even if the cancer had spread to the lungs, the CD8 T cells, released by the *Staphylococcus epidermidis* were able to either shrink or eliminate tumors, improving the survival time of the mice.

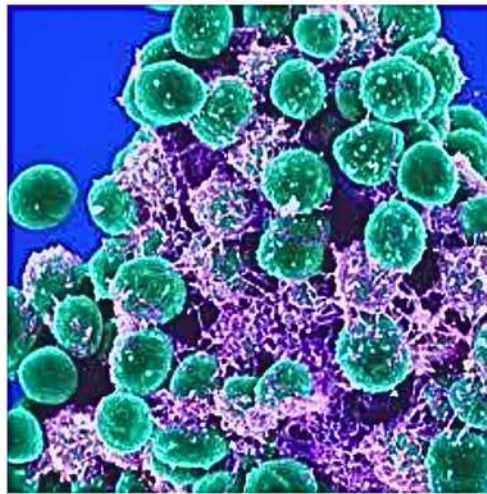
What's more astonishing is the fact that there appears to be evidence of a memory immune response, similar to what

happens after a vaccine. It is now believed that the host organism produces these T cells to essentially vaccinate itself against the colonists, protecting against sure cuts and scrapes that could allow bacteria to breach the skin barrier, hence answering the question of the mystery of the idle T cells.

Translating the therapy to humans.

This new treatment has thus far only been tested in mice. But, there are reasons to be hopeful.

This is because *S. epidermidis* induces the same type of CD8 T cell response in primates like in mice. Secondly, while *S. epidermidis* usually disappears from the mouse skin within a few weeks, most humans are permanently retained with some strain of the bacteria. If this therapy proves to work in humans, then we might be able to combat cancer by using a low-cost therapy that can be applied on the skin.





Haimanti Ghosh, *2nd Semester, Microbiology*



Pritha Saha,
*2nd Semester,
Microbiology*



Through The lenses

• FOCAL POINT •



By- Lisa Das (Sem-2)

BLUE LIGHT THERAPY

Shreya Bera,
*2nd Semester,
Microbiology Hons*

Light's language has many dialects. Bacteria, one of the very oldest living organisms in the earth, are photosensitive, they sense, respond and even produce light in various ways that lead their existence. They have receptors that convert information encoded by different light wavelengths into Biochemical reactions that carry on their physiology, including reproduction, metabolism, and growth. According to research, sometimes certain wavelengths of light delivered in just the right way act as a death sentence- A feature that makes bacterial death by illuminating a promising approach to treating infections.



Blue light immersion by pathogenic bacteria can lead to their death. Blue light remedy, also known as Photodynamic remedy, is a type of light treatment that's used to treat diseased or damaged skin. It uses specific agents called photosensitizing agents along with specific wavelengths of blue light to destroy abnormal skin cells while leaving the surrounding tissue unharmed.

Dermatologists constantly use blue light remedy to help skin cancer and treat precancerous and cancerous skin growths. The FDA has approved a photodynamic remedy for the treatment of actinic keratosis, a type of pre-cancer that develops from the times of exposure to the sun. Actinic keratoses appear as rough, scaled patches on the skin that may be light or dark tan, meat-toned, red, or white in colour. Photodynamic remedy is an optimal treatment for anyone who has multiple lesions since they can all be treated formally. In addition to treating and precluding skin cancer, blue light remedy is also used to treat sun damage, sun spots, and rosacea. Dermatologists also offer blue light for acne, and it has become a popular treatment option for acne sufferers who want to exclude traditional topical treatments and specifics.

Scientists believe that blue light remedy may help manage acne because blue light shafts help destroy the *P. acnes* bacteria responsible for producing acne. They may also have an anti-inflammatory effect on keratinocytes, the most common cells in the external subcaste of the skin. Blue light remedy may offer some benefits over indispensable acne treatments for the following reasons:

- It's safe as long as a trained guru administers it.
- It's doubtful that it will produce long-term complications.
- It doesn't involve antibiotics or other medicines.
- It's applicable for all areas of the body.
- It's suitable for use with utmost other acne curatives.
- It does not cause scarring.



One such example is Sickle cell anaemia. As we all know, this is an autosome linked recessive trait that can be passed from parents to offspring. It is caused by the substitution of Glutamic Acid by Valine in the sixth position of the beta globin chain of the haemoglobin molecule. The mutant haemoglobin molecule undergoes polymerisation causing change in the shape of the RBC from biconcave disc to elongated sickle shaped. This one mutation leads to change in the shape of RBC making it sickle shaped and hard to pass through the blood vessels. So, we can potentially use CRISPR to make a cut and replace this mutated sequence with a correct one.

A person can administer blue light remedy in a dermatologist's office or administer it themselves at home. It's judicious to arrive at the croaker 's office before treatment with clean, makeup-free skin. The croaker will give goggles to cover the eyes, while the person lies or sits under a blue light for the duration of the treatment. The photosensitizing agent is applied to the skin for between 15 twinkles and several hours, depending on the position and inflexibility of the acne and the person's skin type. This provides acceptable time for the agent to absorb into the skin cells and the sebaceous glands. Some people may witness a smarting sensation during this portion of the treatment, which should gradually subside. The number of treatments needed depends on the person's skin type, the number of lesions they have, and how severe those lesions are. Anywhere between two and five sessions are necessary, at 2- 4 week intervals, for optimal results. Some people may notice results after a single session. Between treatments, people should avoid touching or picking the mars on their skin. It's also important to follow the dermatologist's advice on the use of products and home care ways during and after the treatments.



Through The lenses

• FOCAL POINT •



By- Rajdip Roy (Sem-4)

Clothes with Antimicrobial effects

Suprava Acharya
*6th Semester,
Microbiology Hons*

Nowadays, people are becoming more concerned about their health and hygiene. People are adding antimicrobial effects to everything, from the body soap to the paint on their walls, and with that, the demand for antimicrobial-finished clothing is increasing. In selecting the active substances for hygienic finishing, it must be ensured that these substances are not only permanently effective but also compatible with the skin. The new target is to develop antibacterial fabrics that are environmentally friendly, i.e., they are made from plant products. Extracts from the roots, leaves, stems, flowers, fruits, and seeds of diverse species of plants exhibit antibacterial properties.

To increase the durability and controlled release of the antibacterial extracts, they can be employed as microcapsules or as raw antibacterial extracts as finishing agents for textiles. The uniqueness of microencapsulation is the smallness of coated particles, and it provides a means of packaging, separating, and storing materials on a microscopic scale for later release under controlled conditions. In the present work, an antimicrobial finish has been imparted to the cotton fabric using extracts from neem and Mexican daisy by direct application and by microencapsulation using the pad-dry-cure method. The microencapsulation of herbal extracts has been done using phase separation or coacervation.



SEM photographs of microcapsule-treated fabric

The whole process can be carried out using the following methods:

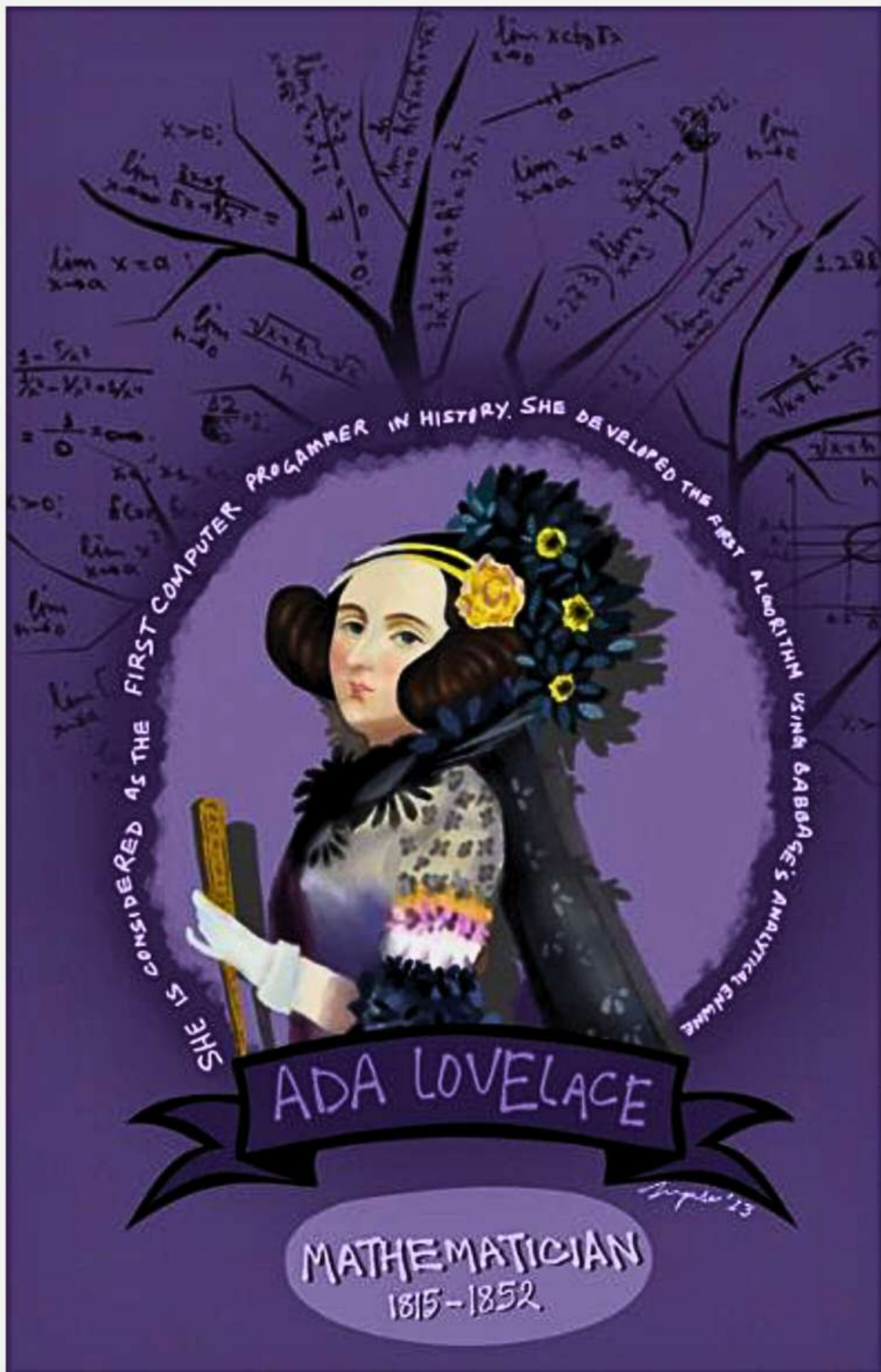
1. Extraction process: the collected plant parts were shadow dried, and after drying, grinding was carried out. Antimicrobial active substances were extracted from the plant by the methanolic extraction method. The powdered plant material was extracted with methanol by adding 20g of herbal powder to 100 ml of methanol for 24 hours to separate the alkaloids.
2. Direct application method: The fabric samples were treated with herbal extracts using citric acid as a cross-linking agent. The methanolic extract samples were applied to the fabric using the pad-dry-cure method. After padding for 30 minutes, the samples were taken, dried at 100–200 °C for 5 minutes, and cured at 180°C for 3 minutes.
3. Microencapsulation method: This is done using neem extract, Mexican daisy extracts, and neem oil as core materials and gum acacia as well.

Summing up the research, it was seen that the herbal extracts, both directly applied and microencapsulated, possess better activity against *Staphylococcus aureus* than against *Escherichia coli*. It is found that directly applied herbal extracts do not show much activity after 10 washes. Microencapsulated samples show higher activity even after 15 days.

The article can be concluded with the fact that antibacterial clothes can be made with the action of antibacterial agents extracted from plants. Incorporating the plant exudates with antibacterial effects in microencapsulated form is much more effective.



Ariyan Adak, 6th Semester, Microbiology Hons.



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Macrophages

—role in sepsis

Aratrika Bishayi
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Sepsis is the body's extreme response to an infection. It is a potentially fatal medical emergency that arises when an infection you already have sets off a sequence of events that affects your entire body. Infections that lead to sepsis most often start in the lung or urinary tract. Bacterial lipopolysaccharide (LPS) via Toll-like receptor 4 (TLR4) is demonstrated to influence thousands of cytokine-related genes expression in macrophages [2 Medvedev AE et al., 2000]. Macrophages are recognised to play essential roles throughout all phases of sepsis and affect both immune homeostasis and inflammatory processes, and macrophage dysfunction is considered to be one of the major causes for sepsis-induced immunosuppression [3 Cheng Y. et al. 2018]

Given its central role in the pathogenesis of LPS sepsis, TLR4 is a target of choice for the development of novel anti-sepsis therapies [5 Hoshino KO et al. 1999]. The inflammatory mediators, including IL-1 β , IL-6, TNF- α as well as reactive oxygen species (ROS) and reactive nitrogen species (RNS), induce cytotoxicity leading to multiple organ damages, and without resolving these activities, they may ultimately result in the pathogenesis of sepsis [6 Anas AA et al., 2010]. It was shown that the ROS/NOD-like receptor protein 3 inflammasome (NLRP3) signaling pathway participates in sepsis-related immune responses [7 Shuai Zhao et al., 2020]. NLRP3 activation is linked to a number of inflammatory conditions, including sepsis [8 Long H et al., 2016], and several studies have shown that NLRP3 null animals are protected against sepsis-induced organ injury [9 Gong Z et al, 2015] and shock [10-11 Kalbitz M et al, 2016; Mao K et al., 2013]. In addition, the NLRP3 inflammasome depends on caspase-1 to mediate immune cell apoptosis. Moreover, distinct IFN- γ functions are related to context-dependent effects on inflammatory NF- κ B-driven cytokine genes, as IFN- γ can either suppress cytokines or contribute to increased cytokine production from macrophages in diseases such as LPS sepsis.

Recent reports [12, Yang X et al., 2013] and others have demonstrated that T-cell immunoglobulin mucin 3 (Tim-3) is also a negative regulator of innate immune cells, such as macrophages. It was found that Tim-3 is involved in regulating macrophage polarisation [13 Zhao Z et al., 2014], but the precise molecular mechanism and the therapeutic potential remain to be determined in LPS sepsis correlating with macrophage polarisation. Previous studies revealed that Tim-3 plays an important role in the mononuclear cell/macrophage system of sepsis patients. Thus, LPS causes downregulation of Tim-3, thus inhibiting its ability to maintain homeostasis and leading to an enhanced inflammatory response to fight a long-lasting infection, but, at the same time, causing host damage [14 Xiaomei Yang et al., 2013].

As for the intracellular mechanisms, some transcriptional factors have been shown to play a role in regulating macrophage differentiation and polarisation. In particular, signal transducer and activator of transcription (STAT) family members, such as STAT1, and suppressor of cytokine signalling 1 (SOCS1), are reported to be important regulators of macrophage polarisation [15–16; Lawrence T and Natoli G. 2011; Yoshimura A. et al., 2007]. The JAK/STAT pathway, which coincidentally is involved in SOCS induction, serves as the primary signalling mechanism for most cytokines in mammals. The above report informed that the JAK/STAT circuitry includes a negative feedback loop that activates STATs to stimulate the transcription of SOCS genes [17 Skyla A. Duncan et al, 2017]. SOCS proteins, as negative regulators of JAK/STAT, represent a promising target for anti-inflammatory therapies [18 Annie Rocio Piñeros Alvarez, et al. 2017]. STAT1 is identified as a signalling adaptor of Tim-3 in macrophages, and it was demonstrated that Tim-3 controls macrophage polarisation by inhibiting the STAT1-microRNA signalling axis [19 Xingwei Jiang et al., 2016]. These findings have potential clinical implications. It has been reported that Tim-3 and SOCS1 communicate with each other and coordinately inhibit cell signalling transduction, resulting in impaired innate immune response [20 Hastings WD, et al. 2009].

The ER-resident protein sigma-1 receptor (S1R) serves as a crucial inhibitor of cytokine production in a preclinical model of septic shock [21 Dorian A. Rosen et al., 2019]. S1R deficiency alters macrophage cytokine expression upon exposure to LPS.

This report on novel regulators of sepsis can prompt targeting of Tim-3 and SOCS proteins (SOCS1/SOCS3 ratio) along with neutralisation of TLR4 either alone or in combination with NLRP3 to prevent LPS sepsis. It can be suggested that the inhibition of TLR4 and blocking of NLRP3 inflammasome signalling, the altered response of M1 and M2 macrophages, and feedback inhibition by SOCS proteins leading to the STAT (STAT1/STAT6) signalling pathway could be the possible mechanisms to give protection from LPS induced sepsis. This study will also figure out the altered expression of SOCS-1/SOCS3, signature marker proteins for autophagy, sirtuin 1 (Sirt1), Sigma-1 receptor (SIR) proteins, and STAT1/STAT6 molecules in M1 and M2 macrophages during LPS-induced sepsis.

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Through The lenses

• FOCAL POINT •



By: Aishi Bhattacharyya (Sem-4)

Microbes to the rescue – Plastic-degrading bacteria

Sonakhi Saha
2nd Semester
Microbiology Hons



Waste waste everywhere, not even an inch to
spare,

O that beautiful earth that was made,
Drenched in cool greenery and shade.

Will She ever be back to start,

To her original self, that very work of art?

Pray she does, the layer of dirt is becoming
permanent,

And may we act before we drown as a result of
this unceremonious abandonment.

-----Self-written.

Among the various social plagues, uncertainties and tragedies of the world, of the major ones is the accumulation of plastic. Although considered a boon at the time of its birth due to its ease of use and cost-effectiveness, this Trojan-horse invention of Humankind has now after years of unprecedented use and accumulation proven to be fatal. Currently a bigger problem is seen in the recycling of the plastic already accumulated. But fortunately, recent research has shown the discovery of bacteria that can degrade plastic. So not only do microbes perform various aerobic and anaerobic pathways within us to sustain our life but now also serve as a major source to prevent the fatality of earth.

Strains of bacteria that degrade plastic were isolated by Takayoshi Sekiguchi, Takako Sato, Makiko Enoki, Haruyuki Kanehiro, Katsuyuki Uematsu, and Chiaki Kato the scientists of the researching group in Japan from the Japan and Kurin Trenches at a depth of 5000 to 7000 m (deeper ocean bottoms). These 13 isolated strains were of *Shewanella*, *Moritella*, *Psychrobacter* and *Pseudomonas* genera. This was by far the first record of the PCL degrading bacteria isolated. There were about six main strains named, CT01 from genus *Shewanella*, CT12, JT01 and JT04 from *Moritella*, JT05 in genus *Psychrobacter*, and JT08 in genus *Pseudomonas*. Investigation was carried out in the fields of cell shape, degrading abilities for several plastic types and growth profiles. The cell shapes of the strains, except JT05, were observed to be rod-shaped, non-spore-forming and motile by means of a single or multi polar flagella. The cell shapes of JT05 were coccal with no visible flagella. From the results of degradation tests on six different aliphatic polyesters, all strains could degrade only PCL. Strains CT01, CT12, JT01 and JT04 are psychrophilic and pressure tolerant bacteria and three strains except JT04 showed typical piezophilic growth profiles. Therefore, it was possible that these strains might play a role in degrading aliphatic polyesters under deep-sea conditions like high hydrostatic pressures.

One of the main problems faced during the industry scale cultivation of the selected and isolated strains were the optimum temperature of the enzymes. These plastic degrading enzymes worked at a temperature higher than that of 30 degrees. That kept the cost at high ranges. The need of the hour was discovery and isolation of bacteria that were stably cold-adapted and with enzymes showing a much lower optimum temperature.

The researches by various Scientists from the Swiss Federal Institute WSL were able to isolate such needed species from the Alps of their country.

(The following is a direct citation from the journal)

“Here we show that novel microbial taxa obtained from the ‘plastisphere’ of alpine and arctic soils were able to break down biodegradable plastics at 15 °C. These organisms could help to reduce the costs and environmental burden of an enzymatic recycling process for plastic.” - Dr Joel Rüthi.

Dr Ruthi and his team isolated 19 strains of bacteria and also 15 strains of Fungi that had grown on free-lying or intentionally buried plastic. These experiments had been conducted in Greenland, Svalbard and Switzerland. Some of the microorganisms were also isolated from soil collected at the summit of Muot da Barba Peider (2,979 m) and in the valley Val Lavirun, both in the canton Graubünden. These micro-organisms could grow in conditions of darkness and at temperatures of 15 degree Celsius. The conditions subjected to them and the molecular techniques used, revealed them to be 13 genera in the phylum Actinobacteria and Proteobacteria, and the fungi about 10 genera in the phylum Ascomycota and Mucoromycota.

Further experimenting and research showed that 19 (56%) of the strains including 11 fungi and 8 bacteria were able to digest at 15 °C, while 14 fungi along with three bacteria had digested the plastic mixtures of PBAT and PLA. Results from Nuclear Magnetic Resonance and fluorescence- based arrays confirmed that the isolated strains were able to chop up the PBAT and PLA polymers into smaller molecules. It was noted the large fraction of the tested strains could digest at least one of the tested plastics.

In the current situation isolation of these strains will definitely increase the cost-effectiveness of the process when industrialized. Although much research and work needs to be done in this field it is safe to say we may have stumbled on a more or less definitive solution for the problem of plastics at hand. Study, experiments, proper implementation and stop on further use of plastics will surely bring a change to the environment. However it all comes down to the sincerity and the hard work we ourselves put in.





Through The lenses

• FOCAL POINT •



By: Teemothi Gayen (Sem-6)

A large, bold, black quotation mark graphic is positioned in the upper right quadrant of the page. It is partially overlaid by a light blue rectangular shape that extends from the top edge of the page.

CAN THE LAST OF US FUNGUS BE REAL?

Sujan Parvin,
4th SEM,
Microbiology Hons

“**The Last of Us**,” a cutting-edge HBO original that is totally set in a post-apocalyptic world where a deadly zombie fungus has taken over, has captivated viewers from all over the world. Now, everyone in academia is asking themselves: if “**life imitates art**,” could mushrooms really rule the planet? One species in the Cordyceps family is called ***Ophiocordyceps unilateralis***. In tropical climates, this fungus, sometimes known as “**zombie fungus**,” infects and kills ants. *O. unilateralis* spores cling to an ant’s frame and access its exoskeleton as soon as they come into contact with the ant. Additionally, the fungus spreads inside the ant’s body, eating away at its interior before eventually reaching the brain and exoskeleton. The fungus has a reputation as a killer because it can pollute and confuse the intelligence of a certain species of ant, but there is no evidence that it can harm humans. The majority of fungal infections require direct contact with an immunocompromised host that is susceptible, which includes cancer patients, transplant recipients, and those with sensitive conditions. According to the Yale Council on Drugs, the majority of fungi cannot survive in temperatures higher than 98.7°F, which

is also the temperature of the human body on average. Various publications claim that fungus prefer warm temperatures and moisture, but the exact amount of warmth they can control is a delicate balance. Less than 500 of the 10 million different kinds of fungi in the region are known to grow on mammals, as "the temperature we consider ordinary is the temperature warm enough to kill most fungi without killing us." In the 2011 New Scientist article "**Killer Fungi Made Us Warm-Blooded,**" Rob Dunn claims. Is the scenario presented in The Last of Us—in which a warmer earth assisted Cordyceps shift into a form that could infect mortal beings—really plausible? Despite not being an expert on Cordyceps Dr. Schwartz highlights the idea that global warming has improved a fungus's thermal tolerance. According to him, "It has not yet been proven. It's a thesis, and it's happening at a beautiful, leisurely pace," he claims. But it's very likely.





Through The lenses

• FOCAL POINT •



By: Niladri Jogger (Sem-2)

विचित्र कथा

देश जहां एक तरफ तकनीकी तौर पर तरक्की कर रहा है वहीं दूसरी तरफ अपनी परंपरा और रीति-रिवाजों का अभ्यास करना नहीं छोड़ता। किंतु इन रीति-रिवाजों और परंपराओं के पीछे भी वैज्ञानिक धातु है जो किसी अज्ञात कारण के पशुयत हमारे समय के लोग तक सटीक तरीकों से प्रचलित हो पाया है, जिस कारण हमारे जमाने के जन-सामान्य महत्वपूर्ण और आध्यात्मिक परम्पराओं को अंधविश्वास मान बैठे हैं। हमारे पूर्वज जिन्होंने इन्हीं कई आध्यात्मिक परम्पराओं के विषय में धर्म ग्रंथों में उल्लेख किया है ऐसा मानते थे कि इन सामान्य परम्पराओं में कहीं न कहीं विज्ञान की प्रस्तुति है, और यह भी मानते थे कि अगर हम में परम्पराओं को रोज़ की जिदगी में निर्धारित रूप प्रयोग करें तो इस्से हमारी भलाई होगी। इन्होंने रिवाजों का एक भाग है 16 श्रृंगार। सोलह सिंगार का अर्थ होता है "16 दुल्हन के श्रृंगार"। जिस्मे 16 चरण है जो एक विवाहित महिला को अपने विवाह के दिन और उसके अतिरिक्त अपनी शोभा बढ़ाने के लिए पालन करनी चाहिए। कर्मकांड मान्यताओं के अलावा भी इसके कई सारे वैज्ञानिक गुण भी है। 16 श्रृंगार एक नारी की छिद्र और अंगो की रक्षा करता है तथा इन अंगो से निर्गत होने वाली शक्तियों पर नियंत्रण बनाये रखने में मदद करता है। सोलह श्रृंगार के पूर्व दुल्हन को पवित्र स्थान स्नान में करवाया जाता है। स्नान में प्रयोग करने वाले तेल में ब्राम्ही शिकाकाई भृंगाराज आदि जड़ी-बुटियों का इस्तमाल होता है। उबटन - इस्मे तेल, दुग्ध, हल्दी आदि का प्रयोग होता है, इसमें न केवल सुगंध होता है बल्की जीवाणु रोधी गुण भी होते हैं। 16 श्रृंगार के 16 चरण:

1. केशपाशचरण : दुल्हन / महिला फूलों की माला केश पर कुंडल के रूप में धारण करती हैं, अक्सर चमेली अथवा गजरे का प्रयोग किया जाता है।
वैज्ञानिक तथ्य:- चमेली का फूल लंबे वक्त तक ताज़ा रहता है तथा लंबे समय तक खुशबू देता है।
2. मांग टीका : यह माना जाता है कि मांग टीका शरीर की गर्मी को नियंत्रित करता है इसकी बनावट इस प्रकार होती है कि यह अंजन चक्र जो माथे का छठा चक्र होता है और तीसरे नयन का भी प्रतिनिधित्व करता है।
3. सिंदूर : सिंदूर को भारत में वैवाहित महिलाओं का पवित्र प्रतीत मानते हैं। हल्दी चुना और पारा धातु के प्रयोग से बनाया गया सिंदूर शरीर को ठंडा रखता है और साथ ही साथ अपने भवन पर नियंत्रण रखने में मदद करता है।
4. बिंदी : बिंदी हिंदू संस्कृति का एक पवित्र प्रतीत है। एक प्रमुख तांत्रिक बिंदु के मध्य स्थित कुंडलिनी उर्जा को बढ़ाने में मदद करता है और महिलाओं को मानसिक संतुलन बनाए रखने में मदद करता है।
5. काजल : जैविक काजल आंखों और आंखों के हिसन की रक्षा करता है तथा आंखों को साकार रखने में मदद करता है और आंखों को ठंडक का एहसास भी देता है।
6. नथनी : आयुर्वेद के अनुसार नथनी का प्रयोग करने से मासिक धर्म और प्रसव पीड़ा से कुछ हद तक आराम मिलता है क्योंकि यह प्रजनन अंगों से जुड़ी होती है।

7. कर्ण फूल : हमारे कानो में बहुत सारे एक्यूपंकचर और एक्यूपेशर बिन्दु है। जब हम कर्ण फूल का प्रयोग करते हैं, शरीर तब एक्यूपंकचर का प्रभाव मासिक धर्म की समस्याओं को ठीक करने में लगाता है, और मुद्रा और गुरदे को स्वस्थ और साकारी रखता है।
8. मंगलसूत्र : मंगलसूत्र की शरीर में महत्वपूर्ण भूमिका होती है क्योंकि यह रक्तचाप के स्तर को नियमित नियंत्रण करता है और रक्त के परिसंचरण में सुधार करता है।
9. बाजूबंद : बाजूबंद बाजुओं के रक्त संचारण को नियंत्रण करने में मदद करता है और सही मात्रा में प्रतिरोध बनाता है जो हाथों को आराम देता है।
10. चूड़ियां : प्रथा के अनुसार चूड़ियां लोहे के या हाथी के दांतों से, हरे या लाल कांच के, चीनी मिट्टी तथा अन्य धातुओं के प्रयोग से बनती हैं। चूड़ियां हाथों के मेदोजों को मज़बूती देती है। आयुर्वेद में यह मानते हैं कि हाथों में चूड़ियों से घर के धातुओं के गुण कुशल पूर्व शरीर में प्रवेश करते हैं।
11. मेहंदी : मेहंदी के औषधीय गुण नसों को आराम देता है और किसी भी प्रकार के तनव से लड़ता है, यह शरीर को ठंडा रखता है और किसी भी प्रकार के चोट या खरोच पर मरहम की तरह कम करता है।
12. हाथफूल : दुल्हन अपने हाथों पर 8 अंगुठियां पहेंती है जो एक केन्द्रीय पुष्प से जुड़ी होती है जो उसके परम पक्ष को ढकने का काम करती है। यह आपकी उंगलियों पर बने छल्ले तथा मस्तिष्क की गतिविधियों को उत्तेजित करने में मदद करती है।
13. आरसी : आरसी एक अंगूठे की अंगूठी है जिस पर दर्पण लगा होता है यह भी हाथ फूल की तरह ही मस्तिष्क की गतिविधि को उत्तेजित करती है और स्वास्थ्य का ध्यान रखने में मदद करती है।
14. करधनी : कुल्हे पर पहने जाने वाली कमरबंद या करधनी मासिक धर्म को नियमित रखने में मदद करती है व मासिक धर्म के दिनों में पेट में होने वाली पिड़ा से भी राहत दिलाती है।
15. पायल : पायल पहनने से पैरों में दर्द, झुंझुनी और कम्जोरी से राहत मिलती है। यह रक्त परिसंचरण को भी नियंत्रित रखता है और सूजी हुई एडियों को राहत देता है। यह मासिक धर्म तथा प्रजनन क्षमता की असमान्यता को भी ठीक करता है।
16. बिछिया : बिछिया मासिक धर्म और प्रजनन क्षमता की संतुलन बढ़ाने में मदद करता है क्योंकि पैरों के बिच वाले अंगुठे जहां बिछिया पेहेनी जाती है उसके नस प्रजनन प्रणाली से जुडती है। मेरी निजी सोच यही है कि भारतीय संस्कृति केवल अंधविश्वास पर नहीं गढ़ा है, बल्कि उसमें सांस्कृतिक विचार के पीछे कई विज्ञानिक कारण भी है जिस्से हम किसी कर्णवश अंजन है। मेरी मान्यता यह है कि हमें पश्चिम परंपरा के साथ-साथ अपने भारतीय संस्कृति को भी उतना ही महत्त्व देना चाहिए।

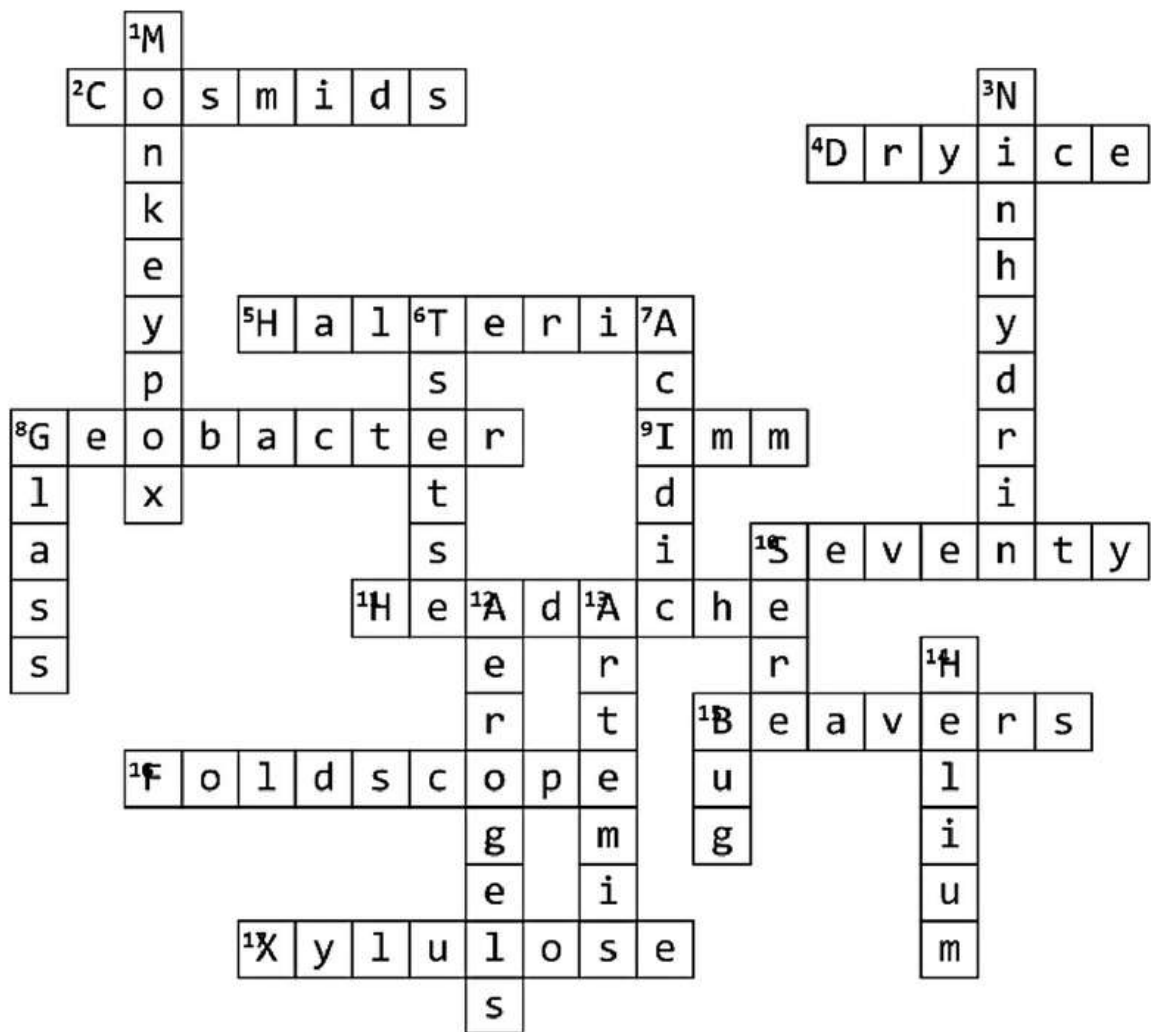
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ANSWERS



CROSS-WORD





Through The lenses

• FOCAL POINT •



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