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Following are the research and academic Collaborations of Department of Microbiology

1. Collaboration for academic activities with PG Department of Biotechnology,Jalandhar Punjab
2. Research Collaboration withP.G.Department of chemistry Savitribai Phule University Pune.
3. Research collaboration with Dr Steward Gracian A Dentistfrom Chennai,a CEO and founder of Sociodent, a start up of ORAL CARE DEVICE.
4. Research collaboration with Pharmacy dept. of Manipal
5. Academic collaborations with IISER PUNE for MANAV ATLAS Project

Supporting documents of Collaborative activities are attached herewith.

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Department of Microbiology, UCM

Report of International E conference on 'Foldscope and its Applications'

Department of Microbiology, University college had organised an International E-conference online on 20th and 21st June 2020 in association with Lyllapur Khalsa College, Dept of Biotechnology, Jalandhar, Punjab. This conference was a part of joint collaboration of total 11 institutes all over the India .Theme of the conference was **'Foldscope and its applications'**.

All these 11 institutes had received a INDO –US Project grant of DBT in 2018 with total sum of Rs 8 Lakhs. Hence all together organised this E conference. As a online event due to COVID Pandemic. Many students and faculties of the respective Colleges attended the conference. All the collaborators who had worked on the Foldscope, shared their work in the conference focusing various applications of Foldscope. The inventor of Foldscope is Dr. Manu Prakash. Who was also the resource person from United States and shared his journey of Foldscope invention. Faculties and students of all institutes attended this conference and many have won BEST paper and poster presentation awards. The media report of the conference is attached herewith for reference. Dr Arundev Sharma of PG Department of Biotechnology Jalandhar Punjab was the organizing secretary of the cE conference.

Dr Bharathi Prakash

Head, Dept of Microbiology, UCM

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International conference on foldscope and its applications

In the valedictory function, 7 different participants were awarded

Rajat Kumar

Jalandhar: Two-day international conference was organized by P.G. Department of Biotechnology of Lyallpur Khalsa College, Jalandhar from 20-21 June 2020. This conference was jointly organized by 11 different institutions from all over India. The participating institutions are Lyallpur Khalsa college Jalandhar, FC college Pune, SGK Government Degree College Guntur, Assam University, AG Arts and Science College Pune, Cotton University Guwahati Asam, ADP College Nagaon Assam, KM Institute for P.G. studies and research Pondicherry, Agricultural College and Research Institute wall

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Jalandhar: Two-day international conference was organized by P.G. Department of Biotechnology of Lyallpur Khalsa College, Jalandhar from 20-21 June 2020. This conference was jointly organized by 11 different institutions from all over India. The participating institutions are Lyallpur Khalsa college Jalandhar, FC college Pune, SGK Government Degree College Guntur, Assam University, AG Arts and Science College Pune, Cotton University Guwahati Asam, ADP College Nagaon Assam, KM Institute for P.G. studies and research Pondicherry, Agricultural College and Research Institute well Vallanadu, University College Mangalore, Nizam College Hyderabad. Around 137 participants including students, research scholars, scientists, Professors participated in the event.During inaugural function the chief guest was Dr. Manu Prakash, the INVENTOR of Foldscope from Stanford University USA and Guest of honour Prof. LS Shashidhara from IISER, Pune/Dean Research Ashoka University, Sonipat. During inaugural function overall patron of this event Dr. Gurpinder Singh Samra welcomed all the dignitaries and highlighted importance of foldscope in the area of education. Dr. Arun Dev Sharma overall coordinator of the conference welcomed all the dignitaries in the conference. During his address Dr. Arun Dev Sharma mentioned that covid-19 pandemic has served as unprecedented Global shock to the various sectors however education hit the hardest, but the post covid-19 crisis send as a chance to do better by organizing e-conferences. This conference intended to provide opportunity and platform to nurture our knowledge in the area of education using foldscope like gadgets. The keynote address was given by Dr. BC Goswami, Vice Chancellor, Cotton University, Assam. Further on behalf of all patrons, Dr. Buchade PB from AG Arts and Science College Pune and Dr. Uday Kumar from Mangalore University College Karnataka gave remarks about the international conference. The chief guest of the occasion Dr. Manu Prakash highlighted the importance of foldscope in today's era. Chief guest Dr. Manu Prakash have specially mentioned that it is a first kind of event organized ever in India with joint collaboration by multi institutions from all over India. He mentioned that all organizing secretaries are the PIs who have received DBT foldscope indo-us Grant from DBT. He mentioned that as the trend of science decreasing day by day so this microscopic gadget can do wonders in student`s life. This small foldscope can be used in our daily life to see contamination of milk adulteration, wheat flours, daily hygiene check of street vendors etc.

The guest of honor Dr. Shashidhara highlighted the importance of Technology in the area of science by citing various suitable examples in the area of science. In this conference there were two invited talk sessions and two technical sessions (oral and poster presentation). During invited talk session, various speakers/organizing secretaries Dr. Gayatri Gurjar, Dr. Tulasi, Dr. Indu Sharma, Dr. Shobha Ajeet Waghmode, Dr. Anjana Singha Naorem, Dr. Mousmi Saikia, Dr. Mahipal Singh Shekhawat, Dr. Anupma Harshal W., Dr. M. Gomathy, Dr. KG Sabarinathan, Dr. Bharathi Prakash, Dr. Nageswara Rao Amanchi, Dr. Geetha and Dr. Suneel presented their findings with foldscope and highlighted its importance in today`s life. In technical oral session about 12 presenters presented their

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In the valedictory function 7 different participants were awarded best poster awards and best oral talks. At the end the conference, convener of the conference Dr. Arun Dev Sharma presented vote of thanks to resource persons, chairpersons and Patrons of different institutes especially Dr. G.S. Samra and President governing Council Madam Balbir Kaur for constant support. During this function inaugurator Dr. Inderjeet Kaur and colleague Prof. Navjot Kaur were also present. Feedback was taken from participants at random and it was highlighted that these type of conferences should be organized every year where students from PG and UG level can present their findings in a supportive way.

Dr. Bharathi Prakash

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Department of Microbiology, University College,Mangalore

Report of Research collaboration with department of Chemistry, Savitribai phule University, Pune

A s a part of the collaboration, between Dr Sunita Gawali Saluke of Dept.of Chemistry of Savitribai Phule University, Pune and **Dr Bharathi Prakash,** Head of Microbiology department, research expertise was provided. Dr Sunita Gawali –Salunke of Savitribai phule University, Pune had sent 41 synthesised chemical compounds of her research scholar to Department of Microbiology for antibacterial and antifungal activity. The antibacterial activity was conducted against *Staph.aureus, K Pneumonia and B.Subtilis.* The antifungal activity was conducted using *P.chrysogenum, A niger* and *A flavus.* The results in the form of zone of inhibition were measured and given in the form of table.

Anti bacterial and antifungal activity of chemical compounds

Sample	Fungus			Bacteria		
	1. Penicillium chrysogenum	*2.Aspergillus nigar*	*3.Aspergillus flavus*	*1.Staphylo coccuP chrysogen*	*2.Klebsiella pneumonia*	*3.Bacillus subtilis*
	Zone of inhibition in (cm)					
1.NL-Cu	2.5	3.0	2.5	2.3	2.0	2.0
2.NL	1.7	2.5	2.0	2.0	1.8	1.8
3.NLOX	0.0	1.5	1.8	2.1	1.0	2.3
4.ILW-Cu-ace	2.5	2.5	2.3	2.0	2.0	2.2
5.ILW –Mn	0.0	1.5	1.5	1.5	0.0	1.8
6.ILW	3.0	2.6	2.5	2.5	2.5	3.0

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7.NL-Ni	1.5	1.7	0.0	2.2	2.0	0.0
8.ILW-Cu	0.0	1.5	1.3	1.8	2.0	1.5
9.NL-Zn	2.0	3.0	1.6	2.5	2.5	2.2
10.NLOX-Cu	0.0	0.0	0.0	1.8	0.0	1.5
11.ILW-Zn	0.0	1.5	1.3	1.5	1.5	1.7
12.ILW-Zn-ace	0.0	1.5	1.5	2.0	1.7	1.7
13.NLOX -Co	0.0	0.0	0.0	1.3	1.2	2.2
14.MnOX-Zn	2.8	3.0	2.1	2.5	2.6	2.5
15.NL-Co	2.0	2.0	1.8	2.3	2.4	1.5
16.ILW-Co	0.0	1.3	1.1	0.0	0.0	1.3
17.NL-Mn	0.0	1.8	0.0	2.2	1.8	1.8
18.NLOX-Mn	0.0	1.0	1.6	2.1	2.4	2.2
19.NLOX-Ni	0.0	0.0	0.0	0.0	1.5	1.4
20.CoPhRT	0.0	2.0	0.0	0.0	0.0	0.0
21.NiPh	3.5	4.0	3.5	1.5	0.0	1.6
22.CuLW	2.0	0.0	2.0	2.3	0.0	1.7
23.ZnLWRT	0.0	0.0	0.0	2.0	1.6	1.7
24.Lw	2.8	2.5	3.0	1.7	3.0	2.0
25.CoLw	0.0	0.0	0.0	1.5	1.5	2.3
26.CuLWRT	1.3	0.0	1.0	1.5	0.0	2.0
27.MnLWRT	0.0	0.0	0.0	1.4	0.0	2.0
28.CoLWRT	0.0	1.8	0.0	1.5	1.6	1.8
29.CuPh	5.0	3.5	4.0	0.0	0.0	2.2
30.NiLW	0.0	1.3	0.0	1.4	1.5	2.5
31.ZnPhRT	3.0	3.5	1.5	0.0	0.0	1.7
32.ZnLW	0.0	0.0	3.0	2.0	1.8	2.6

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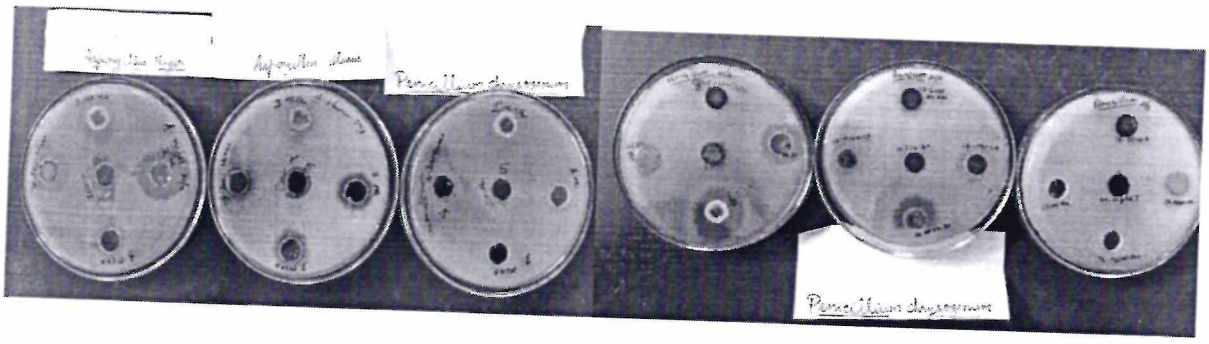
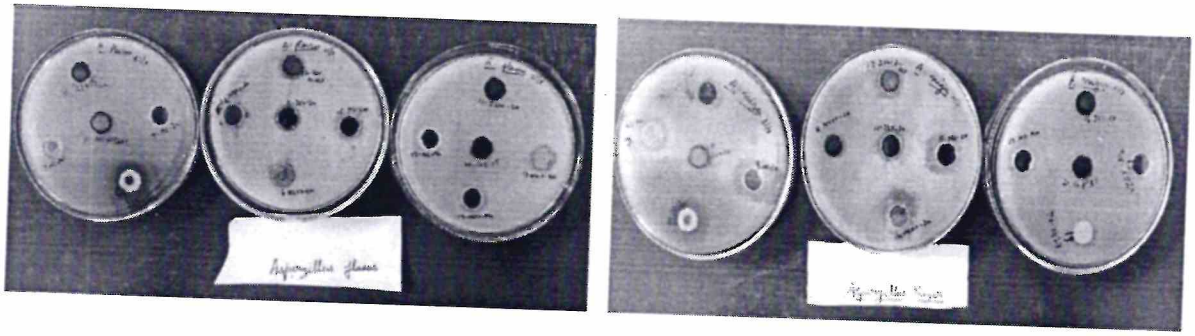
33.MnPhRT	3.0	3.8	3.0	1.5	0.0	1.6
34.ZnPh	4.0	4.2	2.0	1.8	2.0	1.5
35. NiLwRT	2.0	2.5	3.0	1.5	1.5	2.0
36.Ph	4.0	3.0	2.5	3.0	3.5	2.7
37.MnLw	0.0	0.0	0.0	3.5	2.5	4.0
38.Mnph	0.0	2.0	2.5	2.0	1.5	2.0
39.CoPh	3.0	3.0	0.0	0.0	0.0	0.0
40.CuPhRT	0.0	2.5	1.5	2.3	2.3	2.9
41.NiPhRT	0.0	2.3	2.0	1.8	2.0	2.0

The pictures of antimicrobial sensitivity of 41 compounds tested is given bellow.





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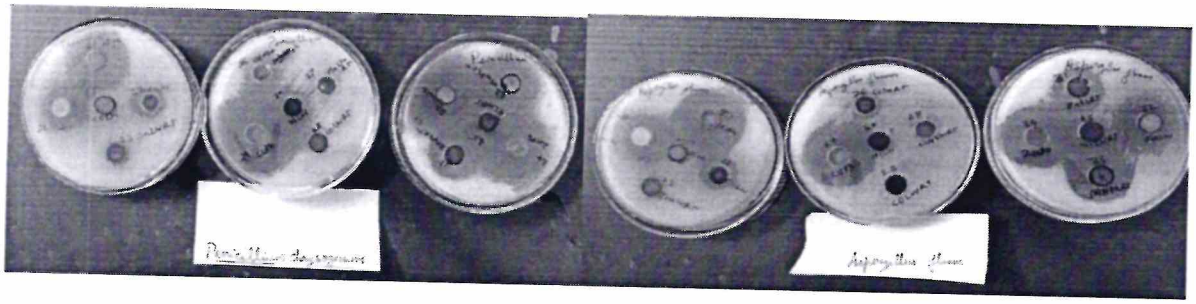

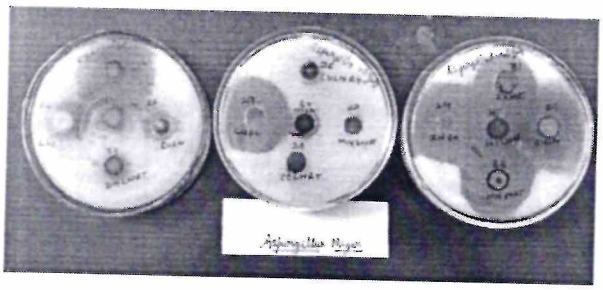

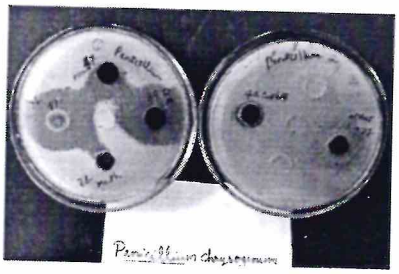

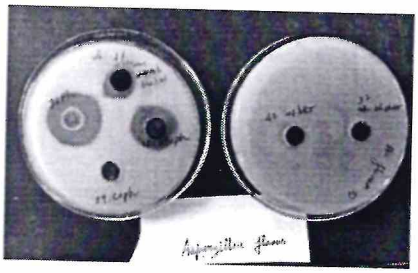

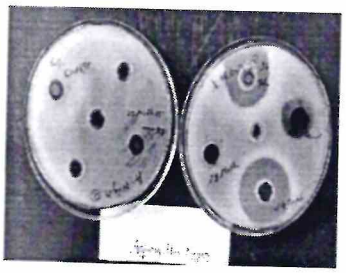

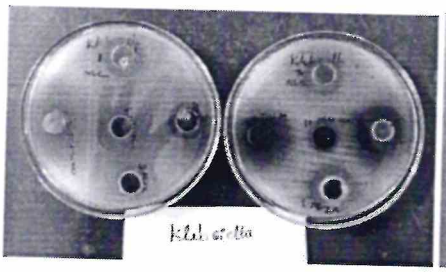

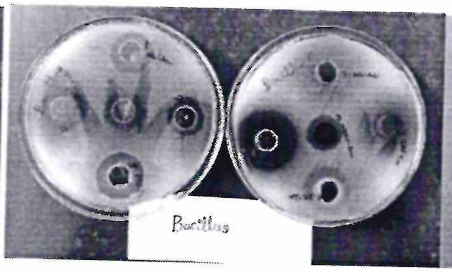

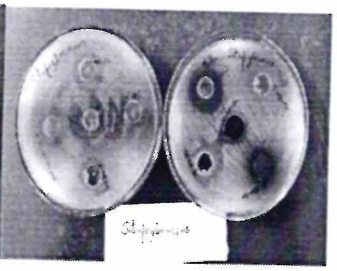

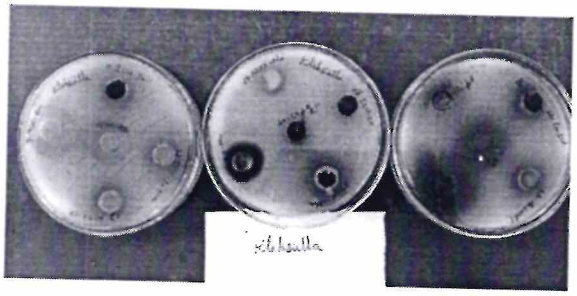

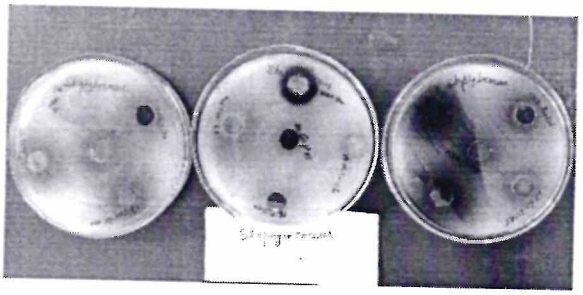

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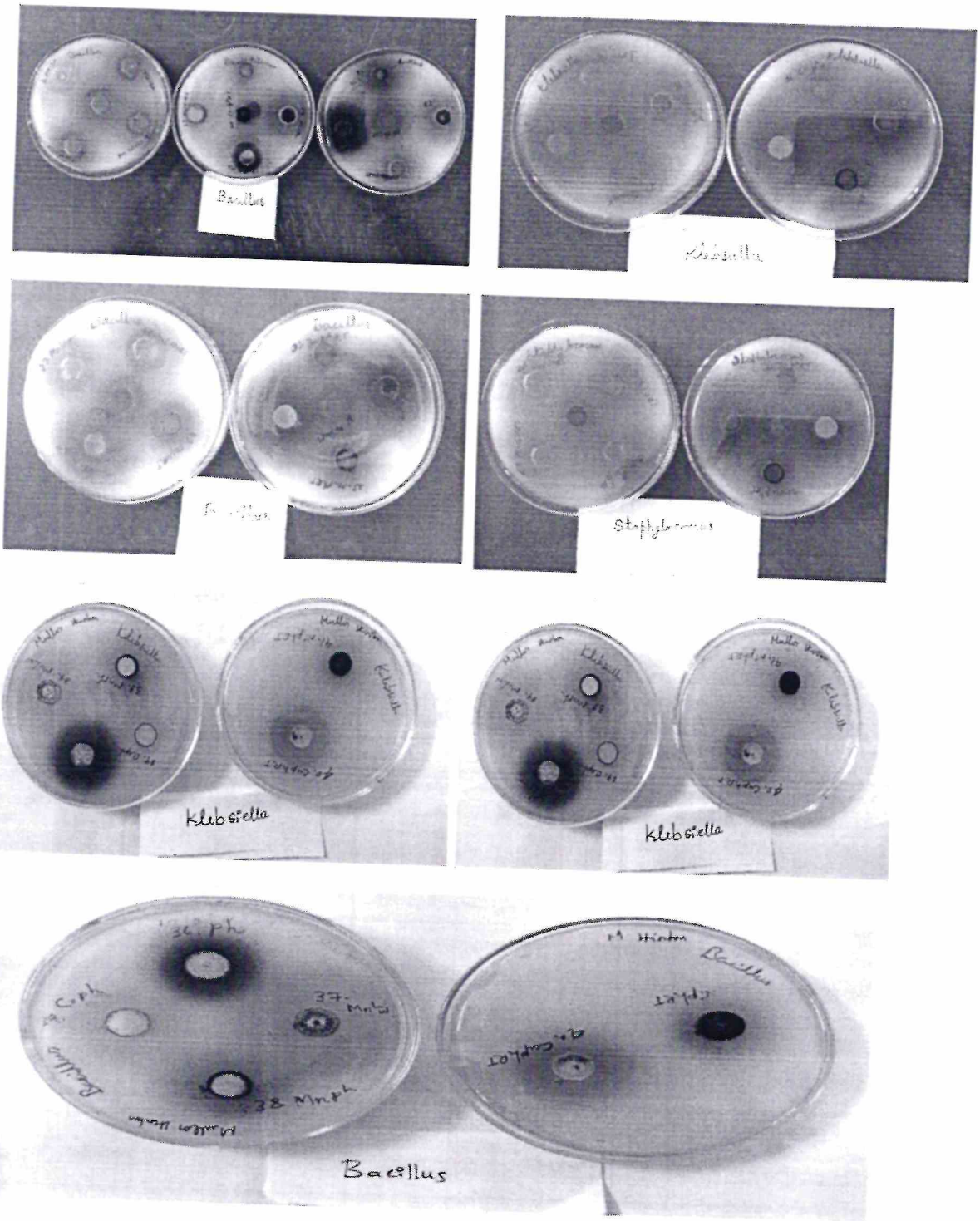

Dr Bharathi Prakash

Head, Dept of Microbiology, UCM

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SocioDent

SOCIODENT PRIVATE LIMITED

CIN – U74999TN2021PTC141808
Regd Off: IITM Research Park, 1 FA, I Floor Kanagam Road,
Taramani, Adayar, Chennai – 600 113
stuvia2j@gmail.com

Date: 11.05.2022

From
Dr.Steward Gracian
Founder and CEO
Sociodent Private Limited
IITM Research Park, No. 1 FA, I Floor,
Kanagam Road, Taramani,
Adayar, Chennai-600 113, Tamil Nadu, India.

To
Dr. Bharathi Prakash
Head, Department of Microbiology,
University College, Mangalore (Karnataka) India

Dear Madam,

Sub: Regarding completion of the first phase of Biofilm testing for our patent pending Assistive oral care device.

I am writing this to inform you that I have received your email with a report of the inferences from the first laboratory trial of the Biofilm study for our innovation. I convey my heartfelt gratitude for supporting our start-up SocioDent, an early-stage med-tech company in our research requirement. As part of the industry collaboration initiative, it was mutually beneficial for us to take your support for conducting the in-vitro lab testing for our patent pending innovation of the Assistive Oral Care Device. We were able to complete the first phase of oral biofilm testing under simulated conditions only because of your expert guidance and support in this regard. We look forward to working with you in the upcoming future research and validation requirements too. We believe this research collaboration can not only lead to the translation of our product into the market but also to some quality publications.

Thanking you,

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University College, Mangalore

For SOCIODENT PRIVATE LIMITED
Steward
Director / Authorised Signatory
Dr. Steward Gracian
Founder and Director
Sociodent Private Limited

Department of Microbiology, UCM

Report of Research collaboration with DR Steward for the biofilm study of his ORAL CARE DEVICE

Evaluation of microbial count on the denture biofilm to check the efficiency of 'Oral care device' designed by Socio-dent Start up.

A Socio-dent, a dental start-up has designed a innovative device for the oral care of bed ridden patients, Who can brush their teeth and clean their mouth this oral care device. To evaluate the efficiency of this device, it was necessary to assess the denture microbial count before and after the use of oral care device. (OCD).

Methodology-

For the validation of the OCD, mixed microbial biofilm, mimicking the oral biofilm was designed at The Department of Microbiology, University College, and Mangalore under Mangalore University. Two dentures, one as test and other as control were designed using the natural extracted teeth from Chennai dental clinics. The denture was made using Gypsum stone. Both the denture sets were sterilized exposing them to U V light in the Laminar airflow chamber or 15 Minutes.

Then both the dentures were kept in two separate heat resistant containers containing Nutrient of 250 ml. Containers and nutrient broth were sterilized in autoclave as per the protocol.

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Mixed Biofilm formation on denture-

For the biofilm formation, Pooled saliva of 1 ml was extracted from 4 female staff of the Microbiology dept., aged between 25 to 52 years. It was pooled and mixed in one sterile test tube and 1 ml of that was added to **test** container with green denture. Pooled saliva was not added as inoculum in the container with Brown denture and nutrient broth as treated as **control.** Both test container –A and control containers-B were incubated for 24 hours at 37^{O}C. After incubation, broth in the A container was turbid due to bacterial growth and B container was as it is. The denture from A container was removed aseptically and rinsed twice with sterile distilled water. Kept in a dry sterile petri plate and 4 teeth were selected to study the biofilm. Last two molars and two incisors. Using 4 sterile swabs, each of the above mentioned tooth was swabbed from both inside and outside and immersed in the 1ml sterile distilled water in the test tube. Mixed well using cyclomixer to liberate all adhered microbes to the swab. 1 ml of this suspension was further diluted serially till 10^{-4} dilution. From each serially diluted tube, 0.5 ml was spread on the nutrient agar plate. All the plates were incubated Thus 4 teeth swabs were spread on 4 nutrient agar plates and numbered 1-4 as given in the table below, and incubated for 24 hour at 37 ^{O}C. After 24 hours of incubation, colonies from each plate were observed counted and recorded.

Since it is a quantitative assessment and mixed biofilm from pooled saliva was used to grow the oral biofilm on the dentures, before and after brushing with OCD, only number of bacterial colonies were evaluated types of bacterial colonies were not necessary to evaluate. This procedure of evaluating bacterial load in the denture biofilm was repeated 3 times before brushing with OCD.

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Using OCD the biofilm on the denture was brushed and the same teeth were swabbed with sterile swabs in the similar fashion and plated with serial dilution. But this time we took only 10^{-4} dilution for plating on nutrient agar. The plates were incubated for the same time and temperature and colonies were observed and counted for documentation.

The bacterial colony counts in CFU (Colony Forming Units) is given in the table.

Observation and Results-

In the control B container, denture as it was not inoculated with pooled saliva, there was no growth. Before using OCD, the bacterial evaluation on experiment was repeated 3 ties to know the reproducibility in the result. In the first two dilution the bacterial count was too high like –Too Numerous to Count, (TNTC). In the 10-3 and 10-4 dilutions the bacterial number was countable. As per the observation before and after brushing with OCD, There is drastic reduction in the number of colonies .After brushing the number has reduced to 12 times in 10-4 serial dilution. One of the Incisors shows zero bacterial growth. This observation shows efficiency of the OCD.

Result

Table-1 Bacterial count before and after brushing with oral care device.

Evaluation of bacterial count on the artificial biofilm mimicked on the denture.					
Date 28-03-2022 Last left Molar	**10-1 dilution 1-1**	**10-2 dilution 1-2**	**10-3 dilution 1-3**	**10-4 dilution** 1-4	Remarks
	Numerous (TNTC)	Numerous (TNTC)	105x10 $^{-3}$	73x10-4	
Last right molar	**2-1** Numerous (TNTC)	**2-2** Numerous (TNTC)	**2-3** **89x10^{-3}**	2-4 91x10-4	

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Incisor 1	**3-1** Numerous (TNTC)	**3-2** Numerous (TNTC)	**3-3** $140x10^{-3}$	4-4 86 x10-4	
Incisor 2	4-1 Numerous (TNTC)	4-2 Numerous (TNTC)	4-3 109 x 10-3	4-4 98x10-4	

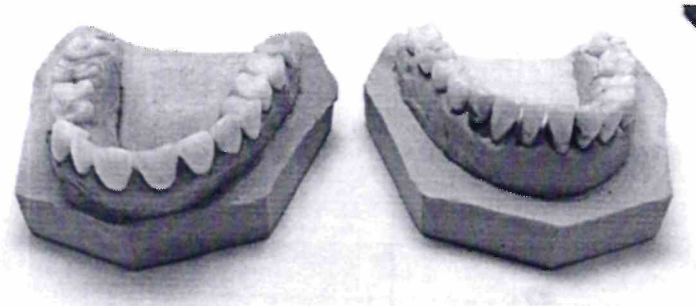
Evaluation of bacterial count before using Oral Care Device

4-04-2022	**Molar -1**	**Molar -2**	**Incisor -1**	**Incisor-2**	
	TNTC	TNTC	330 x 10-4	38 x 10-4	

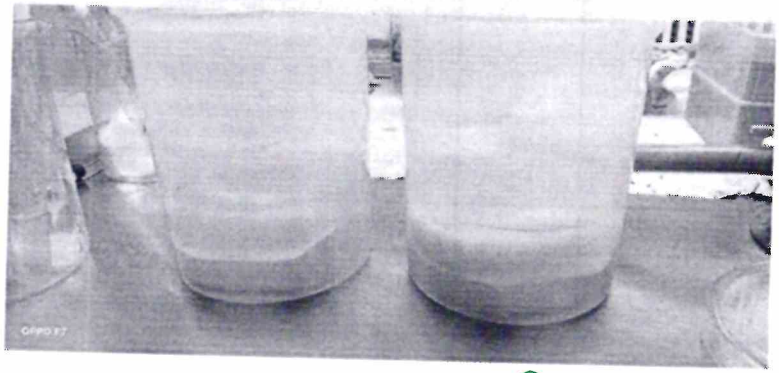
Note-TNTC: Too numerous to count

Evaluation of bacterial count after using oral care device

5-04-2022	**1-4**	**2-4**	**3-4**	**4-4**	
	$19x10^{-4}$	$0 x10^{-4}$	$2x10^{-4}$	$4x10^{-4}$	



Denture model with original teeth test and control set



Dentures in the sterile container with nutrient broth for biofilm formation.

Control container is without inoculum –i.e. pooled saliva

Test container is with Pooled saliva

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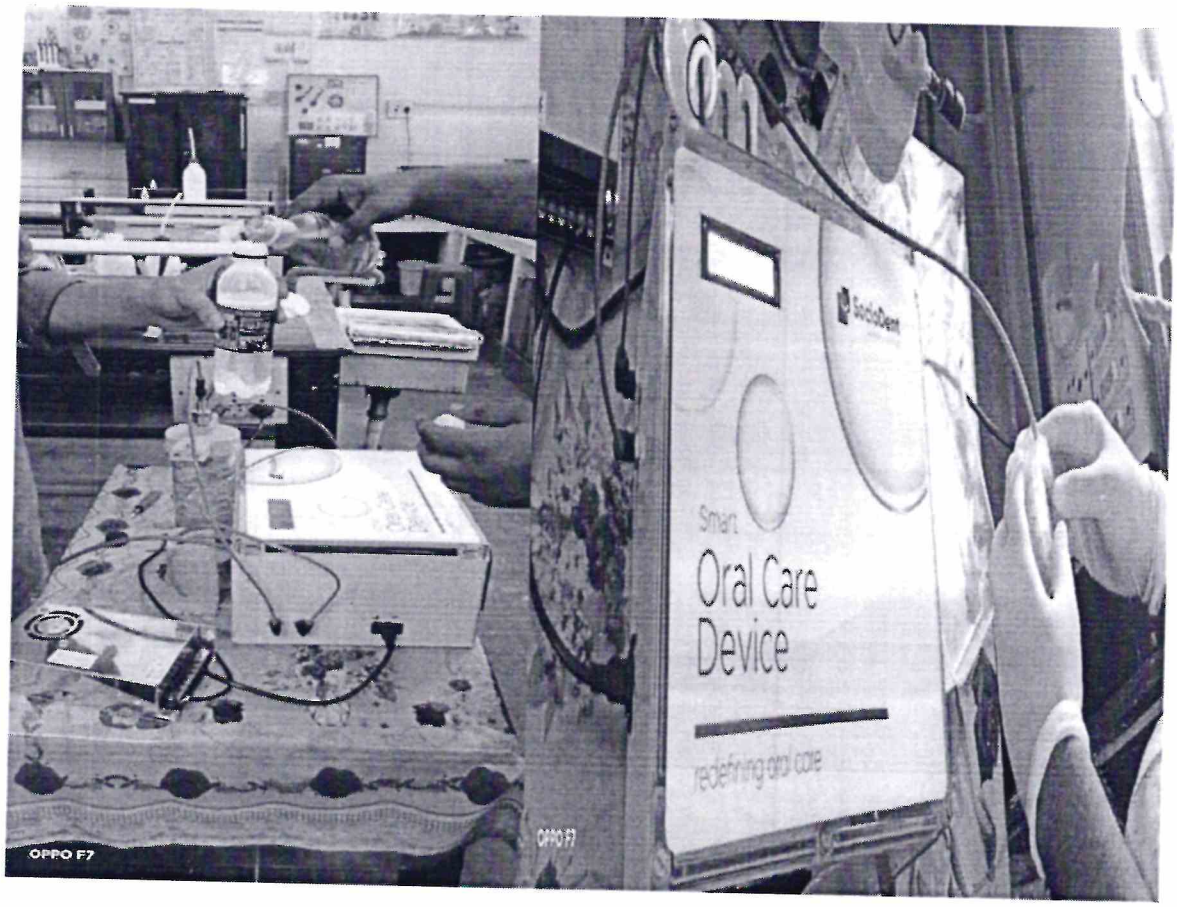

Research Coordinator- Dr Bharathi Prakash. Head, Dept. of Microbiology, and

Collaborative Support Dr Anasuya Rai, Principal, University College, Mangalore with Dr Steward and his associate from Chennai.

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Dr Bharathi Prakash

Publications out of the research work done by Mr VIVEK GHATE , research scholar of Prof Shaila Lewis of Manipal Pharmacy college, Manipal. The research collaboration was between the and **Dr Bharathi Prakash, Head** Dept of Microbiology, at University College, Mangalore and College of Pharmacy Manipal

> Int J Biol Macromol. 2019 Aug 1;134:269-279. doi: 10.1016/j.ijbiomac.2019.04.191. Epub 2019 Apr 30.

Pectin-based silver nanocomposite film for transdermal delivery of Donepezil

Arun K Kodoth [1], Vivek M Ghate [2], Shaila A Lewis [2], Bharathi Prakash [3], Vishalakshi Badalamoole [4]

Affiliations + expand

PMID: 31047929 DOI: 10.1016/j.ijbiomac.2019.04.191

Abstract

A novel pectin-based silver nanocomposite film has been synthesized with the aid of microwave, using green technology and its capacity to adsorb and deliver anti-Alzheimer's drug Donepezil (DPZ) has been investigated. The nanocomposite exhibited excellent adsorption and release efficiency. The pristine and the drug loaded films were characterized using FTIR, TGA, XRD and FESEM-EDS techniques. The DPZ release capacity of the nanocomposite in phosphate buffer saline solution was found to be 94.33 ± 2.12% during 5 days period. Along with the drug, about 92 kcps silver nanoparticles were observed to be released from the film leading to enhanced activity of the system. The drug release followed zero order kinetics and non-Fickian type of diffusion. Toxicity studies of the nanocomposite film conducted with sheep erythrocytes showed <9% hemolysis indicating the non-toxic and blood compatible nature. Further, the antimicrobial activity of the nanocomposite film against S. aureus and E. coli was quite significant compared to the standard antibiotics. These results reveal the nanocomposite film to be appropriate for the transdermal application avoiding the contamination due to the continuous contact of sweat and moisture from the skin.

Keywords: Ag nanoparticles; Antibacterial activity; Donepezil; Drug release; Microwave; Pectin.

Similar articles

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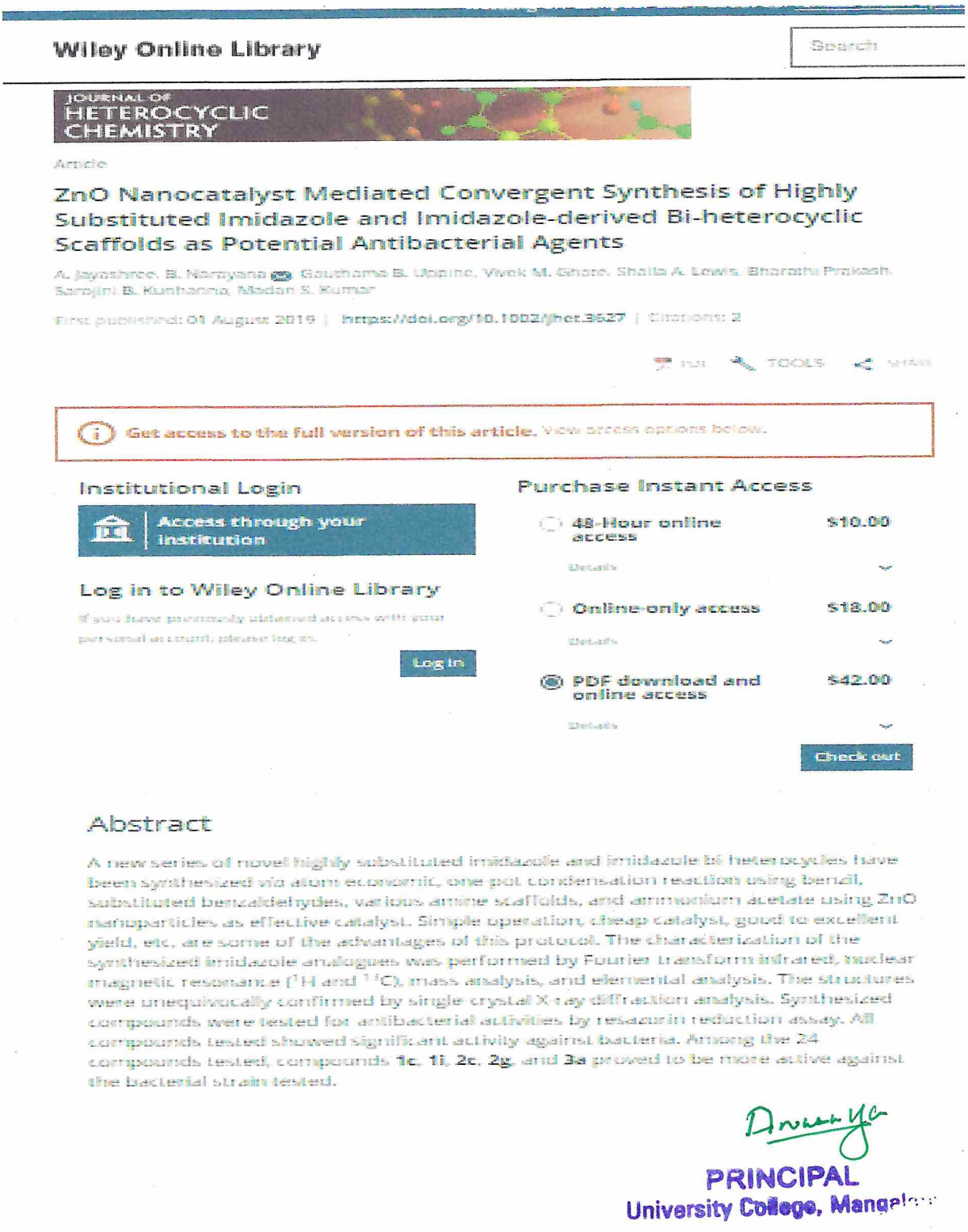
Publications out of the research work done by Mr VIVEK GHATE , research scholar of Prof Shaila Lewis of Manipal Pharmacy college, Manipal. The research collaboration was between the and **Dr Bharathi Prakash, Head** Dept of Microbiology, at University College, Mangalore and College of Pharmacy Manipal



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Article

ZnO Nanocatalyst Mediated Convergent Synthesis of Highly Substituted Imidazole and Imidazole-derived Bi-heterocyclic Scaffolds as Potential Antibacterial Agents

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Abstract

A new series of novel highly substituted imidazole and imidazole bi heterocycles have been synthesized via atom economic, one pot condensation reaction using benzil, substituted benzaldehydes, various amine scaffolds, and ammonium acetate using ZnO nanoparticles as effective catalyst. Simple operation, cheap catalyst, good to excellent yield, etc, are some of the advantages of this protocol. The characterization of the synthesized imidazole analogues was performed by Fourier transform infrared, nuclear magnetic resonance (^{1}H and ^{13}C), mass analysis, and elemental analysis. The structures were unequivocally confirmed by single crystal X-ray diffraction analysis. Synthesized compounds were tested for antibacterial activities by resazurin reduction assay. All compounds tested showed significant activity against bacteria. Among the 24 compounds tested, compounds **1c**, **1i**, **2c**, **2g**, and **3a** proved to be more active against the bacterial strain tested.

PRINCIPAL
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Report of the scientific collaboration

Department of Microbiology of University College and MANAV Project of INDIAN INSTITUTE OF SCIENCE DUCATION AND RESEARCH (IISER) PUNE had organised a webinar on 12th June 2020 during COVID Pandemic on **'How to read Scientific Literature'**? And **Introduction to MANAV –The Human ATLAS Initiative.**

Dr Anupama Harshal a Consultant for Science communication and public engagement for MANAV Project was the resource person from IISER Pune. **Dr Bharathi Prakash** Head of Microbiology department was the convener of the webinar. 38 students and staff participated for this webinar. MANAV project is excellent platform to make the students aware about the proper method of scientific reading for literature review. Many students got enrolled to work under this MANAV ATLAS PROJECT OF IISER, Pune

Dr Bharathi Prakash

Head ,Dept of Microbiology ,UCM

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